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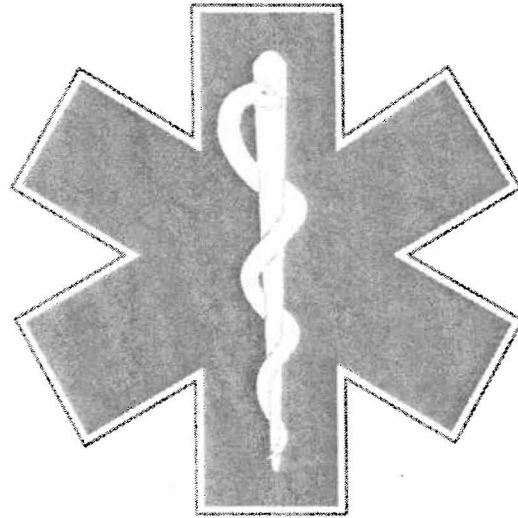
U.S. Department of Health & Human Services
Public Health Service



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EMT-PARAMEDIC



National Standard Curriculum

EMT-PARAMEDIC: NATIONAL STANDARD CURRICULUM

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PREFACE

The National Highway Traffic Safety Administration (NHTSA) has assumed responsibility for the development of training courses that are responsive to the standards established by the Highway Safety Act of 1966 (amended). Since these courses are designed to provide national guidelines for training, it is NHTSA's intention that they be of the highest quality and be maintained in a current and up-to-date status from the point of view of both technical content and instructional strategy.

To this end, NHTSA supported the current project which involved revision of the 1985 *Emergency Medical Technician-Paramedic: National Standard Curriculum*, deemed of high value to the states in carrying out their annual training programs. This curriculum was developed to be consistent with the recommendations of the *National Emergency Medical Services Education and Practice Blueprint*, the *EMT and Paramedic Practice Analysis*, and the *EMS Agenda for the Future*. This course is one of a series of courses making up a National EMS training program for prehospital care. The *EMT-Paramedic: National Standard Curriculum*, represents the highest level of education in EMS prehospital training.

The EMT-Paramedic: National Standard Curriculum represents the minimum required information to be presented within a course leading to certification as a Paramedic. It is recognized that there is additional specific education that will be required of Paramedics who operate in the field, i.e. ambulance driving, heavy and light rescue, basic extrication, special needs, and so on. It is also recognized that this information might differ from locality to locality, and that each training program or system should identify and provide special instruction for these training requirements. This curriculum is intended to prepare a medically competent Paramedic to operate in the field. Enrichment programs and continuing education will help fulfill other specific needs for the Paramedic's education.

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From the very beginning of this revision project, the Department of Transportation relied on the knowledge, attitudes, and skills from hundreds of experts and organizations. These individuals and organizations sought their own level of involvement toward accomplishing the goals of this project. These contributions varied from individual to individual, and regardless of the level of involvement, everyone played a significant role in the development of the curriculum. It is essential that those who have assisted with the achievement of this worthy educational endeavor be recognized for their efforts. For every person named, there are many more individuals who should be identified for their contributions. For all who have contributed, named and unnamed, thank you for sharing your vision. Your efforts have helped assure that the educational/training needs of Paramedics are met so that they can provide appropriate and effective patient care.

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THE EMT-PARAMEDIC: NATIONAL STANDARD CURRICULUM

History

The last revision of the EMT-Paramedic: National Standard Curriculum occurred in the early 1980s with a completed curriculum published in 1985. This current revision came about as a result of the National Highway Traffic Safety Administration's (NHTSA) January 1990 *Consensus Workshop on Emergency Medical Services Training Programs*. Participants discussed the national training curricula needs of Emergency Medical Service (EMS) providers. Using a nominal group process, the participants identified the top priority needs for EMS training in the United States.

The top priorities identified at that meeting led to revision of the EMT-Basic: National Standard Curriculum in 1994 and the First Responder: National Standard Curriculum in 1995. Upon the completion of these curricula, NHTSA funded a project to revise the EMT-Paramedic: National Standard Curriculum, EMT-Intermediate: National Standard Curriculum, and Associated Refresher programs. This curriculum is a result of that contract.

As stated in the contract, this curriculum is specifically designed to address the educational needs of the traditional paramedic. It is not intended to expand the scope of practice of the Paramedic. It is designed to provide a solid foundation for professional practice and additional education with a heavy emphasis on clinical problems solving and decision making.

The development utilized a variety of resources to help in curricular decision making. They included, but were not limited to: National Emergency Medical Services Education and Practice Blueprint, ASTM F1489-93, A Standard Guide for Performance of Patient Assessment by the EMT-Paramedic, Institute of Medicine's Report - Emergency Medical Services for Children, The EMS Agenda for the Future, The EMT and EMT-Paramedic Practice Analysis. These resources provided invaluable insight and assistance throughout the curriculum development.

The Curriculum Development Process

Because of the size of this project, many individuals were brought together to develop the curriculum. These extraordinarily talented individuals were organized into groups and teams. The Administrative Team's primary responsibility was to assure that the project was proceeding according to plan and to serve as a "hub" for the various groups and individuals involved in the many aspects of curriculum development.

The content of this curriculum was developed by writing teams that were each assigned a unit of the curriculum. Each writing team consisted of at least one author, one subject matter expert, and up to eight adjunct writers. These writing teams consisted of some of the most experienced educators and clinicians in emergency medicine. The authors were responsible for coordinating the writing group and actually developing the materials. The subject matter experts were responsible for the accuracy of each section. The subject matter experts were nationally recognized content experts. For all medical areas, the subject matter expert was a physician. The adjunct writers contributed to the development and review of the material.

The peer reviewers of the curriculum represented professionals from around the country who expressed

an interest in participating in the curriculum development process. They had the opportunity to submit comments about each draft of the curriculum to the writing team for consideration. The National Review Team consisted of representatives from national EMS organizations. The National Review team received every draft of the curriculum, and had the opportunity to register organizational opinions. Additionally, the National Review Team had two face-to-face meetings. These meetings were instrumental in developing consensus opinions on controversial issues.

The National Association of State EMS Directors and the National Council of State EMS Training Coordinators made extraordinary contributions to the overall design, development, and content of the curriculum throughout the project. More importantly, these organizations will assume the responsibility for implementing the curriculum in the coming years.

One pilot of the paramedic curriculum was conducted by the Center for Emergency Medicine in Pittsburgh, Pennsylvania. As part of their in-kind service to the project, the Joint Review Committee of Educational Programs for the EMT-Paramedic selected sites from around the country to serve as field test. These sites were asked to implement a draft of the curriculum and provide feedback to the administrative team. Both the pilot test and the field test sites were an important component of the curriculum development. The project team gained valuable insight into the implementation of this curriculum.

The National Registry of EMTs' support of this project was extraordinary. The National Registry contributed to the design and development of the examinations and final evaluation tools that were used in the pilot program, as well as the tabulation and evaluation of scores. They contributed significantly to the design and development of the skill sheets that are contained within this curriculum. The National Registry provided financial support for meetings of the group leaders.

The Joint Review Committee on Educational Programs for the EMT-Paramedic conducted surveys that were used to establish the clinical requirements. They also developed the affective evaluation tools.

Curriculum Goal and Approach

A curriculum is only one component of the educational process. Alone, it cannot assure competence. The goal of this curriculum is to be part of an educational system that produces a competent entry level paramedic. For the purpose of this project, competence was defined relative to the Description of the Profession.

Description of the Profession

The first step in the curriculum design phase of the project was to define the profession in terms of general competencies and expectations. The Description of the Profession was drafted and underwent extensive community and peer review. It was designed to be both practical and visionary, so as to not limit the growth and evolution of the profession. Ultimately it served as the guiding document for the curriculum development. The Description of the Profession also provided the philosophical justification of the depth and breadth of coverage of material. The Description of the Profession for the Paramedic is attached as Appendix A.

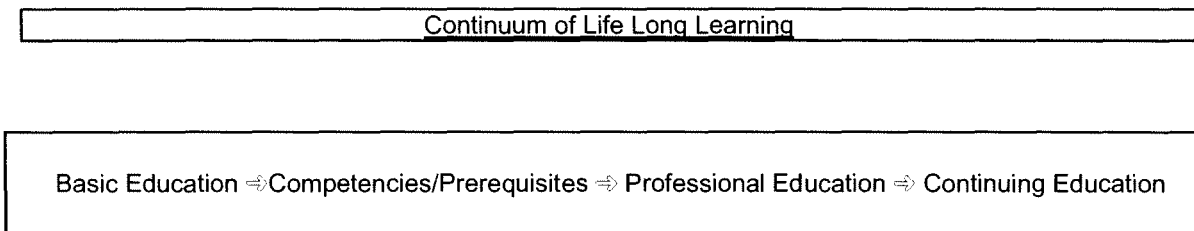
Educational Model

From the Description of the Profession, an Educational Model was developed to achieve the goals of the

course. This Educational Model also went through extensive community and peer review. This is a graphical representation of the major components of the curriculum. The Paramedic Educational Model was designed to be consistent with, and build upon, the Educational Model for the EMT-Basic. The Educational Model is not intended to imply a rigid order or sequence of the material. Course planners and educators should adapt and modify the order of the material to best meet their needs and those of their students.

Much of the material in the preparatory section sets the stage for the rest of the course. Although there is no requirement to adhere to the order of the model, most educators agreed that this information should be presented early in the course. Additionally, Airway and Ventilation and Patient Assessment are fundamental skills and knowledge areas and should be presented toward the beginning of the course of study. In the Educational Model, the Medical and Trauma modules appear on either side Patient Assessment. In general, it is assumed that most programs will cover this material after the Preparatory, Airway, and Patient Assessment material.

The Model is also designed to emphasize the role of professional education as part of life long learning (fig. 1).



The EMT-Paramedic: National Standard Curriculum Diagram of Educational Model is attached as Appendix B.

Competencies

Paramedic program directors often comment that poor basic skills become problematic when attempting to teach many parts of the paramedic course. Deficiencies in basic skills are difficult to overcome throughout the course, but are most evident when teaching communication skills, documentation, and pharmacology math skills. It is not the intent of professional education to teach basic skills, but rather build on an existing base of academic competencies. The Paramedic curriculum assumes competence in English and math prior to beginning the course.

Documentation skills rely far more heavily on spelling, grammar, vocabulary and syntax than on the mastery of the specialized form of report writing that is found in health care. If, through program evaluation, a program identifies less than satisfactory results in documentation skills, it should raise the prerequisite level of English competence.

Similarly, if a program has difficulty with the student's pharmacology math skills, it is suggested that the prerequisite level of math competence be increased, rather than attempting to remediate these basic skills in the context of paramedic education.

The Functional Job Description of the Paramedic (appendix C), conducted by the National Registry of EMTs in 1997 identifies competence in math at the high school level and reading at the post high school level is necessary to perform as an entry level Paramedic. It is suggested that programs assess applicant's basic skills prior to entry into training. If the competence of the applicant falls below this level, the student should be encouraged to remediate the deficiency prior to pursuing paramedic certification. If the program chooses to enroll students below these basic skills levels, it is the program's responsibility to provide individual tutoring, increase course time, provide remedial education, or require co-requisite course work to improve the candidates basic skills prior to graduation.

Course Length

Basic academic skills play a very important role in course length and attrition rate. Attrition rate is a function of the groups basic academic skills and the length of the course. If course length remains constant, and the basic skills of the applicants decreases, the attrition rate will rise. Correspondingly, if a program seeks to decrease its attrition rate or increase examination performance, it may do so by increasing the basic academic skills of its students, increasing course length, or both. This information should be taken into account in course planning.

The emphasis of paramedic education should be competence of the graduate, not the amount of education that they receive. The time involved in educating a paramedic to an acceptable level of competence depends on many variables. Based on the experience in the pilot and field testing of this curriculum, it is expected that the average program, with average students, will achieve average results in approximately 1000-1200 hours of instruction. The length of this course will vary according to a number of factors, including, but not limited to:

- student's basic academic skills competence
- faculty to student ratio
- student motivation
- the student's prior emergency/health care experience
- prior academic achievements
- clinical and academic resources available
- quality of the overall educational program

Appendix D is a summary of the time that each of the eight field test sites needed to cover a draft of the curriculum. These times are meant only as a guide to help in program planing. Training institutes **MUST** adjust these times based on their individual needs, goals and objectives. These times are only recommendations, and should **NOT** be interpreted as minimums or maximums. Those agencies responsible for program oversight are cautioned against using these hours as a measure of program quality or having satisfied minimum standards. Competence of the graduate, not adherence to arbitrary time frames, is the only measure of program quality.

Prerequisites

There are two prerequisites for the Paramedic curriculum: EMT-Basic and Anatomy and Physiology.

EMT-Basic

It has been a long held tradition to use EMT-Basic certification as a prerequisite for more advanced EMS

education, and this curriculum continues that tradition. It is important to note that some educators have questioned the practice of using EMT-Basic as a required certification prior to enrollment in Paramedic education. In fact, no studies have been able to verify EMT-Basic certification or experience as a predictor of success in paramedic education. Of course, paramedics are required to be competent in *all* of the skills and knowledge of and EMT-Basic, and this knowledge base and skills competence should be verified during paramedic education.

Although this curriculum identifies EMT-Basic as a prerequisite, we have done so in the absence of empirical data suggesting that this is appropriate. We encourage flexibility in approaching the issue of EMT-Basic as a prerequisite to paramedic education. We also recognize that it may be possible to incorporate all of the material of an EMT-Basic class into a paramedic program, eliminating the need for it as a prerequisite. Clearly, more research is needed.

Anatomy and Physiology

The Paramedic curriculum has identified course work in anatomy and physiology as either a pre- or co-requisite. A mastery of anatomy and physiology, beyond that covered in the anatomy and physiology review of each section of the curriculum is assumed throughout this curriculum. EMS educational programs have many options to address anatomy and physiology in paramedic education. For programs that have access to formal anatomy and physiology classes, an appropriate level course can be identified as a pre or co-requisite to paramedic training. For other programs, anatomy and physiology can be “front loaded” in the paramedic course, or presented throughout the course.

There are many resources to aid EMS training sites and instructors in teaching an appropriate level of anatomy and physiology to current or prospective paramedic students. These texts and materials are available from many health care, medical and nursing publishers. Publishers usually have significant instructor and program support materials, usually including: textbooks, student workbooks, lesson plans, audiovisual materials, test banks, etc.

A list of objectives has been derived from many of the currently available resources in anatomy and physiology instruction. All of these objectives were consistently found in allied health educational programs or other non-science curricula. A list of the anatomy and physiology objectives that are considered pre- or co-requisite to paramedic education is found in appendix E. Paramedic programs should select courses or textbooks which cover this level of material.

Life Long Learning/Continuing Education

Continuing education is an integral component of any professional education process and the paramedic must be committed to life-long learning. The Paramedic curriculum must fit within the context of a continuing educational system. This is necessary due to the continually changing dynamics and evolution of medical knowledge.

This curriculum is designed to provide the student with the essentials to serve as an entry level paramedic. We recognize that enrichment and continuing education will be needed in some cases to bring the student to full competency. We strongly urge employers and service chiefs to integrate new graduates into specific orientation training programs.

It is important to recognize that this curriculum does not provide students with extensive knowledge in hazardous materials, blood-borne pathogens, emergency vehicle operations or rescue practices in

unusual environments. These areas are not core elements of education and practice as identified in the *National EMS Education and Practice Blueprint*. Identified areas of competency not specifically designed within the EMT-Paramedic: National Standard Curriculum should be taught in conjunction with this program as a local or state option.

PARAMEDIC EDUCATION

Society is becoming more demanding in all areas in education. The current trend in professional education is to demonstrate, in quantitative ways, the value and quality of the program. Simply adhering to standards is no longer adequate to convince the stake holders that educational programs are satisfying the needs of its constituency. Government, society, and the profession are demanding that educational programs are held accountable for the product that they are producing. This section of the curriculum briefly describes critical components, along with adherence to the Paramedic: National Standard Curriculum, that will enable programs to objectively demonstrate their value and quality.

Sponsorship

Paramedic education should take place in an academic environment. An academic environment has services such as a library, student counseling (education, academic, psychological, career, crisis intervention), admissions, financial aid, learning skills centers, student health services, etc. Additionally, an academic environment offers such advantages as admissions screening, standardized student selection criteria, registrar, record keeping, bursar, student activities, collegial environment, formal academic credit, medial resources, and vast institutional resources.

The financial resources should be adequate for the continued operation of the educational program to ensure each class of students is funded to complete the course. The budget should reflect sound educational priorities including those related to the improvement of the educational process.

Admissions for students should be made in accordance with clearly defined and published practices of the institution. Specific academic, health related, and/or technical requirements for admission shall be clearly defined and published. The standards and /or prerequisites must be made known to all potential applicants.

The program should be responsible for establishing a procedure for determining that the applicant's or students' health will permit them to meet the written technical standards of the program. Students should be informed of and have access to health services. The health and safety of students, faculty, and patients associated with educational activities must be adequately safeguarded.

Accurate information regarding program requirements, tuition and fees, institutional and programmatic policies, procedures, and supportive services shall be available to all prospective students and provided to all enrolled students. There should be a descriptive synopsis of the current curriculum on file and available to candidates and enrolled students. There should be a statement of course objectives, copies of course outlines, class and laboratory schedules, clinical and field internship experience schedules, and teaching plans on file and available.

Student and faculty recruitment and student admission and faculty employment practices shall be non-discriminatory with respect to race, color, creed, sex, age, disabling conditions, and national origin. The program and sponsoring institution should have a defined and published policy and procedure for processing student and faculty grievances.

Policies and processes for student withdrawal and for refunds of tuition and fees shall be published and made known to all applicants. Policies by which student may perform service work while enrolled in the program must be published and made known to all concerned in order to avoid practices in which students are substituted for regular staff.

Student records shall be maintained for student admissions, attendance, academic counseling and evaluation. Grades and credits for courses shall be recorded and permanently maintained by the sponsoring institution.

Program Planning/Communities of Interest

As with all professional education, it is critically important that Paramedic education programs are planned, executed and evaluated in a continuous quality improvement model. Only through a thorough assessment of the needs of the community, the establishment of goals to meet those needs, and program evaluation relative to those needs, will a program be able to demonstrate its quality and value.

Every professional education program is designed and conducted to serve a number of communities of interest. It is incumbent on the program directors to identify who is being served by the program, and adapt the program to best meet those needs. The program's goal statement should help to clarify the communities that the program serves. Although students are the consumer of the educational program, they are not the customer of the product. Ultimately, the program serves the employers of graduates, not students. Typically, the communities of interest include directors, managers, and medical directors who hire or supervise graduates. Other communities of interest might include: colleagues, government officials, hospital administrators, insurance companies, patients, and the public.

As part of the planning process, the program should regularly assess the communities of interest, and establish objectives to best serve them. One way to survey the communities of interest is to establish an advisory board consisting of representatives from various communities of interest and regularly question them as to their expectations of entry level Paramedics. The program would use this information for program planning. Specifically, the program should use this information to clarify how to achieve their program goals and objectives.

Program Goal

Each paramedic program should have a program goal. The program goal is a statement of the desired outcome of the program, and typically references graduating competent entry-level providers. By design, program goals are broad based, but establish the parameters by which the effectiveness of the program will be evaluated. A program may have multiple goals, but most use one for clarity. For example, a typical program goals statement might read:

The goal of the ABC Paramedic Education program is to produce competent, entry level

Paramedics to serve in career and volunteer positions in XYZ county.

If the program provided additional training that is clearly not within the definition of the entry level practitioner, then additional information should be included in the goal. Education planning should be based on the program goal, the mission of the sponsoring institution, and the expectations of the health care community. The goal should be made known to all members of the communities of interest, especially the students and faculty.

The goal will be used to select appropriate curricular materials, clinical experiences, and many other aspects of program planning.

Program Objectives

Objectives are more specific statements of the outcomes of the program, and are derived from the program goal in conjunction with the communities of interest. The program can establish as many objectives as they see fit to accurately reflect the program goal. Often, programs find it useful to establish objective along the three domains of learning. Examples might include:

Program Cognitive Objective:

At the completion of the program, the graduate of the ABC Paramedic Education Program will demonstrate the ability to comprehend, apply, and evaluate the clinical information relative to his role as an entry level paramedic in XYZ county.

Program Psychomotor Objective:

At the completion of the program, the student will demonstrate technical proficiency in all skills necessary to fulfil the role of entry level paramedic in XYZ county

Program Affective Objective:

At the completion of the program, the student will demonstrate personal behaviors consistent with professional and employer expectations for the entry level paramedic in XYZ county.

Goals and objectives must be consistent with the needs of the communities of interest, e.g. the program sponsors, employers, students, medical community, and profession. There may be some goals that are important institutional goals that are not useful program goals. The only goals that are considered program goals are those that relate specifically to the competencies attained in the program.

Use of the Goals and Objectives in Program Evaluation

Program goals and objectives form the basis for program assessment. Once the goals and objectives are established, they serve as a mechanism to evaluate the effectiveness of the program. By utilizing a variety of evaluation methodologies (performance of graduates on certification exams, graduate surveys, employer surveys, medical director surveys, patient surveys) the program can evaluate their effectiveness at achieving each objective. For example, if graduates consistently perform poorly on the cardiac section of certification exams, and graduates, employers, and medical directors all state that students are weak in cardiology, the program should critically evaluate this section of their curriculum.

Programs are encouraged to evaluate each objective in as many ways as possible. For example, graduate cognitive skills could be evaluated by performance on standardized tests, certification exams, graduate surveys, employer surveys, and medical director surveys. This provides much more information than using one source of data.

Course Design

The paramedic program should consist of four components of instruction: didactic instruction, skills laboratory, clinical education, and field internship. The first three typically occur concurrently, and the field internship serves as a verification that the student is serving as a competent, entry level practitioner.

Didactic Instruction

The didactic instruction represents the delivery of primarily cognitive material. Although this is often delivered as lecture material, instructors are strongly encouraged to utilize alternate delivery methods (video, discussion, demonstration, simulation, etc.) as an adjunct to traditional classroom instruction. The continued development and increased sophistication of computer aided instruction offers many options for the creative instructor. It is not the responsibility of the instructor to cover all of the material in a purely didactic format, but it is the responsibility of the program director to assure that all students are competent over the material identified by the declarative section.

Skills Laboratory

The skills laboratory is the section of the curriculum that provides the student with the opportunity to develop the psychomotor skills of the paramedic. The skills laboratory should be integrated into the curriculum in such a way as to present skills in a sequential, building fashion. Initially, the skills are typically taught in isolation, and then integrated into simulated patient care situations. Toward the latter part of the program, the skills lab should be used to present instructional scenarios to emphasize the application and integration of didactic and skills into patient management.

Clinical Education

Clinical education represents the most important component of paramedic education since this is where the student learns to synthesize cognitive and psychomotor skills. To be effective, clinical education should integrate and reinforce the didactic and skills laboratory components of the program. Clinical instruction should follow sound educational principles, be logically sequenced to proceed from simple to complex tasks, have specific objectives, and be closely supervised and evaluated. Students should not be simply sent to clinical environments with poorly planned activities and be expected to benefit from the experience.

The ability to serve in the capacity of an entry level paramedic requires experience with actual patients. This process enables the student to build a database of patient experiences that serves to help in clinical decision making and pattern recognition. A skilled clinical educator must point out pertinent findings and focus the beginner's attention.

Program directors should be cautioned against using time as a criteria to determine the quantity of clinical

education. More than any other phase of paramedic education, minimum amounts of patient contacts and frequency of skills performed must be established for clinical education. It is acceptable to use a time based system to help in program planning, but a system must be used to assure that every student satisfies each and every clinical objective.

Typically, clinical education for the paramedic takes place in both the hospital and field environments:

Hospital Clinical - Because of the unpredictable nature of emergency medicine, the hospital environment offers two advantages in paramedic education: volume and specificity. In the hospital setting, the paramedic student can see many more patients than is possible in the field. This is a very important component in building up a "library" of patient care experiences to draw upon in clinical decision making.

The use of multiple departments within the hospital enables the student to see an adequate distribution of patient situations. In addition to emergency departments, which most closely approximate the types of patients that paramedics should see, clinical education should take advantage of critical care units, OB/GYN, operating rooms/anesthesia, recovery, pediatrics, psychiatric, etc. This will help assure a variety of patient presentations and complaints. These also provide a more holistic view of health care and an appreciation for the care that their patients will undergo throughout their recovery. This places emergency care within context.

Paramedic programs throughout the country have created clinical learning experiences in many environments. There is application to emergency medical care in almost any patient care setting. When a particular location lacks access to some patient populations, educational programs have created innovative solutions. Programs are encouraged to be creative and seek out clinical learning experiences in many settings. Examples include: morgues, hospices, nursing homes, primary care settings, doctor's offices, clinics, laboratories, pharmacies, day care centers, well baby clinics, and community and public health centers.

Field Clinical - It is unreasonable to expect students to derive benefit from being placed into a field environment and performing. Field clinical represents the phase of instruction where the student learns how to apply cognitive knowledge and the skills developed in skills laboratory and hospital clinical to the field environment. In most cases, field clinical should be held concurrently with didactic and hospital clinical instruction.

Field instruction, as well as hospital clinical, should follow a logical progression. In general, students should progress from observer to participant to team leader. The amount of time that a student will have to spend in each phase will be variable and depend on many individual factors. One of the largest factors will be the amount and quality of previous emergency care experience. With the trend toward less and less EMT experience prior to paramedic education, program directors must adjust the amount of field experience to the experience of the students.

Clinical affiliations shall be established and confirmed in written affiliation agreements with institutions and agencies that provide clinical experience under appropriate medical direction and clinical supervision. Students should have access to patients who present common problems encourage in the delivery of advanced emergency distributed by age and sex. Supervision should be provided by instructors or preceptors appointed by the program. The clinical site should be periodically evaluated with respect to its continued appropriateness and efficacy in meeting the expectations of the programs. Clinical affiliates should be accredited by the Joint Commission on Accreditation of Healthcare Organizations.

Field Internship

The final ability to integrate all of the didactic, psychomotor skills, and clinical instruction into the ability to serve as an entry level paramedic is conducted during the field internship phase of the program. The field internship is not an instructional, but rather an evaluative, phase of the program. The field internship should occur toward the end of the program, with enough coming after the completion of all other instruction to assure that the student is able to serve as an entry level paramedic. During the field internship the student should be under the close supervision of an evaluator.

Field internship must occur within an emergency medical service which demonstrates medical accountability. Medical accountability exists when there is good evidence that the EMS providers is not operating as an independent practitioner, and when field personnel are under direct medical control of on-line physicians or in a system utilizing standing orders where timely medical audit and review provide quality improvement.

Quality improvement is also a required component of EMS training. The role of medical direction is paramount in assuring the provision of highest quality out-of-hospital care. Medical Directors should work with individuals and systems to review out-of-hospital cases and strive to achieve a sound method of continuous quality improvement.

Student Assessment

Any educational program must include several methods for assessing student achievement. As mentioned before, quizzes of the cognitive and psychomotor domains should be provided regularly and frequently enough to provide the students and the faculty with valid and timely indicators of the student's progress toward and the achievement of the competencies and objectives stated in the curriculum. Ultimately, the program director is responsible for the design, development, administration and grading of all written and practical examinations. This task is often delegated to others. Some programs use outside agency developed or professionally published evaluation instruments. This does not alleviate the program's responsibility to assure the appropriateness of these exam materials. All examinations used within the program must have demonstrated validity and reliability and conform to psychometric standards. Programs are encouraged to use outside sources to validate examinations and/or as a source of classroom examination items.

The primary purpose of this course is to meet the entry-level job expectations as indicated in the job description. Each student, therefore, must demonstrate attainment of knowledge, attitude, and skills in each area taught in the course. It is the responsibility of the educational institution, program director, medical director, and faculty to assure that students obtain proficiency in all content areas. If after counseling and remediation a student fails to demonstrate the ability to learn specific knowledge, attitudes and skills, the program director should not hesitate to dismiss the student. The level of knowledge, attitudes and skills attained by a student in the program will be reflected in his performance on the job as a paramedic. This is ultimately a reflection on the program director, primary instructor, medical director and educational institution. It is not the responsibility of the certifying examination to assure competency over successful completion of the course. Program directors should only recommend qualified candidates for licensure, certification or registration.

Requirements for successful completion of the course are as follows:

Cognitive - Students must demonstrate competency of all content areas. This is most often done using quizzes, regular topical exams, and some combination of comprehensive exams (mid terms and finals). Cognitive evaluations must be reliable and viable. Programs should incorporate psychometric principles whenever possible. For example, item analysis should be utilized to assure discrimination on achievement tests. Scores on tests of known validity and reliability should be correlated to teacher made examinations. Medical director should take examinations and provide content validity input. Examinations should be balanced to areas within the course. Pass/fail scores should be established with an understanding of standard setting. Decisions regarding the continuation of students in class need to be made following a pattern of performance. One test failure should not result in failure from the program. Grading practices should be standardized to prevent bias by instructional staff. Essay and open ended questions should be clearly written and acceptable answers should be known before the examination is administered. Test should be kept secure and reviewed by students during class time. Programs should investigate methods to Special remedial sessions may be utilized to assist in the completion of a unit or module of instruction. Scoring should be in accordance with accepted practices.

Affective - Students must demonstrate professionalism, conscientiousness and interest in learning. The affective evaluation instruments contained within this curriculum were developed using a valid process and their use is strongly recommended. Just as with cognitive material, the program cannot hold a student responsible for professional behaviors that were not clearly taught. The professional attributes evaluated using this instrument references the material in the Roles and Responsibilities of the Paramedic section of the curriculum. The instruments can be incorporated into all four components of the program: didactic, practical laboratory, clinical and field internship. Students who fail to do so should be counseled while the course is in progress in order to provide them the opportunity to develop and exhibit the proper attitude expected of a paramedic. See appendix F.

Psychomotor - Students must demonstrate proficiency in all skills. A complete list of skill competencies expected to be completed within the program should be available to each student. Students should know pass/fail score of any instrument utilized within an educational program. Whenever possible multiple evaluators recording performance of a student should be made. Scenarios should be medically accurate and flow as they would in a typical EMS call. In clinical and field internship all instructional staff must be familiar with psychomotor instruments and expectations. Inter-rater reliability between various instructional staff must be monitored by the program. Clinical and field instructional staff orientations may help resolve issues of inter-rater reliability. Course ending skills examinations should be administered. Special remedial sessions may be utilized to assist in the completion of a unit or module of instruction. Pass/fail scores should be in accordance with accepted practices. It is strongly recommended that program utilize the skills evaluation instruments provided in this curriculum. See appendix G.

Students should be evaluated in all three domains in didactic, practical laboratory, clinical and field internship. For example, the students cognitive knowledge can be evaluated in the clinical setting by direct questioning or discussions. Secondly, if an IV is started on a patient, the psychomotor skill should

be evaluated. Finally, the affective domain, their professional attributes can be measured. This example also applies to skills laboratories. In the skills laboratory, the cognitive domain can be measured by asking questions about the skill, and the affective domain can be measured by their attitude in learning and practicing the skills.

Program Personnel

There are typically many individuals involved in the planning and execution of a paramedic program. For clarity, the following terms are defined as they will be used throughout this document.

These identified roles and responsibilities are a necessary part of each paramedic program. The individuals carrying them out may vary from program to program and from locality to locality as the exact roles interface and overlap. In fact, one person, if qualified, may serve in multiple roles.

Program Director

The Program Director is the individual responsible for course planning, organization, administration, periodic review, program evaluation, continued development, and effectiveness. The program should have a full-time Program Director while the program is in progress, whose primary responsibility is to the educational program. The program Director should contribute an adequate amount of time to assure the success of the program. The program director shall actively solicit and require the cooperative involvement of the medical director of the program.

The program director must have appropriate training and experience to fulfill the role. They should have at least equivalent academic training and preparation and hold all credentials for which the students are being prepared, or hold comparable credentials which demonstrate at least equivalent training and experience.

The program director should have training and education in education and evaluation and be knowledgeable in administration of education and related legislative issues for paramedic education. The program director should assume ultimate responsibility for the administration of the didactic, clinical, and field internship phases of the program. It is the program directors responsibility to monitor all phases of the program and assure that they are appropriate and successful.

Program Faculty

The depth and breadth of paramedic education has evolved through the years and expanded considerably from the early days of emergency medicine. It is no longer reasonable to assume that one individual possesses the required depth of knowledge to be able to teach the entire program. As a result the Program Director and/or Course Coordinator should use content area experts extensively through the program.

Course Medical Director

Medical direction of the paramedic is an essential component of out-of-hospital training. Physician involvement should be in place for all aspects of EMS education. The Course Medical Director of the paramedic program should be a local physician with emergency medical experience who will act as the ultimate medical authority regarding course content, procedures, and protocols. All of the program faculty

should work closely together in the preparation and presentation of the program.

The Course Medical Director can assist in recruiting physicians to present materials in class, settling questions of medical protocol and acting as a liaison between the course and the medical community. During the program the Medical Director will be responsible for reviewing the quality of care rendered by the paramedic student in the clinical and field setting. The Course Medical Director should review all course content material and examinations. The medical director should periodically observe lectures and practical laboratories, field and clinical internships. The medical director should participate in clinical instruction, student counseling, psychomotor and oral testing, and summative evaluation.

Most importantly, the Course Medical Director is responsible to verify student competence in the cognitive, affective and psychomotor domains. Students should not be awarded course ending certificates unless the medical director and program director can assure through documentation of completion of terminal competencies that each student has completed the full complement of education. Documentation of completion of course competencies should be affixed to the student file with signatures of the medical director and program director at the completion of the course.

Licensure, Certification and Registration

State regulatory agencies may require specific evaluation of cognitive and psychomotor performance prior to official licensure, certification or registration as a Paramedic. This is in addition to course completion and may be required by state regulations. The National Registry of EMTs is a recognized agency that provides examinations for certification and registration that may be required by your state. The program director should contact the State Office of Emergency Medical Services for licensure, certification or registration information.

Program Evaluation

On-going evaluation must be initiated to identify instructional or organizational deficiencies which affect student performance. The evaluation process should include both objective and subjective methods. Main methods of objective evaluation generally used are: 1) Graduates' performance on standardized examinations, and 2) Graduates' performance in practice in accordance with established standards of care. Group and individual deficiencies may indicate problems in conducting the education program.

Subjective evaluation should be conducted at regular intervals by providing students with written questions on their opinions of the program's strengths and weaknesses. Students should be given the opportunity to comment on the instruction, presentation style and effectiveness. Students should also be asked to comment on the program's compliance with the specified course of instruction, the quality and quantity of psychomotor skills labs, clinical rotations, and the validity of the examinations.

The purpose of this evaluation process is to strengthen future educational efforts. All information obtained as part of the subjective evaluation should be reviewed for legitimacy and possible incorporation into the course. Due to the important nature of this educational program, every effort should be made to ensure the highest quality instruction.

Facilities

The physical environment for the provision of the paramedic program is a critical component for the success of the overall program. The facility should sufficient space for seating all students. Abundant space should be made available for demonstration during the presentation of the course material. Additional rooms or adequate space should be available to serve as a practice area. The facility should be well lit for adequate viewing of various types of visual aids and demonstrations. Heating and ventilation should assure student and instructor comfort and the seats should be comfortable with availability of desk tops or tables for taking notes. There should be an adequate number of tables for display of equipment, medical supplies, and training aids. A chalkboard (flip chart, grease board) should be in the main hall. A projection screen and appropriate audio visual equipment should be located in the presentation facility. Practice areas should be carpeted and large enough to accommodate six students, one instructor, and the necessary equipment and medical supplies. Tables should be available for practice areas, with appropriate and sufficient equipment and medical supplies.

Equipment and Supplies

Sufficient supplies and equipment to be used in the provision of instruction shall be available and consistent with the needs of the curriculum and adequate for the students enrolled. The equipment must be in proper working order and sufficient to demonstrate skills of patients in various age groups. It is recommended that all the required equipment for the program be stored at the facility to assure availability for its use.

HOW TO USE THE CURRICULUM

There are eight modules of instruction in the core content. There are 52 sections within the eight modules. Each section has the following components:

Unit Terminal Objective

The unit terminal objective represents the desired outcome of completion of the block of instruction. In most cases it is a very high level objective, which can make it difficult to evaluate. This global objective represents the desired competency following completion of the section. Although this objective may be viewed as the aggregate of lower level objectives, in many cases, the whole is greater than the sum of the parts.

Objectives

These are the individual objectives of the curriculum. Mastery of each of these objectives provides the foundation for the higher order learning that is expected of the entry level provider. The instructor and student should strive to understand the complex interrelationships between the objectives. These objectives are not discrete, disconnected bits of knowledge, but rather fit together in a mosaic that is inherently interdependent. The objectives are divided into three categories: Cognitive, Affective, and Psychomotor.

Cognitive
mental process--
perception
reasoning
intuition

Affective
emotional process--
feelings

Psychomotor
physical process--
muscular activity

To assist with the design and development of a specific unit, each objective has a numerical value, e.g., 3-2.1. The first number is the module of instruction, followed by a hyphen and the number of the specific unit. For example, 3-2.1 is:

Module 3:	Patient Assessment
Unit 3-2:	The Initial Assessment
Objective 3-2.1	Summarize the reasons for forming a general impression of the patient. (C-1)

At the end of each objective is a letter for the type of objective: C = Cognitive; A = Affective; and P = Psychomotor. (The example above is cognitive). The number following the type of objective represents the level of objective: 1 = Knowledge; 2 = Application; and 3 = Problem Solving. (The example above is knowledge).

Declarative

This material is designed to provide program directors and faculty with clarification on the depth and breadth of material expected of the entry level paramedic. **The declarative material is not all inclusive. The declarative section of the curriculum lack much of the specific information that must be added by the instructor.** The declarative information represents the bare minimum that should be covered, but the instructor must elaborate on the material listed. Every attempt has been made in development of the declarative material to avoid specific treatment protocols, drug dosages or other material that changes over time and has regional variations. It is the responsibility of the instructors to provide this information.

Specifically, the declarative material is used to help instructors develop lesson plans and instructional strategies. It is also designed to assist examination and publishers in developing appropriate evaluation materials and instructional support materials. **It is of utmost importance to note that the declarative material is not designed to be used as a lesson plan, but rather it should be used by instructors to help develop their own lesson plans.**

Clinical Rotations

The clinical rotations that appear in the EMT-Paramedic: National Standard Curriculum represent a stark departure from previous clinical education recommendations. In the past, clinical competence was determined simply by the number of hours spent in various clinical environments. As there is no assurance that time produced an adequate number of clinical exposures resulting in entry level clinical competence, a different approach was taken with this curriculum. In-kind services were provided by the Joint Review Committee for EMT-Paramedic Program Accreditation (JRC).

The JRC survey all existing accredited programs and asked them to identify the number of psychomotor skills, patient age groups, pathologies, patient complaints and team leader skills they were currently

utilizing in order to identify competent entry level Paramedics. The results of the survey were then presented to the JRC sponsoring organization committee members who possess expertise in cardiology, pediatrics, anesthesia, surgery, emergency medicine and Paramedic education. Using both subject matter expertise and the results of the surveys of accredited programs, the JRC established the clinical rotation goals presented in this curriculum. Items presented in bold are essentials and must be completed by each student within the program. Items in italics are recommendations to achieve the essential.

Although these patient exposures cover a wide domain of skills, pathologies, complaints and ages, they can be achieved in either the clinical or field internship. For example, a student may demonstrate the ability to perform a comprehensive assessment, formulate and implement a treatment plan for patients with chest pain in either a hospital critical care unit or during an encounter in the field. If the patient in this example was not experiencing chest pain at the time of the student evaluation, but had experienced chest pain which resulted in admission to the critical care unit. This interaction would suffice for meeting the clinical rotation for one encounter with a chest pain patient. During this experience the student should complete an evaluated physical examination, a history based upon the initial and present condition of the patient and formulate a treatment plan for the patient based upon initial field or admission findings. This same principle of encountering patients who have identified pathologies or complaints within the past 48 hours will suffice for meeting the clinical rotation requirement.

Some categories can be counted more than once. For example if a student in the field internship encounter a patient with chest pain who was 68 years old and start an IV, the student would obtain credit for a complaint, an age and a skill. The established IV and chest pain assessment, and treatment and implementation plan must be evaluated and the patient age group credit must be recorded. Encounters without evaluation and recording should not be awarded credit.

Obviously during the education the best experience would occur in the field setting which most approximates the function of the job. Recognizing the extended field time that would be necessary to see the recommend variety of patient conditions and skills would be infeasible, the curriculum permits students to obtain these experiences in either hospital clinical or field. The team leaders skills can not be met during hospital rotations. The JRC recommends that a student will obtain credit for one patient for each encounter. For example if a patient has both chest pain and a syncope episode, the student can utilize this experience for either a chest pain patient or a syncope patient, but not for both. The program must develop a clinical rotation patient tracking system in order to assure that each student encounters the recommended number of skills, ages, pathologies, complaints and team leader skills.

The clinical rotations contained within this curriculum are being accomplished by Paramedic education programs at the time of the curriculum revision. These rotations do not represent an increase in clinical requirements. The program director along with the community of interest should use feedback loops that are part of the program evaluation process to either increase or decrease the number of patient exposures based upon valid measurement instruments utilized in graduate surveys. If employers or graduates indicate the need for increased patient encounters in order to bring current graduates to the level of competency then the program should increase the number of encounters to correspond to this need. Likewise if graduates and employers indicate some rotations provided more than competent experience the program may reduce the number of patient encounters within the recognized category.

Although the categories were researched by the JRC, a program director, medical director or community of interest may add different encounters in order to meet community needs. For example if a program is located in an area with a large geriatric population, the program may increase the number of encounters with geriatric patients to correspond to community needs.

EDUCATING PROFESSIONALS

It has long been recognized that paramedics, as an integral part of the health care team, are health care professionals. As such, the education of paramedics should follow a professional, rather than purely technical, model of instruction. Employers and patients are significantly increasing their expectations of paramedics, and EMS education will need to respond.

In *Responsive Professional Education*, Stark, Lowther, and Hagerty (1986), propose that professional preparation is a combination of developing both professional competence and professional attitudes.

Historically, most EMS education has focused primarily on technical competence. Technical competence is only one component of professional competence. Professional competence includes six subcategories:

Conceptual competence - Understanding the theoretical foundations of the profession

Technical competence - Ability to perform tasks required of the profession

Interpersonal competence - Ability to use written and oral communications effectively

Contextual competence - Understanding the societal context (environment) in which the profession is practiced

Integrative competence - Ability to meld theory and technical skills in actual practice

Adaptive competence - Ability to anticipate and accommodate changes (e.g. technological changes) important to the profession.

The main areas of focus of the National Standard Curriculum are on conceptual and technical competence. This revision of the paramedic curriculum is the first to address the strategies of interpersonal and therapeutic communication. Unfortunately, conceptual, technical, and interpersonal competencies are only part of the competencies required for reflective practice.

It is incumbent on the program to keep contextual, integrative and adaptive competence in mind through the entire program. These are not discreet topic areas and do not easily lend themselves to behavioral objectives. Programs and faculty members must constantly weave these issues into the conceptual and technical components of the course.

Contextual competence is an appreciation for how the professional's practice fits into larger pictures. Professional practice is not conducted in a vacuum, but impacts, and is impacted upon, by many forces. Of course, entry level paramedics understand how their practice affects individual patients. In addition, they must appreciate how their actions impact the EMS system where the work, the overall EMS system, the profession, the health care system, and society in general.

Teaching to improve contextual competence requires constant reinforcement of the interdependent nature of professional practice. Faculty must have a clear understanding of the relationship that EMS has with the health care system, the environment and society in general. Faculty must strive to repeatedly emphasize the "big picture" and not to fall into the trap of considering the individual practitioner, or the EMS profession, as a separate entity.

Integrative competence is generally built by having a strong mastery of the theoretical base of the content material. Students can often memorize treatment protocols (practice) without having a grasp of the underlying pathophysiology. In the short term, this enables them to pass the test, but results in poor ability

to integrate the material. Eventually, this shortfall manifests itself as poor decision making and problem solving skills. Medical education must balance theory and practice and constantly emphasize the relationship between the two. Theory and practice are not discreet, mutually exclusive concepts, but rather the flip sides of the same coin.

Another way to improve integrative competence is to broaden the base of educational exposures of the student. It has been repeatedly demonstrated that a broad distribution of course work, typical in liberal studies educational approach, increases integrative competence. Although not always possible, programs which are not satisfied with their graduates' ability to integrate theory and practice may find that adding additional courses from other disciplines will improve the students higher level cognitive skills.

It is effectively impossible for a centrally developed curriculum to identify specific objective and declarative material for contextual, integrative and adaptive competence, but their importance cannot be overstated. Individual instructors and programs must keep these competencies in mind as they are developing instruction strategies to build entry level competence. These competencies are often the result of leadership, mentoring, role modeling, a focus on high level cognition, motivation and the other teaching skills of the faculty.

Professional attitudes, in large part, represent the affective objectives of the program. Unfortunately the development of true professional attitudes are much more than the aggregate sum of the individual objectives. These attitudes represent the social climate, moral and ethical identity of the individual and the profession. These attitudes are influenced and shaped, through role modeling, mentoring, and leading by example. It is very difficult to "teach" in a didactic sense and this is often interpreted by students as preaching. Generally, professional attitudes are best nurtured through leadership and mentoring. Faculty are encouraged to provide a positive role model for the development of professional attitudes in all interactions with students. Paramedic programs should take seriously their responsibility to develop the following professional attitudes:

Professional identity - The degree to which a graduate internalized the norms of a professional

Ethical standards - The degree to which a graduate internalizes the ethics of a profession

Scholarly concern for improvement - The degree to which a graduate recognizes the need to increase knowledge in the profession through research

Motivation for continued learning - The degree to which a graduate desires to continue to update knowledge and skills.

Career marketability - The degree to which a graduate becomes marketable as a result of acquired training

Emergency medicine, like all professions, has a professional culture, personality, behaviors and attitudes that we consider acceptable. The opinion that others have about our profession are profoundly influenced by the professional identity of each of our members. It is very important that we shape our identity consciously, or run the risk of being misunderstood by others. The degree to which new graduates adopt the behaviors and attitudes that the profession considers to be acceptable is a measure of our success in shaping each student's professional identity.

Ethical behavior is one of the cornerstones of professional attitudes. Ethics involves the critical evaluation of complex problems and decision making that takes into account the ambiguity that is most often present in professional decisions. Ethical behavior and decision making involves the ability to consider the greater social ramifications of your actions.

It is becoming increasingly important to have empirical data to validate clinical decisions. This fact is significantly increasing the role of research in medicine. Every medical professional must understand and appreciate the role of research in the future of health care. Of course, not all health care providers will be conducting research, but everyone must be committed to the concept of research as the foundation for decision making.

Primary professional education is just the beginning of a life long journey. The art and science of medicine changes over time. This requires that the professional adopt, from the beginning of practice, a sincere commitment to personal growth and continual improvement.

The last professional attitude is really a function of all that we have discussed. An individual's career marketability is a function of his ability to integrate professional competencies and professional attitudes into his own practice and work habits. Not only will this affect the ability to gain initial employment, but they will significantly impact his promotion potential. It is a very real and practical responsibility of education to prepare professionals for the work place and position them to be able to progressively be promoted. This keeps quality individuals intellectually stimulated, professionally challenged, and financially satisfied so they will not feel a need to leave the profession.

Professional education is a journey; not a destination. It is impossible, and fruitless, to dissect professionalism into increasingly smaller objectives. Mastery of hundreds or thousands of individual objectives does not assure that the graduate will integrate these objectives into professional behaviors. Like Humpty Dumpty, all of the parts may not be able to be assembled into a meaningful whole. There are many people who have mastered various parts of professional competence, but are not able to integrate and synthesize the skills into effective practice. This is the art of medicine, and is not taught specifically, but nurtured and allowed to grow through the creation of a supportive and positive environment.

Appendix A

EMT-Paramedic: Description of the Profession

Appendix B

EMT-Paramedic: Educational Model

Appendix C

Paramedic: Functional Job Analysis

Appendix D

Field Test Program Hours

Appendix D includes information to help program directors make decisions about the length of the program. A pilot test of the curriculum was conducted and all of the cognitive, psychomotor, and clinical objectives were completed in 1122 hours (435 classroom, 171 practical laboratory, clinical/field 516). The following information represents the amount of time needed to complete the course objectives by the pilot and field test sites.

For each unit, we have reported the range, average, standard deviation (SD), and median number of hours spent in didactic and practical laboratory.

Based on this information, and the performance of students in the pilot and field test program, it is recommended that the course be planned for approximately 1000-1200 total hours of instruction (500-600 classroom/practical laboratory, 250-300 clinical, 250-300 field internship.)

Appendix E

Anatomy and Physiology Prerequisite Objectives

Appendix F

Affective Evaluations

Appendix G

Psychomotor Skills Evaluations

Appendix H

Module and Unit Objective Summary

Description of the Profession
Paramedic

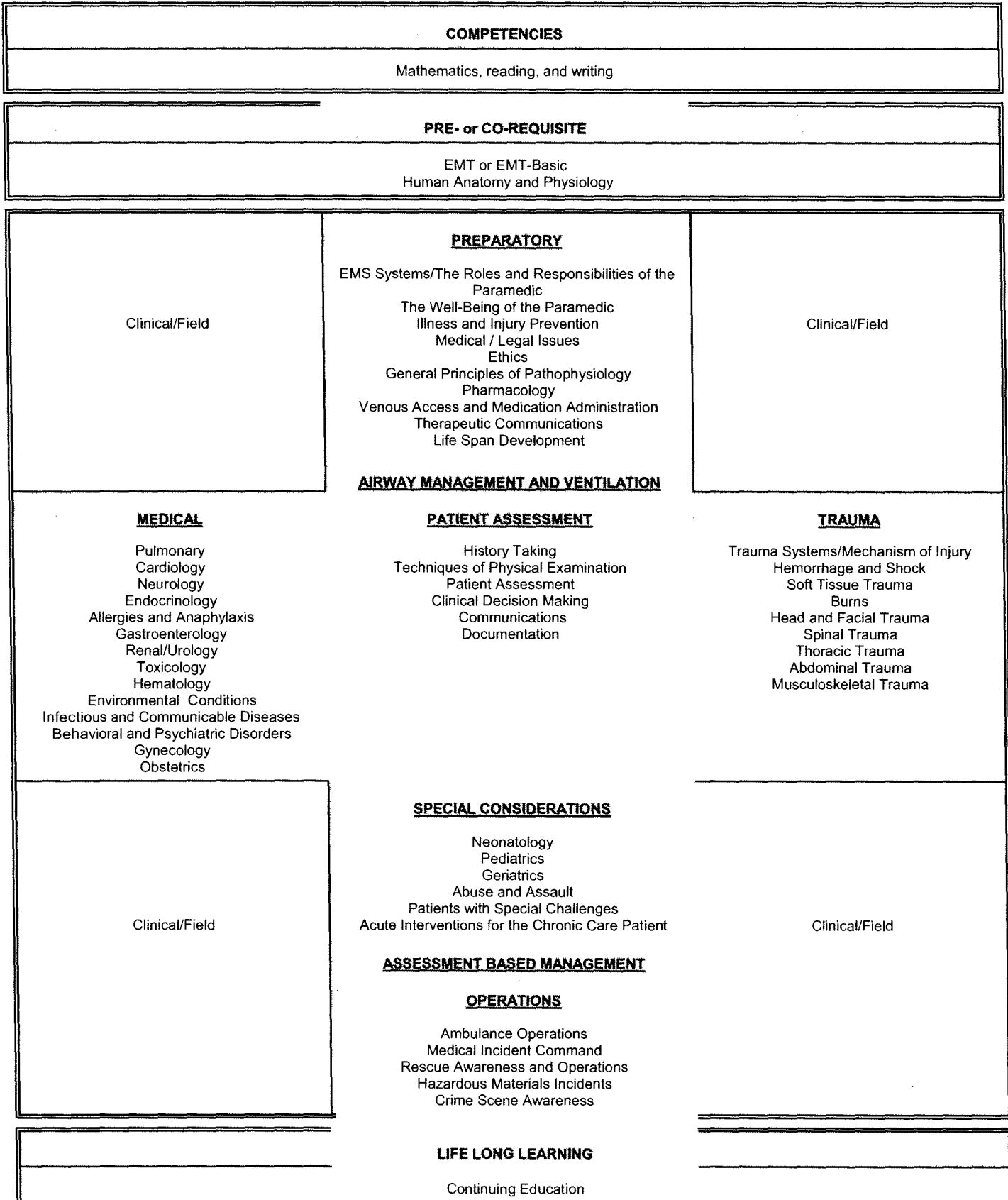
Paramedics have fulfilled prescribed requirements by a credentialing agency to practice the art and science of out-of-hospital medicine in conjunction with medical direction. Through performance of assessments and providing medical care, their goal is to prevent and reduce mortality and morbidity due to illness and injury. Paramedics primarily provide care to emergency patients in an out-of-hospital setting.

Paramedics possess the knowledge, skills and attitudes consistent with the expectations of the public and the profession. Paramedics recognize that they are an essential component of the continuum of care and serve as linkages among health resources.

Paramedics strive to maintain high quality, reasonable cost health care by delivering patients directly to appropriate facilities. As an advocate for patients, paramedics seek to be proactive in affecting long term health care by working in conjunction with other provider agencies, networks, and organizations. The emerging roles and responsibilities of the Paramedic include public education, health promotion, and participation in injury and illness prevention programs. As the scope of service continues to expand, the Paramedic will function as a facilitator of access to care, as well as an initial treatment provider.

Paramedics are responsible and accountable to medical direction, the public, and their peers. Paramedics recognize the importance of research and actively participate in the design, development, evaluation and publication of research. Paramedics seek to take part in life-long professional development, peer evaluation, and assume an active role in professional and community organizations.

**EMT-PARAMEDIC: NATIONAL STANDARD CURRICULUM
DIAGRAM OF EDUCATIONAL MODEL**



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Functional Job Analysis

Paramedic Characteristics

The Paramedic must be a confident leader who can accept the challenge and high degree of responsibility entailed in the position. The Paramedic must have excellent judgement and be able to prioritize decisions and act quickly in the best interest of the patient, must be self disciplined, able to develop patient rapport, interview hostile patients, maintain safe distance, and recognize and utilize communication unique to diverse multicultural groups and ages within those groups. Must be able to function independently at optimum level in a non-structured environment that is constantly changing.

Even though the Paramedic is generally part of a two- person team generally working with a lower skill and knowledge level Basic EMT, it is the Paramedic who is held responsible for safe and therapeutic administration of drugs including narcotics. Therefore, the Paramedic must not only be knowledgeable about medications but must be able to apply this knowledge in a practical sense. Knowledge and practical application of medications include thoroughly knowing and understanding the general properties of all types of drugs including analgesics, anesthetics, anti-anxiety drugs, sedatives and hypnotics, anti-convulsants, central nervous stimulants, psychotherapeutics which include antidepressants, and other anti-psychotics, anticholinergics, cholinergics, muscle relaxants, anti-dysrhythmics, anti-hypertensives, anticoagulants, diuretics, bronchodilators, ophthalmics, pituitary drugs, gastro-intestinal drugs, hormones, antibiotics, antifungals, antiinflammatories, serums, vaccines, anti-parasitics, and others.

The Paramedic is personally responsible, legally, ethically, and morally for each drug administered, for using correct precautions and techniques, observing and documenting the effects of the drugs administered, keeping one's own pharmacological knowledge- base current as to changes and trends in administration and use, keeping abreast of all contraindications to administration of specific drugs to patients based on their constitutional make-up, and using drug reference literature.

The responsibility of the Paramedic includes obtaining a comprehensive drug history from the patient that includes names of drugs, strength, daily usage and dosage. The Paramedic must take into consideration that many factors, in relation to the history given, can affect the type medication to be given. For example, some patients may be taking several medications prescribed by several different doctors and some may lose track of what they have or have not taken. Some may be using non-prescription/over the counter drugs. Awareness of drug reactions and the synergistic effects of drugs combined with other medicines and in some instances, food, is imperative. The Paramedic must also take into consideration the possible risks of medication administered to a pregnant mother and the fetus, keeping in mind that drugs may cross the placenta.

The Paramedic must be cognizant of the impact of medications on pediatric patients based on size and weight, special concerns related to newborns, geriatric patients and the physiological effects of aging such as the way skin can tear in the geriatric population with relatively little to no pressure. There must be an awareness of the high abuse potential of controlled substances and the potential for addiction, therefore, the Paramedic must be thorough in report writing and able to justify why a particular narcotic was used and why a particular amount was given. The ability to measure and re-measure drip rates for controlled substances/medications is essential. Once medication is stopped or not used, the Paramedic must send back unused portions to proper inventory arena.

The Paramedic must be able to apply basic principles of mathematics to the calculation of problems associated with medication dosages, perform conversion problems, differentiate temperature reading

between centigrade and Fahrenheit scales, be able to use proper advanced life support equipment and supplies (i.e. proper size of intravenous needles) based on patient's age and condition of veins, and be able to locate sites for obtaining blood samples and perform this task, administer medication intravenously, administer medications by gastric tube, administer oral medications, administer rectal medications, and comply with universal pre-cautions and body substance isolation, disposing of contaminated items and equipment properly.

The Paramedic must be able to apply knowledge and skills to assist overdosed patients to overcome trauma through antidotes, and have knowledge of poisons and be able to administer treatment. The Paramedic must be knowledgeable as to the stages drugs/medications go through once they have entered the patient's system and be cognizant that route of administration is critical in relation to patient's needs and the effect that occurs.

The Paramedic must also be capable of providing advanced life support emergency medical services to patients including conducting of and interpreting electrocardiograms (EKGs), electrical interventions to support the cardiac functions, performing advanced endotracheal intubations in airway management and relief of pneumothorax and administering of appropriate intravenous fluids and drugs under direction of off-site designated physician.

The Paramedic is a person who must not only remain calm while working in difficult and stressful circumstances, but must be capable of staying focused while assuming the leadership role inherent in carrying out the functions of the position. Good judgement along with advanced knowledge and technical skills are essential in directing other team members to assist as needed. The Paramedic must be able to provide top quality care, concurrently handle high levels of stress, and be willing to take on the personal responsibility required of the position. This includes not only all legal ramifications for precise documentation, but also the responsibility for using the knowledge and skills acquired in real life threatening emergency situations.

The Paramedic must be able to deal with adverse and often dangerous situations which include responding to calls in districts known to have high crime and mortality rates. Self-confidence is critical, as is a desire to work with people, solid emotional stability, a tolerance for high stress, and the ability to meet the physical, intellectual, and cognitive requirements demanded by this position.

Physical Demands

Aptitudes required for work of this nature are good physical stamina, endurance, and body condition that would not be adversely affected by frequently having to walk, stand, lift, carry, and balance at times, in excess of 125 pounds. Motor coordination is necessary because over uneven terrain, the patient's, the Paramedic's, and other workers' well being must not be jeopardized.

Comments

The Paramedic provides the most extensive pre-hospital care and may work for fire departments, private ambulance services, police departments or hospitals. Response times for nature of work are dependent upon nature of call. For example, a Paramedic working for a private ambulance service that transports the elderly from nursing homes to routine medical appointments and check-ups may endure somewhat less stressful circumstances than the Paramedic who works primarily with 911 calls in a districts known to have high crime rates. Thus, the particular stresses inherent in the role of the Paramedic can vary, depending on place and type of employment.

However, in general, in the analyst's opinion, the Paramedic must be flexible to meet the demands of the ever-changing emergency scene. When emergencies exists, the situation can be complex and care of the patient must be started immediately. In essence, the Paramedic in the EMS system uses advanced training and equipment to extend emergency physician services to the ambulance. The Paramedic must be able to make accurate independent judgements while following oral directives. The ability to perform duties in a timely manner is essential, as it could mean the difference between

life and death for the patient.

Use of the telephone or radio dispatch for coordination of prompt emergency services is required, as is a pager, depending on place of employment. Accurately discerning street names through map reading, and correctly distinguishing house numbers or business addresses are essential to task completion in the most expedient manner. Concisely and accurately describing orally to dispatcher and other concerned staff, one's impression of patient's condition, is critical as the Paramedic works in emergency conditions where there may not be time for deliberation. The Paramedic must also be able to accurately report orally and in writing, all relevant patient data. At times, reporting may require a detailed narrative on extenuating circumstances or conditions that go beyond what is required on a prescribed form. In some instances, the Paramedic must enter data on computer from a laptop in ambulance. Verbal skills and reasoning skills are used extensively.

Job Analysis Schedule

1. Establish Job Title: Emergency Medical Technician—Paramedic
 2. D. O. T. Title, Industry Designation and Code 079.374.010
 3. WTA Group: Occupations in medicine and health,
 4. SIC Code
 5. SOC Code 3690 Emergency medical technicians
 6. GOE 10.03.02 (medical services)
7. Job Summary: In emergency situations, administers all facets of basic and advanced life support medical services to injured and sick persons in pre-hospital settings as directed by physician.
8. Work Performed Estimates:

Worker Functions	Data	People	Things
	3	7	4

3. Compiling
7. Serving
4. Manipulating

Work Field: 294 Health, Caring, and Medical
 M.P.S.M.S. 920 (Materials, Products, Subject Matter, and Services) Medical and other health services.

9. Worker Traits Ratings:

General Education Development (GED) encompasses three broad areas which are rated independently in relation to the occupation being assessed: **Reasoning Development, Mathematical Development, and Language Development.**

General Educational Development (GED) embraces those aspects of education (both formal and informal) which contribute to the worker's reasoning development, the ability to follow instructions, and to the acquisition of "tool" knowledge such as language and mathematical skills.

This is education of a general nature which does not have a recognized, fairly specific occupational objective. Ordinarily, such education is obtained in elementary school, high school, or college. However, it may be obtained from experience and self study.

Description of rating on the GED Scale: Level 1= lowest level; Level 6 = highest level.

Low

Hig
h

1	2	3	<u>Math 4</u>	<u>Reasoning 5</u> <u>Language 5</u>	6
---	---	---	----------------------	---	---

Bolded and underlined areas define the analyst's rating for the Paramedic. (Other numbers are shown for informational purposes only). A detailed explanation follows:

Reasoning development (R)

Level 5

Two relevant examples from text are provided for assignment to Level 5 for the Paramedic:

Example from text: Level R-5:5

Prepares and conducts in service training for company personnel. Evaluates training needs in order to develop educational materials for improving performance standards. Performs research relating to course preparation and presentation. Compiles data for use in writing manuals, handbooks, and other training aids. Develops teaching outlines and lesson plans, determines content and duration of courses, and selects appropriate instructional procedures based on analyses of training requirements of company personnel.

Example from text: Level R 5:6

Renders general nursing care to patients in hospital, infirmary, sanitarium, or similar institution. Administers prescribed medications and treatments in accordance with approved techniques. Prepares equipment and aids physician during treatments or examination of patients. Observes, records, and reports to supervisor or physician patient conditions, reactions to drugs, treatments, and significant incidents.

Examples of job duties of the Paramedic that align themselves with the above examples related to "Reasoning" include:

Visually inspects and assesses or "sizes up" the scene upon arrival to determine if scene is safe, determines the mechanism of illness or injury, the

total number of patients involved, and remains calm and confident while demonstrating leadership and responsibility. Reports verbally to the responding EMS unit or communications center as to the nature and extent of injuries and the number of patients. Recognizes hazards. Conducts triage, sorting out and classifying priorities for most immediate need for treatment. Uses excellent judgement to identify priorities based on the most critical needs for patient survival. Directs Basic EMT to assist.

Determines nature and extent of illness or injury in patient, takes pulse, blood pressure, and temperature, visually observes patient, recognizes the mechanisms of injury and takes comprehensive medical history of patient, including patient's current usage of prescribed and non-prescribed medications/drugs.

Accepts primary responsibility for all aspects of advanced life support given to the patient, including use of advanced life support equipment and administration of medication that includes narcotics; responsible for thorough written documentation of all activity related to patient care and medication dispensation. Uses good judgement to draw conclusions with often, limited information; verbally communicates effectively to provide quality treatment to diverse age and cultural groups. Provides family support, manages the difficult patient, conducts fundamental mental status assessment, restrains patient, and intervenes pharmacologically.

Uses advanced life support equipment and administers medication through the patient's most appropriate body route, including intravenous. Provides pre-hospital emergency care of simple and multiple system trauma such as controlling hemorrhage, bandaging wounds, manually stabilizing painful, swollen joints and injured extremities, and immobilizing spine. Uses automatic defibrillator apparatus in application of electric shock to heart, manages amputation, uses anti-shock garment, conducts peripheral venous access, intra-osseous infusion, manual defibrillation, interprets EKGs, manually stabilizes neck and body of child and adult, immobilizes extremities, straightens selected

fractures, and reduces selected dislocations. Delivers newborn. Complies with practices and policies, established protocols within organization of employment according to state regulations. Maintains confidentiality, responsible for the safe and therapeutic administration of drugs including narcotics, must be able to apply this knowledge in a practical through a thorough knowledge and understanding of the general properties of all types of drugs including analgesics, anesthetics, anti-anxiety drugs, sedatives and hypnotics, anti-convulsants, central nervous stimulants, psychotherapeutics which include antidepressants, and other anti-psychotics, anticholinergics, cholinergics, muscle relaxants anti-dysrhythmics, anti-hypertensives, anticoagulants, diuretics, bronchodilators, ophthalmics, pituitary drugs, gastro-intestinal drugs, hormones, antibiotics, antifungals, antiinflammatories, serums, vaccines, anti-parasitics, and others.

The Paramedic is personally responsible legally, ethically, morally for each drug administered, using correct precautions and techniques, observing and documenting the effects of the drugs administered, keeping one's own pharmacological knowledge base current as to changes and trends in administration and use, keeping abreast of all contraindications to administration of specific drugs to patients based on their constitutional make-up, and using drug reference literature.

Note: In the analyst's opinion, while many aspects of Level 4 "Reasoning" are pertinent to the Paramedic role such as "using rational systems to solve practical problems where limited standardization exists", and "cares for patients and children in private homes, hospitals, sanitariums, and similar institutions, takes and records temperature, pulse and respiration rate, sterilizes equipment and supplies using germicides, sterilizer or autoclave", this definition is somewhat limiting. There are also many abstract variables with which the Paramedic must contend on a regular basis. Strong reasoning ability is required to deal with the complexity and variety of the situations in which the Paramedic works. This includes not only the aspects of providing quality advanced emergency medical care requiring the use of logic and reason to define problems

and arrive at solutions on a practical basis, but also contributing to the Paramedic profession by using reasoning to define and analyze problems and arrive at solutions to enhance the field through teaching, and contributing to research through written media/journals.

Thus, the reasoning level for the Paramedic is more like a level 5 than a level 4.

Mathematical development (M)

Level 4

Example from text: Shop math: Practical application of fractions, percentages, ratio and proportion, and measurement.

Examples of the above level (math) in relation to work performed by the Paramedic include:

Calculating correctly the amount of medication to be given in relation to patient's weight, age, and other factors that warrant adjustment of volume.
Measuring and re-measuring drip rates of medications/controlled substances administered intravenously. Sending back to inventory area, any unused portions. Completing log sheets that detail the numbers and totals of services provided and amounts of medications used.

Note: The Paramedic is legally accountable and responsible for maintaining Class I Medications (narcotics) and must keep accurate count and inventory of such items.

Language development (L)

Level 5

Reading-Read literature, book and play reviews, scientific and technical journals, abstracts, financial reports and legal documents.

Examples of job duties that align themselves with the above examples in relation to the reading level assigned include that:

The Paramedic must be able to accurately read a Drug Reference Manual to determine not only the name of the drug on a label, but to recognize that a generic

name and a brand name may not always appear on a prescription label, thus the need for cross/referencing through written reference materials. The Paramedic needs to know what type of drug(s) the patient is taking, how long ago it was taken, how long the effects are expected to remain in the body based on the patient's constitutional make-up, what condition for which it was prescribed, general information, cautions and warnings, possible side effects, possible adverse side effects, drug and food interactions, the usual dosage an duration of dosage for adult and child, antidotes for overdoses, and other special information.

The Paramedic also takes a comprehensive medical history of patient, including patient's current usage of prescribed and non-prescribed medications/drugs.

At times, the patient does not know when or if he/she took a certain medication. Often, many individuals are taking multiple medications simultaneously and it will be up to the Paramedic to read from the medication bottles or containers the exact names of the medications and the dosages. It is absolutely essential that the Paramedic read correctly and expediently. For example, the drug "Milontin" must not be construed as "Melatonin". Milontin, a drug used for control of petit mal seizures may be associated with severe reduction in white blood cell platelet counts and when used alone for both grand mal and petit mal seizures may increase the number of grand mal seizures and necessitate more medicine to control the seizures. It can also cause a person's urine to turn pink or brown. Although the discoloration is harmless, it could cause alarm in the patient. In addition, sudden stoppage of this medication may bring on more seizures. While it is a good idea for patients using this drug to wear identification, they may or may not be. On the other hand, Melatonin, a currently popular over the counter remedy purported to improve sleep and general well being has none of the ramifications as Miltonin. The preceding is but one example. There are numerous examples of names of medications which if not read correctly, could mean the difference in the treatment administered, and ultimately, whether or not the patient lives or dies.

The Paramedic must also be able to read and interpret EKGs. In addition, as a basic part of emergency care, the Paramedic searches for medical clues/identification on a patient. These are generally in written form on a bracelet. In addition, the Paramedic gathers demographic patient information that must be recorded during the interview. At times, if the patient has poor vision and cannot see, hear or cannot read, and there is no family member to assist, the Paramedic may be asked to gather pertinent data through reading such documents as a driver's license, a health care provider form or human services agency card. The Paramedic must be able to accurately read a street map, both for name of street and number of building/residence location.

Detailed written reports are an essential part of the Paramedic's job and the Paramedic must be able to review the narrative he/she writes to verify for accuracy. Legally, the Paramedic is accountable for what is written.

It is ideal that the Paramedic read professional journals to keep current with his/her profession. However, it is mandatory that the Paramedic keep abreast of new equipment, techniques for using the equipment and new medications on the market. Information of this nature is generally transmitted through written literature and manuals. The Paramedic, in practice, will refer to algorithms and basic care protocols (which do vary), in much the same manner that a physician uses the Physicians' Desk Reference or a licensed professional therapist uses the Diagnostic & Statistical Manual IV. The Paramedic must successfully complete continuing education programs that involve accurate reading of course materials to update skills and competencies as required by employers, medical direction, and licensing or certifying agencies.

The Paramedic is personally responsible legally, ethically, and morally for each drug administered, reading the labels, using correct precautions and techniques, observing and documenting the effects of the drugs administered, keeping one's own pharmacological knowledge base current as to changes and trends in administration and use,

keeping abreast of all contraindications to administration of specific drugs to patients based on their constitutional make-up, and using up to date drug reference literature.

Writing - Write novels, plays, editorials, journals, speeches, manuals, critiques, poetry, and songs.

Example from text: L5-4

Write service manuals and related technical publications concerned with installation, operation, and maintenance of electrical, electronic mechanical and other equipment. Interviews workers to acquire or verify technical knowledge of a subject. Rewrites articles, bulletins, manuals or similar publications.

Examples of the above (writing) in relation to work performed by the Paramedic:

Writes detailed comprehensive narrative report on patient care given. Writes professional journal articles for Emergency Medical Technician literature. Writes and prepares lesson plans, manuals and curriculum for instructional purposes.

Speaking - Conversant in the theory, principles, and methods of effective and persuasive speaking, voice and diction, phonetics, and discussion and debate.

Examples of the above (speaking) in relation to work performed by the Paramedic:

Answers verbally to telephone or radio emergency calls from dispatcher to provide advanced efficient and immediate emergency medical care to critically ill and injured persons.

Interviews patient and or significant others to gain comprehensive understanding of patient's condition for development of workable patient diagnosis. Adjusts/alters verbal communication with patient and family/significant others to reflect and ensure adequate and appropriate care and treatment with respect to the age of the patient, i.e. child,

adolescent, or geriatric, and cultural status. Provides family support through good communication and responding appropriately verbally, manages the difficult patient through use of voice and choice of words, conducts fundamental mental status assessment by asking pertinent questions, restrains patient often using persuasive verbal techniques to which patient can relate. Teaches curriculum to other EMTs, communicates with other EMS providers, physicians, hospital staff, police departments, fire departments, and relays findings verbally.

Note: With respect to Language Development, there are components of both "Level 4" and "Level 5" in the role of the Paramedic, such as Level 4's "reading novels, poems, newspapers, periodicals, journals, manuals, dictionaries, thesauruses, and encyclopedias; writing and preparing business letters, expositions, summaries and reports, using prescribed format and conforming to all rules of punctuation, grammar, diction and style; and speaking by participating in panel discussions, dramas and debates, and speaking extemporaneously on a variety of subjects". However, there are more Level 5 components as are shown above, than there are Level 4, thus it is deemed to be at Level 5.

10. FORMAL EDUCATION: High school diploma/GED with advanced training and certification

11. SPECIAL VOCATIONAL PREPARATION (SVP) (Time requirement of an additional 900-1200 classroom hours beyond the 110 hours acquired at the Basic EMT level SVP is defined as the amount of lapsed time required by a typical worker to learn the techniques, acquire the information, and develop the facility needed for average performance in a specific job worker situation. Level 6 is the approximate time ascribed for completion of preparation for a Paramedic (other numbers are listed for informational purposes only).

SVP	1	2	3	4	5	<u>6</u>	7	8	9
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Explanation of scale:

Level Time¹

- 1 Short demonstration only
- 2 Anything beyond short demonstration up to and including one month
- 3 Over one month up to and including three months
- 4 Over three months up to and including six months
- 5 Over six months up to and including one year
- 6 Over one year up to and including two years
- 7 Over two years up to and including four years
- 8 Over four years up to and including ten years
- 9 Over ten years

NOTE: The levels of this scale are mutually exclusive and do not overlap

¹ Time that applies to General Educational Development is not considered in estimating SVP

APTITUDES

Aptitudes, a component of Worker Characteristics, are the capacities or specific abilities which an individual must have in order to learn a given work activity. There are 11 Aptitudes used for job analysis. Aptitude estimates are useful as analytic and descriptive tools and can be expressed in terms of the following levels or categories which reflect the amounts of the aptitudes possessed by the segments of the working population.

These ratings are explained by the number preceding the rating.

1. The top 10 % of the population. This segment of the population possesses an extremely high degree of the aptitude.
2. The highest third exclusive of the top 10% of the population. This segment of the population possesses an above average or high degree of the aptitude.
3. The middle third of the population. This segment of the population possesses a medium degree of the aptitude, ranging from slightly below to slightly above average.
4. The lowest third exclusive of the bottom 10 % of the population. This segment of the population possesses a below average degree of the aptitude.
5. The lowest 10% of the population. This segment of the population possesses a negligible degree of the aptitude.

Level 1 indicates a higher degree of particular aptitude

whereas Level 5 indicates a lower degree of an aptitude pertinent to a job. If an aptitude is rated as a Level 5, it means that for the job under study, the amount of aptitude required is negligible or not required at all. The ratings for aptitudes for the Paramedic are as follows and are explained below in further detail: C1 G 2 P 2 K 2 M 2 E
2 V 3 N 3 S 3 Q 3

1. Highest 10 % of the population has this aptitude	C= Color Discrimination
2. Highest middle third	G= General Learning Ability P= Form Perception K= Motor Coordination M= Manual Dexterity E= Eye, Hand, Foot Coordination
3. Middle middle third	V= Verbal N= Numerical S= Spatial Q= Clerical
4. Lower middle third	N/A
5. Lowest 10 % of the population has this aptitude	N/A

The following is an explanation of each of the above aptitude ratings.

G - Intelligence (General Learning Ability)

Level 2 Represents a high degree of aptitude or ability. This ranks the Paramedic in the highest third of the population, excluding the top 10 percent.

Note: Level 2 and Level 3 overlap, thus a rating judgement must be made. Level 3 represents the middle third of the population and includes aptitudes that run slightly above and slightly below average. It is the analyst's opinion that intelligence/general learning aptitude is at least average to slightly above average for the Paramedic position. While with Level 3, intelligence is required to learn and apply principles of anatomy, physiology, microbiology, nutrition, psychology, and patient care used in nursing; to make independent judgements in absence of doctor and to determine methods and treatments to use when caring for patients with injuries or illnesses, Level 2, which is higher, is more appropriate based on the following related, but not specific example:

Example from text G: 2

Compounds and dispenses medications, following prescriptions: understands the composition and effects of drugs and is able to test them for strength and purity. Checks prescriptions to determine whether dosages are reasonable and the drugs chemically and physiologically compatible. Must be able to compound ingredients to form powders, pills, ointments and solutions. Must make sterile solutions, buy medical supplies, and advise medical staff on the selection and effects of drugs.

Another related example from text is G2-5

Intelligence is required to learn the basic principles relating to biochemistry, microbiology, parasitology, blood cells, body cells, viruses, serum and vaccines and the preparation and examination of tissues.

Note: Overall, general intelligence (learning ability) must be of the level required for the Paramedic to acquire the skills and knowledge necessary in applying principles of advanced patient life support in emergency medical situations through extensive knowledge of pharmacological principles. Thus intelligence is more like a Level 2 than a Level 3.

V - Verbal Aptitude

Level 2 Fairly high degree of aptitude required.

No text illustrations in medical area.

Closely related skills appear comparable to text example, V2-3: Studies origin, relationship, development, anatomy, and other basic principles of plant and animal life, usually specializing in research centering around a particular plant, animal or aspect of biology: Verbal aptitude is required to read and comprehend information concerning biological sciences and to express orally or in writing findings from investigations in various fields such as agriculture, animal or plant life, genetics, pharmacology and microbiology.

On the job:

The most relevant applications of the above are speaking, writing, and communicating with physicians, nurses, and other EMS systems, and the findings pertinent to patients in emergency medical situations.

N - Numerical Aptitude (Perform arithmetic operations quickly and accurately)

Level 3 Average degree of aptitude required. No illustrations in medical area.

Somewhat related is text Example N2-3 whereby numerical aptitude is required to compute size of individual portions needed to obtain required nutritional values for regular or special diets, and to calculate total quantity of foodstuffs needed for specific period based on number to be fed, menus for period and individual quantities needed. Numerical aptitude is also required to break down total into number of units by standard sizes to prepare requisitions for vendors, and to maintain and analyze food cost records.

On the job:

Calculates in expedient manner, the amount of supplies/medications needed immediately, especially when occasions of multiple injuries occur. Calculates the amount of medication to be given in relation to patient's weight, age, and other factors that warrant adjustment of volume using oral, auto-injection, sublingual, inhalation, subcutaneous, intramuscular, intraosseous, transcutaneous, rectal, endotracheal, and central intravenous routes, as well as infusion pumps to administer medications. Administers in practical sense, the amount calculated. Tracks and logs all medications/narcotics administered.

S - Spatial Aptitude (Comprehend forms in space and understand relationships to plane and solid objects)

Level 3

Example from text: Level S - 3:1

Spatial aptitude is required to visualize anatomic positions and the relationship between the

point of application of forces and the area affected (as in traction); and to place treatment devices or administer manual treatment in relationship to the affected body part.

On the job :

Mobilizes spine, sets select fractures and dislocations. Sets up and administers intravenous medications and narcotics. Applies manual and advanced life support techniques to resuscitate patient. Carefully transports patient as to avoid further injury.

P - Form Perception (Ability to make visual comparisons and discriminations and see slight differences in shapes and shadings of figures and widths and lengths of lines)

Level 2 High degree of aptitude required

Example from text:

P - 2:6 Form perception is required to perceive pertinent details of size, shape, and form in skeletal structure, organs, tissue, and specimens of various animals.

On the job:

Conducts patient assessment through visually observing any changes in size of pupils, swelling, shrinking, or dislocations/protrusions of all body parts. Checks for most appropriate vein to administer medication.

Q - Clerical Perception (Ability to perceive pertinent detail in verbal or tabular material-proof read)

Level 3

Example from text: Q - 3:13

Assists in care of hospital patients under direction of nursing and medical staff. Clerical perception is required to read and report such data as temperatures, pulse rate and respiration rate, to report patient's food and fluid intake and output, and to read charts and instructions accurately. Generally completes documentation of relevant data on pre-printed form. Must be able to read form accurately and report patient information in appropriate allocated space. Occasionally, may be required to submit short narrative report.

On the job:

Takes and records vital signs, reads EKGs and compiles log of work performed.

K - Motor Coordination (Ability to make a movement response quickly and accurately and coordinate eye-hand)

Level 2 High degree of aptitude required

Example from text: K - 2:5

Renders general nursing care to patients in hospital, infirmary, sanitarium, or similar institution.

On the job:

Coordinates vision, finger and hand movements in taking vital signs, freeing airway including surgery, performing CPR, administering medication/narcotics through grasping of and inserting needle into skin, delivering newborn, setting up equipment, turning equipment off and on, balancing self when lifting /moving or stabilizing patients, and other.

F - Finger Dexterity (Ability to move fingers and manipulate small objects rapidly and quickly)

Level 2 High degree of aptitude required

No illustrations in medical field.

On the job:

Recommended due to necessity of positioning needle for injection, opening and maintaining airway, ventilating patient, controlling hemorrhage, bandaging wounds, administer medications, manually stabilizing painful swollen and deformed extremities, and performing other basic and advanced life support functions.

M - Manual Dexterity (Ability to move the hands easily and skillfully)

Level 2 High degree of aptitude required

On the job:

No illustrations given. Recommended due to nature of work which involves moving the hands skillfully and quickly to perform essential functions of advanced/ skilled emergency patient care.

E - Eye-Hand-Foot Coordination (Ability to coordinate these)

Level 2 High degree of aptitude required

No text illustrations given.

On the job:

Recommended as job may require balancing on ladders, stairs, or walking on uneven terrain while assisting in carrying patients. In the interest of time and safety, may be required to move quickly.

C - Color Discrimination (Ability to perceive difference in colors, shades, or harmonious combinations, or to match colors)

Level 1 Highest degree of aptitude and ability required.

Example from text: C-1:4 Uses color discrimination and color memory in making diagnosis of patients' affliction or condition, by recognizing any deviations in color of diseased tissue from healthy tissue; evaluating color characteristics such as hue and saturation of affected body parts; and making determination as to extent or origin of condition.

Temperament

D	R	<u>I</u>	<u>V</u>	E	A	<u>S</u>	<u>T</u>	<u>U</u>	<u>P</u>	<u>J</u>	M
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Explanation of terms:

Terms bolded and underlined above are those deemed most pertinent to temperament of the Paramedic when performing the job a Paramedic is expected to perform. Temperaments are the adaptability requirements made on the worker by specific types of jobs. Below is a list of various temperament factor definitions. The shaded areas are those deemed applicable to the role of the

Paramedic.

D	Directing , controlling, or planning the activities of others
R	Performing repetitive or short cycle work
I	Influencing people in their opinions, attitudes or judgments
V	Performing a variety of duties
E	Expressing personal feelings
A	Working alone or in part in physical isolation from others
S	Performing effectively under stress
T	Attaining precise set limits, tolerances , and standards
U	Working under specific instructions
P	Dealing with people
J	Adaptability to making judgments and decisions based on sensory or judgmental criteria
M	Adaptability to making judgements based on measurable or verifiable criteria

Interests

Interests	1a	1b	2a	<u>2b</u>	3a	3b	<u>4a</u>	4b	5a	5b
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The Paramedic is seen as having interests that relate to:

4a - A preference for working for the presumed good of the people.

2b - A preference for activities of a scientific and technical nature

Physical Demands

Physical Demands	S	L	M	H	<u>V</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>
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The Paramedic's job involves very heavy lifting (50 pounds frequently, no maximum) and involves climbing, balancing, stooping, kneeling, crouching, crawling, reaching, handling, fingering, feeling, talking, hearing, and seeing on a frequent basis. Shaded, underlined, bolded areas above are applicable to the job of the Paramedic.

Explanation of terms:

1. Strengths

S = Sedentary (10 pounds maximum)

L = Light work (10 pounds frequently, 20 pounds maximum)

M = Medium work (25 pounds frequently, 50 pounds maximum)

H = Heavy work (50 pounds frequently, 100 pounds maximum)

V = Very heavy work (50 pounds frequently, no maximum)

2. Climbing and/or balancing
3. Stooping, kneeling, crouching and crawling
4. Reaching, handling, fingering and/or feeling
5. Talking and hearing
6. Seeing

Environmental Conditions

Working Conditions	Location
1 Exposure to weather (outside atmospheric conditions)	Indoors, Outdoors, Both
2 Extreme cold with or without temperature changes (Exposure to non-weather related cold temperatures)	Indoors, Outdoors, Both
3 Extreme heat with or without temperature changes (Exposure to non-weather related hot temperatures)	Indoors, Outdoors, Both
4 Wet and humid (Contact with water or other liquids or exposure to non-weather related humid conditions)	Indoors, Outdoors, Both
5 Noise intensity levels (Can range from very quiet, quiet, moderate, loud to very loud)	Indoors, Outdoors, Both
6 Vibration (Exposure to a shaking object or surface)	Indoors, Outdoors, Both
7 Atmospheric conditions (Exposure to conditions such as fumes, noxious odors, dusts, mists, gases, and poor ventilation that affect the respiratory system, eyes or the skin)	Indoors, Outdoors, Both
8 Proximity to moving mechanical parts (Exposure to possible bodily injury from moving mechanical parts of equipment, tools, or machinery)	Indoors, Outdoors, Both
9 Exposure to electrical shock (Exposure to possible bodily injury from electrical shock)	Indoors, Outdoors, Both
10 Working in high exposed places (Exposure to possible bodily injury)	Indoors,

. from falling)	Outdoors, Both
1 Other environmental conditions: mines, 1 slopes, fumes, smoke, dust, high crime . neighborhoods, darkness, law violators	Indoors, Outdoors, Both

Note: In the analyst's opinion, the general environmental conditions in which the Paramedic works cannot be adequately assessed in an indoor evaluative environment. The Paramedic in an actual work situation can be exposed to any working condition listed above. Because of the variance in climate, environmental conditions and locations in the United States and the infinite possibilities in which a Paramedic is expected to provide advanced life support, working conditions, at best, may be less than optimal. The Paramedic must be able to focus on providing the best care possible in often adverse and dangerous situations. This can include servicing neighborhoods known to have high crime rates and performing optimally in situations where multiple incidents and trauma exist, i.e. a major highway accident that involves numerous persons and vehicles. The Paramedic may be required frequently to walk, climb, crawl, bend, pull, push, or lift and balance over less than ideal terrain, such as an icy highway, muddy ground, dilapidated stairs/flooring and any other scenario or combination of scenarios. There may be exposure to a variety of noise levels, which at times can be quite high, particularly when multiple sirens are sounding, and crowds/bystanders/families are upset and may be screaming, crying hysterically, and making demands that may or may not be reasonable.

**U. S. Department of Labor
Manpower Administration**

Analyst: Cathy Cain, Ph. D.

Date: 2/16/98

Physical Demands and Environmental Conditions

ESTAB. JOB TITLE Paramedic **ESTAB. & SCHED. NO.**
DOT TITLE & CODE 079.010
GOE CODE & TITLE 100302 Medical services; SOC 3690
Code: F = Frequently
 O = Occasionally
 NP = Not Present
 C = Constantly

Job Summary: In emergency medical situations, takes leadership role and assumes responsibility for applying specific knowledge and skills related to basic and advanced life support to patients; provides advanced life support to patients under supervision of physician and directs lower level EMTs to assist based on their levels of competency within their scope of practice.

Physical Demands		Comments
1 Strength		
a Standing	47 %	1 Walking and standing are major components of this job. Sitting is necessary for transportation to and from scene of emergency.
Walking	50 %	
Sitting	3%	
k Lifting	F	1 The Paramedic is required to assist in lifting and carrying injured or sick persons to ambulance and from ambulance into hospital. May be required to engage in pushing
Carrying	F	
Pushing	O	

Pulling	O		and/or pulling to assist other EMS providers to extricate patient from scenes to include but not limited to closed upright vehicles, patient in closed overturned vehicle, patient pinned beneath vehicle, pinned inside vehicle, in vehicles with electrical hazards.
2 Climbing	F	2	Climbing and balancing may be required to gain access to site of emergency, i.e., stairs, hillsides, ladders, and in safely assisting in transporting patient.
Balancing	F		
3 Stooping	F	3	Patients are often found injured or sick in locations where assessment of patient is possible only through the Paramedic's stooping, kneeling, crouching, or crawling.
Kneeling	F		
Crouching	F		
Crawling	F		
4 Reaching	F	4	Required for assessing pulse, assessing breathing, blocking nose and checking ventilation, lifting chin, head, or jaw for opening airway, following angle of ribs to determine correct position for hands after each ventilation, compressing sternum, and assisting in lifting of patient, administering medications through intravenous therapy or other means, and handling of advanced life support equipment, such as mirror airway devices. Extension of arms to use hands and fingers to assess vital signs, feeling and touching of patient's skin to assess body warmth, handling limited equipment, and transporting of patient are important aspects of this position. Finger dexterity needed to insert needle, and prepare fluids/medication for administration and to operate equipment.
Hadeling	F		
Fingering	F		
Feeling	F		

Talking		5	Responding to patients, physicians, and co-workers through hearing is necessary in transmitting patient information and following directions.
Ordinary	F		
Other	O		May be required to shout for help and additional assistance.
<hr/>			
Hearing		5	Verbally responding to dispatcher's message on phone or radio is necessary for quick, efficient service that can be vital to life in emergency situations.
Ordinary conversation	F		
Other	F		Communication on scene is critical for interviewing patient and in some instances, significant others, and in relaying this information in most expedient manner. Sounds of vehicles may alert Paramedic that additional help is on the way. Other sounds can alert the Paramedic that other persons may be hurt or injured, i.e., someone thrown behind a bush in a vehicle accident who cannot be seen and whose voice may be barely audible.
Seeing		6	Sight is used to drive ambulance to scene of injury or illness, to visually inspect patient and area, to read map, to read small print on medication/prescription containers, to read drug reference manuals, and to administer treatment.
Acuity, Near	F		
Acuity, Far	F		
Depth Perception	F		
Accommodation	F		
Color Vision	F		
Field of Vision	F		

7. General Education: High school graduation or equivalency is required.

8. Vocational Preparation:

a. College: None

2. Vocational Education Courses: An additional 900-1200 hours of education beyond the 110 required for the Basic EMT.

c. Apprenticeship: None

d. In-plant Training: None

5. On-the-Job-Training: During course of training, the Paramedic in training status will spend varying amounts of time in supervised clinical work in hospital and field settings.

6. Performance on Other Jobs: None required; however, training in the military as a medic is seen as beneficial.

9. Experience: None

10. Orientation:

11. Licenses, Etc.: Certification as Emergency Medical Technician: Paramedic, ACLS and CPR. Must maintain annual certification through continuing education.

12. Relation to Other Jobs and Workers:

Promotion: In some locations, Paramedics may become instructors, dispatchers or administrators.

Transfers: None

Supervision Received: Physician

Supervision Given: Some to lower level Basic EMTs.

13. Machines, Tools, Equipment, and Work Aids: Ambulance, radio/telephone/pager, blood pressure cuff, thermometer, extrication devices, esophageal airway obturator, ventilation mask, spinal boards, intravenous therapy equipment: needles and fluids, anti-shock garments, wheelchairs, and stretchers, EKG machines, defibrillator, visual airway intubation and other complex equipment, and sometimes, a computer for documentation.

14. Materials and Products: Broad range of medications including narcotics, disposable latex gloves, bandages, universal dressings such as gauze pads, tape, blankets, pillows and sheets, oxygen, drugs, and intravenous fluids.

**Description of tasks
(encompasses the range of all tasks performed by lower level
EMTs)**

1. Answers verbally to telephone or radio emergency calls from dispatcher to provide advanced efficient and immediate emergency medical care to critically ill and injured persons using a full range of equipment.
2. Drives ambulance to scene of emergency, reads map, responds safely and quickly to the address or location as directed by radio dispatcher. observes traffic ordinances and regulations. Visually inspects and assesses or "sizes up" the scene upon arrival to determine if scene is safe, determines the mechanism of illness or injury, the total number of patients involved, and remains calm and confident while demonstrating leadership and responsibility.
3. Radios dispatcher for additional help or special rescue and /or utility services. Reports verbally to the responding EMS unit or communications center as to the nature and extent of injuries and the number of patients. Recognizes hazards. Conducts triage, sorting out and classifying priorities for most immediate need for treatment. Uses excellent judgement to identify priorities based on the most critical needs for patient survival.
4. searches for medical identification as clue in providing emergency care, i.e. identification bracelet for patient who is diabetic. Reassures patient and bystanders while working in a confident and efficient manner, avoids misunderstandings and undue haste while working expeditiously to accomplish the task. Extricates patient from entrapment, works with other EMS providers in rendering emergency care and protection to the entrapped patient. Performs emergency moves, assists other EMS providers in the use of prescribed techniques and appliances for safe removal of the patient.
5. Determines nature and extent of illness or injury in patient, takes pulse, blood pressure, and temperature, visually observes patient, recognizes the mechanisms of injury, takes comprehensive medical history of patient, including patient's current usage of prescribed and non-prescribed medications/drugs. Communicates with and provides verbal direction to Basic EMT to assist with tasks within the Basic's scope of practice. Obtains consent and

refusal. Uses good judgement to draw conclusions with often, limited information; verbally communicates effectively to provide quality treatment to diverse age and cultural groups. Provides family support, manages the difficult patient, conducts fundamental mental status assessment, restrains patient, and intervenes pharmacologically.

6. Positions unresponsive patient, protects the seizing patient, identifies and treats the hypoglycemic patient, provides heating/cooling interventions, manages burns and exposures, overdoses, conducts ingestion management. Manually stabilizes neck and body of child and adult, immobilizes extremities, straightens selected fractures and reduces selected dislocations. Delivers newborn. Provides pre-hospital emergency care of simple and multiple system trauma such as controlling hemorrhage, bandaging wounds, manually stabilizing painful, swollen joints and injured extremities, and immobilizing spine.
7. Uses basic and advanced life support equipment to open airway and upper airway adjuncts, removes foreign bodies, uses upper airway suction devices, performs orotracheal intubation, nasotracheal intubation, oral intubation with pharmacological assistance and surgery on airway. Uses dual or single lumen airway devices. Provides mouth to mouth barrier device ventilation, oxygen administration, chest injury management, bag-valve mask resuscitation. Uses powered ventilation devices, hand held aerosol nebulizer. Performs cardio-pulmonary resuscitation, uses automatic defibrillator apparatus in application of electric shock to heart, manages amputation, uses anti-shock garment, conducts peripheral venous access, intraosseous infusion, manual defibrillation, interprets EKGs, uses external pacemaker.
8. Administers medication (narcotics), determines the patient's most appropriate body route based on patient diagnosis. Calculates amount of medication to be given in relation to patient's weight, age, and other factors that warrant adjustment of volume. Uses oral, auto-injection, sublingual, inhalation, subcutaneous, intramuscular, intraosseous, transcutaneous, rectal, endotracheal, and intravenous routes including central and peripheral lines and venesection as well as infusion pumps to administer medications.
9. Assists other EMS providers in lifting patient onto stretcher, places patient in ambulance, secures stretcher. Continues to monitor patient en route to hospital.

10. Checks, maintains vehicles, and provides mechanical report. Restocks and replaces used supplies, uses appropriate disinfecting procedures to clean equipment, checks all equipment to insure adequate working condition for next response. Takes inventory of and accounts for all medications (narcotics) given. Keeps log of all transactions. Prepares accurate and legible medical reports. Provides medical reports to staff.
11. Transports non-emergency patients to regularly scheduled appointments, for example, transport geriatric patients in nursing homes. Uses computer to enter data for EMS reports.
12. Supervises the activities and educational experiences of assigned observers and students. Complies with regulations in handling the deceased.
13. Functions as the primary direct care provider of emergency health care services to sick and injured patients in pre-hospital settings. Works primarily in advanced life support units affiliated with fire departments, police departments, rescue squads, hospitals, or private ambulance services under the off-site supervision of a physician, usually through radio communication, is usually the senior level member of a two person team, working in conjunction with a Basic EMT.
14. Accepts primary responsibility for all aspects of advanced life support given to the patient, including use of advanced life support equipment and administration of medication that includes narcotics; responsible for thorough written documentation of all activity related to patient care and medication dispensation. Successfully completes continuing education and refresher courses as required by employers, medical direction, and licensing or certifying agencies. Meets qualifications within the functional job analysis.

Qualifications

Must be at least 18 years of age and be a high school graduate or equivalent. Must have proof of valid driver's license. Ability to communicate verbally; via telephone and radio equipment; ability to lift, carry, and balance up to 125 pounds (250 with assistance); ability to interpret and respond to written, oral, and diagnostic form instructions; ability to use good judgment and remain calm in high-stress situations and take on role of "leader".

Must have the ability to read road maps; drive vehicle, accurately discern street signs and address numbers, read medication/prescription labels and directions for usage in quick, accurate, and expedient manner, ability to communicate verbally with patients and significant others in diverse cultural and age groups to interview patient, family members, and bystanders, and ability to discern deviations/changes in eye/skin coloration due to patient's condition and to the treatment given. Must be able to document, in writing, all relevant information in prescribed format in light of legal ramifications of such; ability to converse with dispatcher and EMS providers via phone or radio as to status of patient.

Good manual dexterity with ability to perform all tasks related to advanced emergency patient care and documentation. Ability to bend, stoop, balance, and crawl on uneven terrain; and the ability to withstand varied environmental conditions such as extreme heat, cold, and moisture. Ability to perform quickly, precise, practical mathematical calculations pertinent to ratio and proportion of medication and supplies used in emergency patient care. Must be independent, confident, able to work independently without defined structure, have good stable reasoning ability with ability to draw valid conclusions expediently relevant to patient's condition, often, using limited information. Must have knowledge and skills relevant to position and be able to implement them in stressful situations. Must be cognizant of all legal, ethical, and moral obligations inherent within scope of practice.

Must be able to perform mathematical calculations/ratios and apply them in expedient, practical manner. Must be independent, confident, able to work independently without structure, have good stable reasoning ability and able to draw valid conclusions quickly relevant to patient's condition, often, using limited information. Must have knowledge and skills relevant to position and be able to implement them in practical fashion in stressful situations. Must be cognizant of

all legal, ethical, and moral obligations inherent within scope of practice.

Must have successful completion of approved curriculum with achievement of passing scores on written and practical certification examinations as defined by programmatic guidelines. Re-certification is dependent upon an individual's successful completion of inter-agency approved Paramedic continuing education fresher courses. At any given time, performs any or all tasks performed by a lower level EMT. May supervise activities of students or interns, and/or may engage in writing of journal articles or teach. Meets qualifications within the functional job analysis.

EMT-PARAMEDIC: NATIONAL STANDARD CURRICULUM

**FIELD AND PILOT TEST DIDACTIC AND PRACTICAL LABORATORY
HOURS REPORT**

	Didactic					Practical Laboratory				
	Min. (hours)	Max. (hours)	Ave. (hours)	Stand. Dev.	Median	Min (hours)	Max (hours)	Ave. (hours)	Stand. Dev.	Median
Preparatory										
Well Being Paramedic	1.00	11.00	3.97	3.73	2.00	1.00	1.00	1.00	N/A	1.00
Roles & Responsibilities	1.00	5.50	2.81	1.56	2.00	1.00	1.00	1.00	N/A	1.00
Illness/Injury Prevention	0.00	4.00	2.14	1.36	2.00	1.00	1.00	1.00	N/A	1.00
Medical/Legal	2.00	5.00	3.22	0.97	3.00	1.00	2.00	1.50	0.71	1.50
Ethics	0.00	3.50	1.44	0.98	1.00	1.00	1.00	1.00	0.00	1.00
Pathophysiology	8.00	35.00	18.06	8.72	20.00	2.00	8.50	6.17	3.62	8.00
Pharmacology	8.00	45.00	26.33	13.08	22.50	4.00	18.75	10.25	7.63	8.00
Medication Administration	2.00	24.00	9.63	6.80	8.50	2.00	20.00	9.86	6.54	9.00
Thera. Communication	1.00	4.50	2.28	1.20	2.00	1.00	2.00	1.50	0.71	1.50
Life Span Development	2.00	10.00	3.75	2.50	3.00	1.00	1.00	1.00	N/A	1.00
<i>Module Totals</i>	<i>38.00</i>	<i>101.00</i>	<i>72.56</i>	<i>19.84</i>	<i>73.00</i>	<i>0.00</i>	<i>36.25</i>	<i>14.47</i>	<i>10.95</i>	<i>12.00</i>
Airway Management & Ventilation										
Airway and Ventilation	5.00	16.00	10.58	4.16	12.00	8.00	20.00	11.88	4.16	10.50
<i>Module Totals</i>	<i>5.00</i>	<i>16.00</i>	<i>10.58</i>	<i>4.16</i>	<i>12.00</i>	<i>0.00</i>	<i>20.00</i>	<i>10.56</i>	<i>5.55</i>	<i>10.00</i>
Patient Assessment										
History Taking	1.50	4.00	2.47	0.83	2.00	1.00	4.00	2.75	1.50	3.00
Technique of PE	1.00	31.50	8.72	10.41	4.00	2.00	22.00	8.29	7.78	4.00
Patient Assessment	4.00	15.50	6.92	3.68	6.00	4.00	12.00	6.25	2.92	5.00
Clinical Decision Making	0.00	4.00	1.88	1.25	2.00	2.00	6.00	3.33	2.31	2.00
Communications	1.00	4.00	1.94	1.01	2.00	1.00	5.00	3.00	1.83	3.00
Documentation	1.00	4.00	1.94	1.01	2.00	1.00	5.00	2.60	1.82	2.00
<i>Module Totals</i>	<i>12.00</i>	<i>42.00</i>	<i>23.67</i>	<i>9.11</i>	<i>25.00</i>	<i>6.00</i>	<i>26.00</i>	<i>17.11</i>	<i>7.15</i>	<i>20.00</i>
Trauma										
Trauma System/ MOI	1.00	4.00	2.75	1.39	3.00	1.00	4.00	2.75	1.50	3.00
Hemorrhage and Shock	4.00	14.00	6.78	4.04	5.00	4.00	30.25	11.85	10.75	8.00
Soft Tissue Trauma	1.00	5.00	3.06	1.43	3.50	1.00	3.00	2.20	0.84	2.00
Burns	1.00	4.00	3.06	1.15	3.50	2.00	16.00	6.25	6.55	3.50
Head and Face Trauma	2.00	7.00	4.31	1.79	4.00	1.00	4.00	3.20	1.30	4.00
Spinal Trauma	2.00	6.00	3.31	1.39	3.25	1.00	5.00	3.33	1.51	4.00
Thoracic Trauma	2.00	6.00	3.69	1.16	3.75	2.00	7.25	3.85	2.15	4.00
Abdominal Trauma	1.50	4.00	2.69	1.10	2.00	1.00	4.00	2.50	1.38	2.50
Musculoskeletal Trauma	2.00	8.50	4.13	1.90	4.00	1.00	7.25	3.71	2.05	3.50
<i>Module Totals</i>	<i>0.00</i>	<i>44.00</i>	<i>30.03</i>	<i>14.02</i>	<i>36.00</i>	<i>0.00</i>	<i>73.75</i>	<i>22.08</i>	<i>23.66</i>	<i>16.00</i>

	Didactic					Practical Laboratory				
	Min. (hours)	Max. (hours)	Ave. (hours)	Stand. Dev.	Median	Min (hours)	Max (hours)	Ave. (hours)	Stand. Dev.	Median
Medical										
Pulmonology	4.00	20.00	11.25	5.73	10.00	1.00	12.00	6.00	4.04	4.00
Cardiology	24.00	126.75	51.31	32.63	38.00	8.00	108.00	34.89	32.10	26.00
Neurology	4.00	22.50	10.50	5.52	8.00	1.00	5.00	2.67	2.08	2.00
Endocrinology	2.00	6.00	4.47	1.38	4.00	1.00	3.00	2.00	1.00	2.00
Allergies & Anaphylaxis	1.00	4.00	3.16	1.09	3.50	0.50	2.00	1.17	0.76	1.00
Gastroenterology	2.00	12.00	5.69	3.25	4.00	1.00	2.00	1.50	0.71	1.50
Urology	1.00	4.00	2.72	1.03	2.88	1.00	2.00	1.50	0.71	1.50
Toxicology	3.00	18.50	7.03	5.05	5.75	1.00	3.00	2.00	1.41	2.00
Environmental Conditions	2.00	9.00	5.14	2.00	5.00	0.50	3.00	1.50	1.32	1.00
Infectious & Comm	1.00	10.50	5.67	2.82	5.00	1.00	3.00	2.00	1.41	2.00
Behavioral/Psychiatric	3.00	9.75	5.03	2.64	4.00	0.50	8.75	3.42	4.63	1.00
Hematology	1.00	4.00	3.16	1.13	3.63	1.00	2.00	1.50	0.71	1.50
Gynecology	4.00	16.00	7.69	4.74	6.00	1.00	16.75	8.88	11.14	8.88
Obstetrics	4.00	12.00	7.00	3.55	6.00	1.00	10.00	5.00	4.58	4.00
<i>Module Totals</i>	<i>74.00</i>	<i>237.75</i>	<i>125.42</i>	<i>48.59</i>	<i>122.00</i>	<i>9.50</i>	<i>138.50</i>	<i>48.67</i>	<i>46.00</i>	<i>30.00</i>
Special Considerations										
Neonatology	2.00	8.00	5.63	2.00	6.00	1.00	9.00	4.60	3.65	3.00
Pediatrics	4.00	32.00	16.38	10.34	16.00	2.00	29.00	11.00	10.77	8.00
Geriatrics	4.00	12.00	6.66	2.78	6.63	1.00	6.00	3.00	2.16	2.50
Abuse & Assault	1.00	4.00	2.75	1.39	3.00	1.00	2.00	1.50	0.71	1.50
Pts with Sp. Challenges	2.00	6.00	3.59	1.30	3.88	1.00	2.00	1.50	0.71	1.50
Acute Int in CCP	3.00	4.00	3.69	0.46	4.00	2.00	2.00	2.00	0.00	2.00
<i>Module Total</i>	<i>0.00</i>	<i>54.00</i>	<i>34.39</i>	<i>17.33</i>	<i>40.00</i>	<i>0.00</i>	<i>40.00</i>	<i>11.11</i>	<i>13.19</i>	<i>8.00</i>
Assessment Based Management										
Assess Based Mgmt	2.00	8.00	4.40	2.19	4.00	2.00	28.00	10.00	12.11	5.00
<i>Module Totals</i>	<i>0.00</i>	<i>8.00</i>	<i>2.44</i>	<i>2.79</i>	<i>2.00</i>	<i>0.00</i>	<i>28.00</i>	<i>4.44</i>	<i>9.10</i>	<i>0.00</i>
Operations										
Medical Incident Cmd.	2.00	6.00	3.50	1.41	4.00	2.00	9.00	4.67	3.79	3.00
Rescue A & O	2.00	36.25	9.66	11.50	4.00	2.00	45.00	26.33	22.05	32.00
Haz Mat Incidents	2.00	16.00	6.50	5.10	4.00	2.00	12.00	6.00	5.29	4.00
Crime Scene Awareness	1.00	5.00	3.39	1.38	4.00	2.00	2.00	2.00	0.00	2.00
<i>Module Totals</i>	<i>0.00</i>	<i>58.00</i>	<i>20.11</i>	<i>18.07</i>	<i>16.00</i>	<i>0.00</i>	<i>60.00</i>	<i>12.78</i>	<i>23.46</i>	<i>0.00</i>
Miscellaneous Classroom Time										
Exams & Reviews	16.00	59.00	32.86	15.32	32.00	8.00	91.50	34.88	38.31	20.00
Final Testing	4.00	40.00	14.64	12.63	8.00	4.00	52.00	17.00	23.41	6.00
BLS Labs	8.00	78.00	42.00	35.04	40.00	15.00	101.00	51.50	37.93	45.00
<i>Misc Total</i>	<i>0.00</i>	<i>159.50</i>	<i>50.94</i>	<i>50.07</i>	<i>32.00</i>	<i>0.00</i>	<i>244.50</i>	<i>45.94</i>	<i>80.29</i>	<i>12.00</i>

EMT-PARAMEDIC: NATIONAL STANDARD CURRICULUM

FIELD AND PILOT TEST CLINICAL
HOURS REPORT

	Min. (hours)	Max. (hours)	Average (hours)	Standard Deviation	Median
Clinical Rotations					
Anesthesia	6.00	52.00	17.75	15.02	14.00
Critical Care	8.00	80.00	32.00	22.63	24.00
Emergency Department	80.00	256.00	137.25	57.58	116.00
Triage	8.00	12.00	9.60	2.19	8.00
IV Team	8.00	12.00	9.00	2.00	8.00
Morque	4.00	6.00	4.67	1.15	4.00
Operating Room Observation	6.00	16.00	9.00	4.76	7.00
Pediatric ED	16.00	48.00	29.33	16.65	24.00
Pediatric OR	4.00	4.00	4.00	N/A	4.00
Pediatric PAR	4.00	8.00	6.00	2.83	6.00
Psychiatrics	6.00	8.00	7.60	0.89	8.00
Labor & Delivery	8.00	39.00	15.88	10.80	12.00
Elective/Miscellaneous	16.00	56.00	30.40	17.34	24.00
Field Internship	108.00	1160.00	347.88	345.39	260.00
Field Summative Evaluation	8.00	240.00	118.40	85.30	120.00
<i>Clinical Total</i>	<i>0.00</i>	<i>1731.00</i>	<i>602.89</i>	<i>474.06</i>	<i>516.00</i>

The following list of objectives have been derived from many of the currently available resources in anatomy and physiology instruction that are typically part of allied health educational programs or other non-science curricula. The objectives that are listed below are in common with most of these programs. Paramedic education program should select courses or textbooks which cover this level of material.

OBJECTIVES:

Define anatomy, physiology, and pathophysiology

Name the levels of organization of the body and explain each

Name the organ systems of the body

Define homeostasis and give an example of a typical homeostatic mechanism

Describe the anatomical position

Describe the sagittal, midsagittal, transverse and frontal planes

Use proper terminology to describe the location of body parts with respect to one another

Name the body cavities, their membranes and some organs within each cavity

Explain the four quadrants of the abdomen and name the organs in those areas

Define matter, element, atom, proton, neutron, and electron

Using symbols, name some common elements found in the body

Describe the purpose of ionic, covalent and hydrogen bonds in the body

Describe what happens in synthesis and decomposition reactions

Explain the importance of water to the function of the body

Describe where water is found in the body

Explain the roles of oxygen and carbon dioxide in cell respiration

Explain pH and state normal pH ranges in body fluids

Explain how a buffer system resists major pH changes

Describe the functions and types of sugars, fats, and proteins

Explain how enzymes function as catalysts

Describe the function of DNA, RNA and ATP

Name the organic molecules that make up the cell membrane and state their functions

State the arrangement of the molecules in the cell membrane

State the five functions of proteins in the cell membrane

Describe the cytoplasm

Describe how the cell membrane regulates the composition of the cytoplasm

Explain isotonic, hypotonic, and hypertonic solutions and their effects on the cell

State the function of the nucleus and chromosomes

Describe the function of the cell organelles

Define each of these cellular transport mechanisms and give an example of the role of each in the body: diffusion, osmosis, facilitated diffusion, active transport, filtration, phagocytosis and pinocytosis

Describe what happens in mitosis and meiosis and describe the importance of each

Describe the four major categories of tissues and give general characteristics of each

Describe the function of epithelial tissue depending on their location

Describe the functions of connective tissue and relate them to the function of the body or an organ system

Explain the basic differences between smooth, skeletal and cardiac muscle

Describe in brief nervous tissue

Name the organs made of nerve tissue

Describe the location of pleural membranes, pericardial membranes, and the perineum-mesentery

State the location of mucous membranes and state the function of mucus

Name some membranes made of connective tissue

State the three functions of the integumentary system

Name the two layers of skin

State the location and function of the stratum corneum and the stratum germinativum

Describe the function of melanocytes and melanin

Describe the function of hair and nails

Describe the functions of the secretions of sebaceous glands, ceruminous glands and eccrine sweat glands

Describe how the arterioles in the dermis respond to heat, cold, and stress

Name the tissues that make up the subcutaneous tissue and describe their functions

Describe the function of the skeleton

Explain how bones are classified and give an example of each

Describe how the embryonic skeleton is replaced by bone

State the nutrients necessary for bone growth
Name the hormones involved in bone growth and maintenance
Explain what is meant by exercise for bones and explain its importance
Identify the two major subdivisions of the skeleton and list the bones in each area
Explain how joints are classified; give an example of each and describe the movements possible
Describe the parts of a synovial joint and explain their function
Describe muscle structure in terms of muscle cells, tendons and bones
Describe the difference between antagonistic and synergistic muscles
Name the energy sources for muscle contraction and state the simple equation for cell respiration
Explain the importance of hemoglobin and myoglobin and oxygen debt and lactic acid
Describe the neuromuscular junction and explain the function for each part
Describe the structure of a sarcomere
Explain polarization, depolarization and repolarization in terms of ions and charges
Describe the sliding filament theory of muscle contraction
State the major muscles of the body and their functions
Name the divisions of the nervous system and state the general functions of each
Name the parts of a neuron and the function of each
Explain the importance of Schwann cells in the peripheral nervous system and neuroglia in the central nervous system
Describe the electrical nerve impulse and impulse transmission at the synapse
Describe the types of neurons, nerves and nerve tracts
Explain the importance of stretch reflexes and flexor reflexes
Describe the reflex arc
State the functions of the parts of the brain and locate each part on a diagram
Name the meninges and describe their locations
State the locations and functions of cerebrospinal fluid
Explain the general purpose of sensations
Name the parts of the sensory pathway and the general functions of each part
Describe the characteristics of sensations
Name the cutaneous senses and explain their purpose
Explain referred pain and explain its importance
Explain the importance of proprioception, or muscle sense
Describe the pathways for the senses of smell and taste and explain how these senses are interrelated
Name the parts of the eye and explain their function in sight
Name the parts of the ear and explain their function in hearing
Describe the physiology of equilibrium
Distinguish between endocrine and exocrine glands
Define hormone and prostaglandin
Identify the primary endocrine glands and list the major hormones secreted by each
Explain the roles of positive and negative feedback mechanisms in hormone secretions
Describe the relationship between parathyroid hormone and calcitonin
Describe the relationship between insulin and glucagon
Explain what prostaglandins are made of and state some of their functions
Explain how protein hormones are believed to exert their effects
Explain how steroid hormones are believed to exert their effects
Describe the primary functions of blood
List the formed elements of blood and state the primary functions of each
Name the hemopoietic tissues and the kinds of blood cells each produces
Describe what happens to red blood cells at the end of their life span including the fate of hemoglobin
Explain the ABO and Rh blood types
Name the five kinds of white blood cells and the functions of each
State what platelets are and explain how they are involved in hemostasis
Describe the three stages of blood clotting
Explain how abnormal clotting is prevented in the vascular system
Describe the location of the heart in terms of body cavities and relationship to other structures
Name the chambers of the heart and the vessels that enter or leave each
State the valves of the heart and their function
State how heart sounds are created
Trace the pathway of a blood cell throughout the body

Describe coronary circulation

Describe the cardiac conduction pathway and its relationship to a normal electrocardiogram

Explain stroke volume, cardiac output and Starling's law of the heart

Explain how the nervous system regulates the function of the heart

Describe the structure and function of each of the blood vessels: arteries, veins and capillaries

Describe the exchange of gases that occur at the capillary level

Name the major systemic arteries and the parts of the body they nourish

Name the major systemic veins and the parts of the body they drain of blood

Define blood pressure and state the normal ranges for the systolic and diastolic indices

Describe the functions of the lymphatic system

State how lymph is formed

Describe the system of lymph vessels and explain how lymph is returned to the blood

State the location and function of lymph nodules and nodes

State the location and function of the spleen

Define immunity

Explain the role of the thymus in immunity

Explain the differences between humoral immunity and cell mediated immunity

Compare and contrast the development and function of B cells and T cells

Describe the differences between acquired immunity and genetic immunity

Explain how vaccines work

State the general function of the respiratory system

State the pathway of the respiratory system including nasal cavities, pharynx and larynx

State the function of the turbinates in the nasal cavity

Describe the structure and function of the larynx and the speaking mechanism

State the roles of the visceral and parietal pleura in respiration

State the changes in air pressure within the thoracic cavity during respiration

Explain the diffusion of gases in external and internal respiration

Describe how oxygen and carbon dioxide are transported in the blood

Explain the nervous and chemical mechanisms that regulate respiration

Explain how respiration affects the pH of certain body fluids

Describe the general function of the digestive system and name the major divisions

Identify the accessory organs of digestion

Explain the difference between mechanical and chemical digestion

Describe the structure and function of the teeth and tongue

Explain the function of saliva

Describe the location and function of the pharynx and esophagus

List and describe the four layers of the alimentary canal

Describe the difference in absorption between the large and small intestine

Describe the function of the normal flora in the colon

Define peristalsis

Define chyme

State the normal range of body temperature

Define metabolism, catabolism and anabolism

State the different ways heat is generated and lost in the body

State why the hypothalamus is the thermostat of the body

State what the products of cell respiration are and how the body disposes of them

Describe the metabolic roles of fats, glucose and proteins

Describe basal metabolic rate and the factors that affect it

Define kilocalories

Describe the water compartments and the name for the water in each

Explain how water moves between the compartments

Explain how water is taken in by the body and exits the body

Describe the location and general function of each organ in the urinary system

Name the parts of a nephron

Define glomerular filtration rate

Describe how the kidneys function in maintaining normal blood volume and pressure

Describe how the kidneys help to maintain normal blood pH and electrolyte balance

State the hormones that affect kidney function

Explain the interaction between capillary blood pressure and blood proteins

Describe the characteristics of normal urine
Define diploid and haploid
Describe the difference between spermatogenesis and oogenesis
Define gametes
Name the hormones necessary for the formation of gametes
List the essential and accessory organs of the male and female, give the general function of each
Identify and describe the structures that constitute external genitals in both sexes
Name the parts of a sperm cell
Define endometrium
Briefly describe the life cycle of an oocyte
Describe the menstrual cycle in terms of change in hormone levels and the condition of the endometrium
Beginning with fertilization, describe the major developmental changes during gestation
Describe the structure and function of the placenta and umbilical cord
Describe the difference between fetal circulation/respiration and adult circulation/respiration
State the length of an average gestation period
Describe the states of labor
Describe the major changes that take place in an infant at birth
Explain how microorganisms are named and classified
Describe the distribution of and the benefits of normal flora
Explain what is meant by infectious disease
Describe the different methods by which infectious diseases are spread
List some important infectious diseases
Define genetic disease
Explain how genes can cause disease
Define homologous chromosomes, autosomes, sex chromosomes and genes
Define alleles, genotype, phenotype, homozygous, and heterozygous
Discuss the difference between dominant and recessive traits
List some important genetic diseases

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INSTRUCTIONS FOR AFFECTIVE STUDENT EVALUATIONS

There are two primary purposes of an affective evaluation system: 1) to verify competence in the affective domain, and 2) to serve as a method to change behavior. Although affective evaluation can be used to ultimately dismiss a student for unacceptable patterns of behavior, that is not the primary purpose of these forms. It is also recognized that there is some behavior that is so serious (abuse of a patient, gross insubordination, illegal activity, reporting for duty under the influence of drugs or alcohol, etc) that it would result in immediate dismissal from the educational program.

The two forms included in the EMT-Paramedic: National Standard Curricula were developed by the Joint Review Committee on Educational Programs for the EMT-Paramedic. They represent extensive experience in the evaluation of student's affective domain. The nature of this type of evaluation makes it impossible to achieve complete objectivity, but these forms attempt to decrease the subjectivity and document affective evaluations.

In attempting to change behavior it is necessary to identify, evaluate, and document the behavior that you want. The eleven affective characteristics that form the basis of this evaluation system refer to content in the Roles and Responsibilities of the Paramedic unit of the curriculum. Typically, this information is presented early in the course and serves to inform the students what type of behavior that is expected of them. It is important that the instructor is clear about these expectations.

Cognitive and psychomotor objectives are relatively easy to operationalize in behavioral terms. Unfortunately, the nature of the affective domain makes it practically impossible to enumerate all of the possible behaviors that represent professional behavior in each of the eleven areas. For this reason, the instructor should give examples of acceptable and unacceptable behavior in each of the eleven attributes, but emphasize that these are examples and do not represent an all inclusive list.

The affective evaluation instruments included in this curriculum take two forms: A Professional Behavior Evaluation and a Professional Behavior Counseling Record. The Professional Behavior Evaluation should be completed regularly (i.e. every other week, once a month, etc.) by faculty and preceptors about each student. It is recommended that this form be completed by as many people as practically possible and that it becomes part of the students record. The more independent evaluations of the student, the more reliable are the results.

The only two options for rating the student on this form are "competent" and "not yet competent". For each attribute, a short list of behavioral markers is listed that indicates what is generally considered a demonstration of competence for entry level paramedics. This is not an all inclusive list, but serves to help the evaluator in making judgements. Clearly there are behaviors which warrant a "not yet competent" evaluation that are not listed. Any ratings of "not yet competent" require explanation in the space provided.

Establishing a cut score to use in conjunction with the Professional Behavior Evaluation instrument is important. A cut score can be established by judgement of the local programs community of interest. The question the community should ask is, what percent score do we expect of graduates of our education program to achieve in the affective domain in order to demonstrate entry level competency for a (first month, second semester, graduate, etc.) level student?

When the cut score judgement is made on acceptability or deviation of competent behavior for each characteristic a percent score can be achieved. For example, a student may received 10 competent checks out of 11 (10 of 11 = 91%), or 5 of 7 (because 4 areas were not evaluated) for a score of 71%. This student may then continue to obtain scores of 91%, 91% 82%, etc and have a term grade of 86% in the affective domain. Each student in the program would receive an average score. Results of multiple evaluations throughout the program would indicate if the score set by the community of interest was too

high or too low. When a number of evaluations had evolved adjustments in acceptable score would yield a standard for the community. This standard coupled with community of interest judgements based upon graduate student and employer survey feedbacks would identify additional validity evidence for the cut score each year. A valid cut score based upon years of investigation could then be used as a determining factor on future participation in the education program.

For all affective evaluations, the faculty member should focus on patterns of behavior, not isolated instances that fall outside the students normal performance. For example, a student who is consistently on time and prepared for class may have demonstrated competence in time management and should not be penalized for an isolated emergency that makes him late for one class. On the other hand, if the student is constantly late for class, they should be counseled and if the behavior continues, rated as "not yet competent" in time management. Continued behavior may result in disciplinary action.

The second form, the Professional Behavior Counseling form is used to clearly communicate to the student that their affective performance is unacceptable. This form should be used during counseling sessions in response to specific incidents (i.e. cheating, lying, falsification of documentation, disrespect/insubordination, etc.) or patterns of unacceptable behavior. As noted before, there is some behavior that is so egregious as to result in immediate disciplinary action or dismissal. In the case of such serious incidents, thorough documentation is needed to justify the disciplinary action. For less serious incidents, the Professional Behavior Counseling form can serve as an important tracking mechanism to verify competence or patterns of uncorrected behavior.

On the Professional Behavior Counseling form, the evaluator checks all of the areas that the infraction affects in the left hand column (most incidents affect more than one area) and documents the nature of the incident(s) in the right hand column. Space is provided to document any follow-up. This should include specific expectations, clearly defined positive behavior, actions that will be taken if the behavior continues, and dates of future counseling sessions.

Using a combination of these forms helps to enable the program to demonstrate that graduating students have demonstrated competence in the affective domain. This is achieved by having many independent evaluations, by different faculty members at different times, stating that the student was competent. These forms can also be used to help correct unacceptable behavior. Finally, these forms enable programs to build a strong case for dismissing students following a repeated pattern of unacceptable behavior. Having numerous, uncoberrated evaluations by faculty members documenting unacceptable behavior, and continuation of that behavior after remediation, is usually adequate grounds for dismissal.

PROFESSIONAL BEHAVIOR EVALUATION

Student's

Name: _____

Date of

evaluation: _____

1. INTEGRITY	Competent []	Not yet competent []
Examples of professional behavior include, but are not limited to: Consistent honesty; being able to be trusted with the property of others; can be trusted with confidential information; complete and accurate documentation of patient care and learning activities.		
2. EMPATHY	Competent []	Not yet competent []
Examples of professional behavior include, but are not limited to: Showing compassion for others; responding appropriately to the emotional response of patients and family members; demonstrating respect for others; demonstrating a calm, compassionate, and helpful demeanor toward those in need; being supportive and reassuring to others.		
3. SELF - MOTIVATION	Competent []	Not yet competent []
Examples of professional behavior include, but are not limited to: Taking initiative to complete assignments; taking initiative to improve and/or correct behavior; taking on and following through on tasks without constant supervision; showing enthusiasm for learning and improvement; consistently striving for excellence in all aspects of patient care and professional activities; accepting constructive feedback in a positive manner; taking advantage of learning opportunities		
4. APPEARANCE AND PERSONAL HYGIENE	Competent []	Not yet competent []
Examples of professional behavior include, but are not limited to: Clothing and uniform is appropriate, neat, clean and well maintained; good personal hygiene and grooming.		
5. SELF - CONFIDENCE	Competent []	Not yet competent []
Examples of professional behavior include, but are not limited to: Demonstrating the ability to trust personal judgement; demonstrating an awareness of strengths and limitations; exercises good personal judgement.		
6. COMMUNICATIONS	Competent []	Not yet competent []
Examples of professional behavior include, but are not limited to: Speaking clearly; writing legibly; listening actively; adjusting communication strategies to various situations		
7. TIME MANAGEMENT	Competent []	Not yet competent []
Examples of professional behavior include, but are not limited to: Consistent punctuality; completing tasks and assignments on time.		
8. TEAMWORK AND DIPLOMACY	Competent []	Not yet competent []
Examples of professional behavior include, but are not limited to: Placing the success of the team above self interest; not undermining the team; helping and supporting other team members; showing respect for all team members; remaining flexible and open to change; communicating with others to resolve problems.		
9. RESPECT	Competent []	Not yet competent []
Examples of professional behavior include, but are not limited to: Being polite to others; not using derogatory or demeaning terms; behaving in a manner that brings credit to the profession.		

_____ - Faculty Signature

PROFESSIONAL BEHAVIOR EVALUATION

Student's Name: _____

~~_____~~
Sample

Date of evaluation: _____

September 1998

<p>1. INTEGRITY</p> <p>Examples of professional behavior include, but are not limited to: Consistent honesty; being able to be trusted with the property of others; can be trusted with confidential information; complete and accurate documentation of patient care and learning activities.</p>	Competent [<input checked="" type="checkbox"/>]	Not yet competent [<input type="checkbox"/>]
<p>2. EMPATHY</p> <p>Examples of professional behavior include, but are not limited to: Showing compassion for others; responding appropriately to the emotional response of patients and family members; demonstrating respect for others; demonstrating a calm, compassionate, and helpful demeanor toward those in need; being supportive and reassuring to others.</p>	Competent [<input checked="" type="checkbox"/>]	Not yet competent [<input type="checkbox"/>]
<p>3. SELF - MOTIVATION</p> <p>Examples of professional behavior include, but are not limited to: Taking initiative to complete assignments; taking initiative to improve and/or correct behavior; taking on and following through on tasks without constant supervision; showing enthusiasm for learning and improvement; consistently striving for excellence in all aspects of patient care and professional activities; accepting constructive feedback in a positive manner; taking advantage of learning opportunities</p>	Competent [<input checked="" type="checkbox"/>]	Not yet competent [<input type="checkbox"/>]
<p>4. APPEARANCE AND PERSONAL HYGIENE</p> <p>Examples of professional behavior include, but are not limited to: Clothing and uniform is appropriate, neat, clean and well maintained; good personal hygiene and grooming.</p>	Competent [<input checked="" type="checkbox"/>]	Not yet competent [<input type="checkbox"/>]
<p>5. SELF - CONFIDENCE</p> <p>Examples of professional behavior include, but are not limited to: Demonstrating the ability to trust personal judgement; demonstrating an awareness of strengths and limitations; exercises good personal judgement.</p>	Competent [<input checked="" type="checkbox"/>]	Not yet competent [<input type="checkbox"/>]
<p>6. COMMUNICATIONS</p> <p>Examples of professional behavior include, but are not limited to: Speaking clearly; writing legibly; listening actively; adjusting communication strategies to various situations</p>	Competent [<input type="checkbox"/>]	Not yet competent [<input checked="" type="checkbox"/>]
<p>7. TIME MANAGEMENT</p> <p>Examples of professional behavior include, but are not limited to: Consistent punctuality; completing tasks and assignments on time.</p>	Competent [<input type="checkbox"/>]	Not yet competent [<input checked="" type="checkbox"/>]
<p>8. TEAMWORK AND DIPLOMACY</p> <p>Examples of professional behavior include, but are not limited to: Placing the success of the team above self interest; not undermining the team; helping and supporting other team members; showing respect for all team members; remaining flexible and open to change; communicating with others to resolve problems.</p>	Competent [<input checked="" type="checkbox"/>]	Not yet competent [<input type="checkbox"/>]

Sample

John Brown - Faculty Signature

PROFESSIONAL BEHAVIOR EVALUATION

Student's Name: Steve R.

Sample

Date of evaluation: December 1999

1. INTEGRITY	Competent [<input checked="" type="checkbox"/>]	Not yet competent [<input type="checkbox"/>]
<p>Examples of professional behavior include, but are not limited to: Consistent honesty; being able to be trusted with the property of others; can be trusted with confidential information; complete and accurate documentation of patient care and learning activities.</p>		
2. EMPATHY	Competent [<input type="checkbox"/>]	Not yet competent [<input checked="" type="checkbox"/>]
<p>Examples of professional behavior include, but are not limited to: Showing compassion for others; responding appropriately to the emotional response of patients and family members; demonstrating respect for others; demonstrating a calm, compassionate, and helpful demeanor toward those in need; being supportive and reassuring to others.</p>		
3. SELF - MOTIVATION	Competent [<input checked="" type="checkbox"/>]	Not yet competent [<input type="checkbox"/>]
<p>Examples of professional behavior include, but are not limited to: Taking initiative to complete assignments; taking initiative to improve and/or correct behavior; taking on and following through on tasks without constant supervision; showing enthusiasm for learning and improvement; consistently striving for excellence in all aspects of patient care and professional activities; accepting constructive feedback in a positive manner; taking advantage of learning opportunities</p>		
4. APPEARANCE AND PERSONAL HYGIENE	Competent [<input checked="" type="checkbox"/>]	Not yet competent [<input type="checkbox"/>]
<p>Examples of professional behavior include, but are not limited to: Clothing and uniform is appropriate, neat, clean and well maintained; good personal hygiene and grooming.</p>		
5. SELF - CONFIDENCE	Competent [<input type="checkbox"/>]	Not yet competent [<input checked="" type="checkbox"/>]
<p>Examples of professional behavior include, but are not limited to: Demonstrating the ability to trust personal judgement; demonstrating an awareness of strengths and limitations; exercises good personal judgement.</p>		
6. COMMUNICATIONS	Competent [<input type="checkbox"/>]	Not yet competent [<input checked="" type="checkbox"/>]
<p>Examples of professional behavior include, but are not limited to: Speaking clearly; writing legibly; listening actively; adjusting communication strategies to various situations</p>		
7. TIME MANAGEMENT	Competent [<input checked="" type="checkbox"/>]	Not yet competent [<input type="checkbox"/>]
<p>Examples of professional behavior include, but are not limited to: Consistent punctuality; completing tasks and assignments on time.</p>		
8. TEAMWORK AND DIPLOMACY	Competent [<input type="checkbox"/>]	Not yet competent [<input checked="" type="checkbox"/>]
<p>Examples of professional behavior include, but are not limited to: Placing the success of the team above self interest; not undermining the team; helping and supporting other team members; showing respect for all team members; remaining flexible and open to change; communicating with others to resolve problems.</p>		

PROFESSIONAL BEHAVIOR EVALUATION

Student's Name: Steve R.

Sample

Date of evaluation: November 1999

1. INTEGRITY	Competent [<input checked="" type="checkbox"/>]	Not yet competent [<input type="checkbox"/>]
<p>Examples of professional behavior include, but are not limited to: Consistent honesty; being able to be trusted with the property of others; can be trusted with confidential information; complete and accurate documentation of patient care and learning activities.</p>		
2. EMPATHY	Competent [<input type="checkbox"/>]	Not yet competent [<input checked="" type="checkbox"/>]
<p>Examples of professional behavior include, but are not limited to: Showing compassion for others; responding appropriately to the emotional response of patients and family members; demonstrating respect for others; demonstrating a calm, compassionate, and helpful demeanor toward those in need; being supportive and reassuring to others.</p>		
3. SELF - MOTIVATION	Competent [<input checked="" type="checkbox"/>]	Not yet competent [<input type="checkbox"/>]
<p>Examples of professional behavior include, but are not limited to: Taking initiative to complete assignments; taking initiative to improve and/or correct behavior; taking on and following through on tasks without constant supervision; showing enthusiasm for learning and improvement; consistently striving for excellence in all aspects of patient care and professional activities; accepting constructive feedback in a positive manner; taking advantage of learning opportunities</p>		
4. APPEARANCE AND PERSONAL HYGIENE	Competent [<input checked="" type="checkbox"/>]	Not yet competent [<input type="checkbox"/>]
<p>Examples of professional behavior include, but are not limited to: Clothing and uniform is appropriate, neat, clean and well maintained; good personal hygiene and grooming.</p>		
5. SELF - CONFIDENCE	Competent [<input type="checkbox"/>]	Not yet competent [<input checked="" type="checkbox"/>]
<p>Examples of professional behavior include, but are not limited to: Demonstrating the ability to trust personal judgement; demonstrating an awareness of strengths and limitations; exercises good personal judgement.</p>		
6. COMMUNICATIONS	Competent [<input type="checkbox"/>]	Not yet competent [<input checked="" type="checkbox"/>]
<p>Examples of professional behavior include, but are not limited to: Speaking clearly; writing legibly; listening actively; adjusting communication strategies to various situations</p>		
7. TIME MANAGEMENT	Competent [<input checked="" type="checkbox"/>]	Not yet competent [<input type="checkbox"/>]
<p>Examples of professional behavior include, but are not limited to: Consistent punctuality; completing tasks and assignments on time.</p>		
8. TEAMWORK AND DIPLOMACY	Competent [<input type="checkbox"/>]	Not yet competent [<input checked="" type="checkbox"/>]
<p>Examples of professional behavior include, but are not limited to: Placing the success of the team above self interest; not undermining the team; helping and supporting other team members; showing respect for all team members; remaining flexible and open to change; communicating with others to resolve problems.</p>		

Sample

T. Jones

- *Faculty Signature*

PROFESSIONAL BEHAVIOR COUNSELING RECORD

Student's

Name: _____

Date of

counseling: _____

Date of

incident: _____

✓	Reason for Counseling	Explanation (use back of form if more space is needed):
	Integrity	
	Empathy	
	Self - Motivation	
	Appearance/Personal Hygiene	
	Self - Confidence	
	Communications	
	Time Management	
	Teamwork and Diplomacy	
	Respect	
	Patient Advocacy	
	Careful delivery of service	

Follow-up (include specific expectations, clearly defined positive behavior, actions that will be taken if behavior continues, dates of future counseling sessions, etc.):

_____ -Faculty signature

I have read this notice and I understand it.

_____ -Student signature

_____ -Administrative or Medical Director Review

PROFESSIONAL BEHAVIOR COUNSELING RECORD

Student's Name: Joe L.

Sample

Date of counseling: February 23, 1999

Date of incident: February 21, 1999

✓	Reason for Counseling	Explanation (use back of form if more space is needed):
	Integrity	<i>Joe reported to a field rotation 16 minutes late, he was not wearing (nor</i>
	Empathy	<i>did he have in his possession) a uniform belt and with "at least 2 days</i>
	Self - Motivation	<i>beard growth" according to field supervisor Johnson. When Joe was</i>
✓	Appearance/Personal Hygiene	<i>approached regarding this situation he became argumentative and told</i>
	Self - Confidence	<i>Mr. Johnson to "... mind your own business." Joe was asked to leave.</i>
	Communications	<i>Others that witnessed this exchange were Paramedics Davis and</i>
✓	Time Management	<i>Lawrence.</i>
	Teamwork and Diplomacy	
✓	Respect	
	Patient Advocacy	
	Careful delivery of service	

Follow-up (include specific expectations, clearly defined positive behavior, actions that will be taken if behavior continues, dates of future counseling sessions, etc.):

- Reviewed clinical Policies and Procedures manual section referring to personal appearance and hygiene, time management, and respect. I also reviewed the conduct at clinical rotations with Joe.
- Asked Joe to writ a letter of apology to field supervisor Johnson, and Paramedics Davis and Lawrence, which he agreed to do.
- I informed Joe that any further display of

disrespectful behavior will result in dismissal from the program. A continued pattern of poor time management and/or poor appearance/personal hygiene could also result in dismissal.

Sample

Bill Smith -Faculty signature

I have read this notice and I understand it.

Joe L. -Student signature

Dr. Jones -Administrative or Medical Director Review

PROFESSIONAL BEHAVIOR COUNSELING RECORD

Student's Name: Steve

Sample

Date of counseling: December 14, 1998

Date of incident: November and December 1999

✓	Reason for Counseling	Explanation (use back of form if more space is needed):
	Integrity	<i>This counseling session was in response to the two Professional Behavior</i>
✗	Empathy	<i>Evaluations file by Instructors Cox and Jones. They both indicated that</i>
	Self - Motivation	<i>Steve has been disruptive in classes (see attached)</i>
	Appearance/Personal Hygiene	
✗	Self - Confidence	
✗	Communications	
	Time Management	
✗	Teamwork and Diplomacy	
✗	Respect	
	Patient Advocacy	
	Careful delivery of service	

Follow-up (include specific expectations, clearly defined positive behavior, actions that will be taken if behavior continues, dates of future counseling sessions, etc.):

● Student was advised that his behavior is inappropriate and unacceptable. Continuation of this behavior will result in dismissal from class.

● Written warning from program director.

● Instructors Cox and Jones to complete Professional Behavior Evaluations bi-weekly throughout next semester

M. Travis

-Faculty signature

I have read this notice and I understand it.

Steve R.

-Student signature

Dr. O'Hara

-Administrative or Medical Director Review

Sample

The following skill evaluation instruments were developed by the National Registry of EMTs. They are in draft format and have not yet been approved for usage in Advanced Level National Registry examinations.

**National Registry of Emergency Medical Technicians
Advanced Level Practical Examination**

PATIENT ASSESSMENT-TRAUMA

NOTE: Areas denoted by "*" may be integrated within sequence of Initial Assessment

	Possible Points	Points Awarded
Takes or verbalizes body substance isolation precautions	1	
SCENE SIZE-UP		
Determines the scene/situation is safe	1	
Determines the mechanism of injury/nature of illness	1	
Determines the number of patients	1	
Requests additional help if necessary	1	
Considers stabilization of spine	1	
INITIAL ASSESSMENT/RESUSCITATION		
Verbalizes general impression of the patient	1	
Determines responsiveness/level of consciousness	1	
Determines chief complaint/apparent life-threats	1	
Airway -Opens and assesses airway (1 point) -Inserts adjunct as indicated (1 point)	2	
Breathing -Assess breathing (1 point) -Assures adequate ventilation (1 point) -Initiates appropriate oxygen therapy (1 point) -Manages any injury which may compromise breathing/ventilation (1 point)	4	
Circulation -Checks pulse (1 point) -Assess skin (either skin color, temperature or condition) (1 point) -Assesses for and controls major bleeding if present (1 point) -Initiates shock management (1 point)	4	
Identifies priority patients/makes transport decision	1	
FOCUSED HISTORY AND PHYSICAL EXAMINATION/RAPID TRAUMA ASSESSMENT		
Selects appropriate assessment	1	
Obtains, or directs assistant to obtain, baseline vital signs	1	
Obtains SAMPLE history	1	
DETAILED PHYSICAL EXAMINATION		
Head -Inspects mouth**, nose**, and assesses facial area (1 point) -Inspects and palpates scalp and ears (1 point) -Assesses eyes for PEARRL ** (1 point)	3	
Neck** -Checks position of trachea (1 point) -Checks jugular veins (1 points) -Palpates cervical spine (1 point)	3	
Chest ** -Inspects chest (1 point) -Palpates chest (1 point) -Auscultates chest (1 point)	3	
Abdomen/pelvis** -Inspects and palpates abdomen (1 point) -Assesses pelvis (1 point) -Verbalizes assessment of genitalia/perineum as needed (1 point)	3	
Lower extremities ** -Inspects, palpates, and assesses motor, sensory and circulatory functions (1 point/leg)	2	
Upper extremities -Inspects, palpates, and assesses motor, sensory, and circulatory functions (1 point/arm)	2	
Posterior thorax, lumbar, and buttocks** -Inspects and palpates posterior thorax (1 point) -Inspects and palpates lumbar and buttocks area (1 point)	2	
Manages secondary injuries and wounds appropriately (1 point/injury or wound)	1	
Ongoing assessment (1 point)	1	
TOTAL	43	

CRITICAL CRITERIA

- _____ Failure to initiate or call for transport of the patient within 10 minute time limit
- _____ Failure to take or verbalize body substance isolation precautions
- _____ Failure to determine scene safety
- _____ Failure to assess for and provide spinal protection when indicated
- _____ Failure to voice and ultimately provide high concentration of oxygen
- _____ Failure to find or appropriately manage problems associated with airway, breathing, hemorrhage or shock (hypoperfusion)
- _____ Failure to differentiate patient's need for immediate transportation versus continued assessment and treatment at the scene
- _____ Does other detailed or focused history or physical examination before assessing and treating threats to airway, breathing and circulation
- _____ Orders a dangerous or inappropriate intervention

**National Registry of Emergency Medical Technicians
Advanced Level Practical Examination**

PATIENT ASSESSMENT-MEDICAL

	Possible Points	Points Awarded
Takes or verbalizes body substance isolation precautions	1	
SCENE SIZE-UP		
Determines the scene/situation is safe	1	
Determines the mechanism of injury/nature of illness	1	
Determines the number of patients	1	
Requests additional help if necessary	1	
Considers stabilization of spine	1	
INITIAL ASSESSMENT		
Verbalizes general impression of the		

EMT-Paramedic: National Standard Curriculum

Module and Unit Objective Summary

- 1 At the completion of this module, the paramedics student will understand the roles and responsibilities of a Paramedic within an EMS system, apply the basic concepts of development, pathophysiology and pharmacology to assessment and management of emergency patients, be able to properly administer medications, and communicate effectively with patients.
 - 1-1 At the completion of this unit, the paramedic student will understand his or her roles and responsibilities within an EMS system, and how these roles and responsibilities differ from other levels of providers.
 - 1-2 At the completion of this unit, the paramedic student will understand and value the importance of personal wellness in EMS and serve as a healthy role model for peers.
 - 1-3 At the completion of this unit, the paramedic student will be able to integrate the implementation of primary injury prevention activities as an effective way to reduce death, disabilities and health care costs.
 - 1-4 At the completion of this unit, the paramedic student will understand the legal issues that impact decisions made in the out-of-hospital environment.
 - 1-5 At the completion of this unit, the paramedic student will understand the role that ethics plays in decision making in the out-of-hospital environment.
 - 1-6 At the completion of this unit, the paramedic student will be able to apply the general concepts of pathophysiology for the assessment and management of emergency patients.
 - 1-7 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles of pharmacology and the assessment findings to formulate a field impression and implement a pharmacologic management plan.
 - 1-8 At the completion of this unit, the paramedic student will be able to safely and precisely access the venous circulation and administer medications.
 - 1-9 At the completion of this unit, the paramedic student will be able to integrate the principles of therapeutic communication to effectively communicate with any patient while providing care.
 - 1-10 At the completion of this unit, the paramedic student will be able to integrate the physiological, psychological, and sociological changes throughout human development with assessment and communication strategies for patients of all ages.
- 2 At the completion of this module, the paramedic student will be able to establish and/ or maintain a patent airway, oxygenate, and ventilate a patient.
 - 2-1 At the completion of this unit, the paramedic student will be able to establish and/ or maintain a patent airway, oxygenate, and ventilate a patient.
- 3 At the completion of this module, the paramedic student will be able to take a proper history and perform a comprehensive physical exam on any patient, and communicate the findings to others.
 - 3-1 At the completion of this unit, the paramedic student will be able to use the appropriate techniques to obtain a medical history from a patient.
 - 3-2 At the completion end of this unit, the paramedic student will be able to explain the pathophysiological significance of physical exam findings.
 - 3-3 At the end of this unit, the paramedic student will be able to integrate the principles of history taking and techniques of physical exam to perform a patient assessment.
 - 3-4 At the end of this unit, the paramedic student will be able to apply a process of clinical decision making to use the assessment findings to help form a field impression.
 - 3-5 At the completion of this unit, the paramedic student will be able to follow an accepted format for dissemination of patient information in verbal form, either in person or over the radio.
 - 3-6 At the completion of this unit, the paramedic student will be able to effectively document the essential elements of patient assessment, care and transport.
- 4 At the completion of this module, the paramedic student will be able to integrate

pathophysiological principles and assessment findings to formulate a field impression and implement the treatment plan for the trauma patient.

- 4-1 At the completion of this unit, the Paramedic student will be able to integrate the principles of kinematics to enhance the patient assessment and predict the likelihood of injuries based on the patient's mechanism of injury.
 - 4-2 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement the treatment plan for the patient with shock or hemorrhage.
 - 4-3 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and the assessment findings to formulate a field impression and implement the treatment plan for the patient with soft tissue trauma.
 - 4-4 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and the assessment findings to formulate a field impression and implement the management plan for the patient with a burn injury.
 - 4-5 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the trauma patient with a suspected head injury.
 - 4-6 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with a suspected spinal injury.
 - 4-7 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for a patient with a thoracic injury.
 - 4-8 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and the assessment findings to formulate a field impression and implement the treatment plan for the patient with suspected abdominal trauma.
 - 4-9 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and the assessment findings to formulate a field impression and implement the treatment plan for the patient with a musculoskeletal injury.
- 5 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement the treatment plan for the medical patient.
- 5-1 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement the treatment plan for the patient with respiratory problems.
 - 5-2 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement the treatment plan for the patient with cardiovascular disease.
 - 5-3 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement the treatment plan for the patient with a neurological problem.
 - 5-4 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with an endocrine problem.
 - 5-5 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with an allergic or anaphylactic reaction.
 - 5-6 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement the treatment plan for the patient with a gastroenterologic problem.
 - 5-7 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with a renal or urologic problem.
 - 5-8 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and

- implement a treatment plan for the patient with a toxic exposure.
- 5-9 At the completion of this unit, the paramedic student will be able to integrate the pathophysiological principles of the hematopoietic system to formulate a field impression and implement a treatment plan.
 - 5-10 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement the treatment plan for the patient with an environmentally induced or exacerbated medical or traumatic condition.
 - 5-11 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement a management plan for the patient with infectious and communicable diseases.
 - 5-12 At the end of this unit, the paramedic student will be able to describe and demonstrate safe, empathetic competence in caring for patients with behavioral emergencies.
 - 5-13 At the end of this unit, the paramedic student will be able to utilize gynecological principles and assessment findings to formulate a field impression and implement the management plan for the patient experiencing a gynecological emergency.
 - 5-14 At the completion of this unit, the paramedic student will be able to apply an understanding of the anatomy and physiology of the female reproductive system to the assessment and management of a patient experiencing normal or abnormal labor.
- 6 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement the treatment plan for neonatal, pediatric, and geriatric patients, diverse patients, and chronically ill patients.
- 6-1 At the completion of this lesson, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement the treatment plan for the neonatal patient.
 - 6-2 At the completion of this lesson, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement the treatment plan for the pediatric patient.
 - 6-3 At the completion of this unit, the paramedic student will be able to integrate the pathophysiological principles and the assessment findings to formulate and implement a treatment plan for the geriatric patient.
 - 6-4 At the completion of this unit, the paramedic student will be able to integrate the assessment findings to formulate a field impression and implement a treatment plan for the patient who has sustained abuse or assault.
 - 6-5 At the completion of this unit the paramedic student will be able to integrate pathophysiological and psychosocial principles to adapt the assessment and treatment plan for diverse patients and those who face physical, mental, social and financial challenges.
 - 6-6 At the completion of this unit, the paramedic student will be able to integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the acute deterioration of a chronic care patient.
- 7 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement the treatment plan for patients with common complaints.
- 7-1 At the completion of this unit, the paramedic student will be able to integrate the principles of assessment based management to perform an appropriate assessment and implement the management plan for patients with common complaints.
- 8 At the completion of this unit, the paramedic student will be able to safely manage the scene of an emergency.
- 8-1 At the completion of this unit, the paramedic will understand standards and guidelines that help ensure safe and effective ground and air medical transport.
 - 8-2 At the completion of this unit, the paramedic student will be able to integrate the principles of general incident management and multiple casualty incident (MCI) management

techniques in order to function effectively at major incidents.

- 8-3 At the completion of this unit, the paramedic student will be able to integrate the principles of rescue awareness and operations to safely rescue a patient from water, hazardous atmospheres, trenches, highways, and hazardous terrain.
- 8-4 At the completion of this unit, the paramedic student will be able to evaluate hazardous materials emergencies, call for appropriate resources, and work in the cold zone.
- 8-5 At the completion of this unit, the paramedic student will have an awareness of the human hazard of crime and violence and the safe operation at crime scenes and other emergencies.

UNIT TERMINAL OBJECTIVE

- 1-1 At the completion of this unit, the paramedic student will understand his or her roles and responsibilities within an EMS system, and how these roles and responsibilities differ from other levels of providers.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 1-1.1 Define the following terms: (C-1)
 - a. EMS Systems
 - b. Licensure
 - c. Certification
 - d. Registration
 - e. Profession
 - f. Professionalism
 - g. Health care professional
 - h. Ethics
 - i. Peer review
 - j. Medical direction
 - k. Protocols
- 1-1.2 Describe key historical events that influenced the development of national Emergency Medical Services (EMS) systems. (C-1)
- 1-1.3 Identify national groups important to the development, education, and implementation of EMS. (C-1)
- 1-1.4 Differentiate among the four nationally recognized levels of EMS training/ education, leading to licensure/ certification/ registration. (C-1)
- 1-1.5 Describe the attributes of a paramedic as a health care professional. (C-1)
- 1-1.6 Describe the recognized levels of EMS training/ education, leading to licensure/ certification in his or her state. (C-1)
- 1-1.7 Explain paramedic licensure/ certification, recertification, and reciprocity requirements in his or her state. (C-1)
- 1-1.8 Evaluate the importance of maintaining one's paramedic license/ certification. (C-3)
- 1-1.9 Describe the benefits of paramedic continuing education. (C-1)
- 1-1.10 List current state requirements for paramedic education in his/ her state. (C-1)
- 1-1.11 Discuss the role of national associations and of a national registry agency. (C-1)
- 1-1.12 Discuss current issues in his/ her state impacting EMS. (C-1)
- 1-1.13 Discuss the roles of various EMS standard setting agencies. (C-1)
- 1-1.14 Identify the standards (components) of an EMS System as defined by the National Highway Traffic Safety Administration. (C-1)
- 1-1.15 Describe how professionalism applies to the paramedic while on and off duty. (C-1)
- 1-1.16 Describe examples of professional behaviors in the following areas: integrity, empathy, self-motivation, appearance and personal hygiene, self-confidence, communications, time management, teamwork and diplomacy, respect, patient advocacy, and careful delivery of service. (C-1)
- 1-1.17 Provide examples of activities that constitute appropriate professional behavior for a paramedic. (C-2)
- 1-1.18 Describe the importance of quality EMS research to the future of EMS. (C-3)
- 1-1.19 Identify the benefits of paramedics teaching in their community. (C-1)
- 1-1.20 Describe what is meant by "citizen involvement in the EMS system." (C-1)
- 1-1.21 Analyze how the paramedic can benefit the health care system by supporting primary care to patients in the out-of-hospital setting. (C-3)
- 1-1.22 List the primary and additional responsibilities of paramedics. (C-1)

- 1-1.23 Describe the role of the EMS physician in providing medical direction. (C-1)
- 1-1.24 Describe the benefits of medical direction, both on-line and off-line. (C-1)
- 1-1.25 Describe the process for the development of local policies and protocols. (C-2)
- 1-1.26 Provide examples of local protocols. (C-1)
- 1-1.27 Discuss prehospital and out-of-hospital care as an extension of the physician. (C-1)
- 1-1.28 Describe the relationship between a physician on the scene, the paramedic on the scene, and the EMS physician providing on-line medical direction. (C-1)
- 1-1.29 Describe the components of continuous quality improvement. (C-1)
- 1-1.30 Analyze the role of continuous quality improvement with respect to continuing medical education and research. (C-3)
- 1-1.31 Define the role of the paramedic relative to the safety of the crew, the patient, and bystanders. (C-1)
- 1-1.32 Identify local health care agencies and transportation resources for patients with special needs. (C-1)
- 1-1.33 Describe the role of the paramedic in health education activities related to illness and injury prevention. (C-1)
- 1-1.34 Describe the importance and benefits of research. (C-2)
- 1-1.35 Explain the EMS provider's role in data collection. (C-1)
- 1-1.36 Explain the basic principles of research. (C-1)
- 1-1.37 Describe a process of evaluating and interpreting research. (C-3)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 1-1.38 Assess personal practices relative to the responsibility for personal safety, the safety of the crew, the patient, and bystanders. (A-3)
- 1-1.39 Serve as a role model for others relative to professionalism in EMS. (A-3)
- 1-1.40 Value the need to serve as the patient advocate inclusive of those with special needs, alternate life styles and cultural diversity. (A-3)
- 1-1.41 Defend the importance of continuing medical education and skills retention. (A-3)
- 1-1.42 Advocate the need for supporting and participating in research efforts aimed at improving EMS systems. (A-3)
- 1-1.43 Assess personal attitudes and demeanor that may distract from professionalism. (A-3)
- 1-1.44 Value the role that family dynamics plays in the total care of patients. (A-3)
- 1-1.45 Advocate the need for injury prevention, including abusive situations. (A-1)
- 1-1.46 Exhibit professional behaviors in the following areas: integrity, empathy, self-motivation, appearance and personal hygiene, self-confidence, communications, time management, teamwork and diplomacy, respect, patient advocacy, and careful delivery of service. (A-2)

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

- I. Introduction
 - A. Role of the paramedic quite different today from the “ambulance driver” of yesterday
 - B. Paramedics engage in a variety of professional activities
 - 1. Enhance their ability to provide quality service

- II. EMS system development
 - A. Pre-20th century
 - 1. Biblical
 - 2. Edwin Smith papyrus (1500 B.C.)
 - 3. Code of Hammurabi
 - 4. Jean Larrey, physician - Napoleonic Wars - ambulances volantes (1790s)
 - 5. American Civil War
 - a. Clara Barton, nurse
 - b. Coordinated service for wounded
 - 6. New York City Health Department Ambulance Service - 1869
 - B. 20th Century
 - 1. WWI and WWII developments
 - a. Battlefield ambulance corps developed
 - 2. 1950s and 1960s
 - a. Urban, hospital-based systems develop into municipal services
 - b. Rural funeral homes develop into volunteer fire and freestanding services
 - c. 1966 National Academy of Sciences - National Research Council report
 - (1) “Accidental Death and Disability: The Neglected Disease of Modern Society” (the White Paper)
 - (2) Defined 10 critical points
 - d. Highway Safety Act of 1966
 - (1) Created USDOT as a cabinet-level department
 - (2) Provided legislative authority and finance to improve EMS
 - (3) More than \$142 million between 1968 and 1979
 - (4) Early advanced life support pilot programs
 - e. Mortality comparisons - WWI to Vietnam
 - (1) Advances in field care emerged for trauma patients
 - (2) Reduced deaths from similar trauma
 - 3. 1970s
 - a. 1973 Emergency Medical Service Systems Act
 - (1) Defined 15 required components
 - (2) Regional approach, trauma focus
 - b. Regional system development 1974 - 1981
 - c. 1977 national educational standards for paramedics first developed
 - 4. 1980s-90s
 - a. Omnibus Budget Reconciliation Act of 1981
 - b. “Preventive Health and Health Services Block Grant” consolidation
 - c. National Highway Traffic Safety Administration (NHTSA) effort to sustain the DHHS effort with reduced funding and staff
 - d. NHTSA’s “10 System Elements”
 - e. Responsibility for system development, funding, etc., returned to states

- (1) Funding reduced, efforts diminish, and momentum lost
 - f. Health care reform
 - (1) Managed care, expanded scope of practice, etc.
- III. Current EMS system
 - A. Network of coordinated services that provide aid and medical care to the community
 - B. Work as a unified whole, to meet the emergency care needs of a community
 - C. Standards (components) of an EMS System
 - 1. Defined by the National Highway Traffic Safety Administration
 - a. Regulation and policy
 - b. Resource management
 - c. Human resources and training
 - d. Transportation
 - e. Facilities
 - f. Communications
 - g. Trauma systems
 - h. Public information and education
 - i. Medical direction
 - j. Evaluation
 - D. EMS system operation
 - 1. Citizen activation
 - 2. Dispatch
 - 3. Out-of-hospital care
 - 4. Hospital care
 - 5. Rehabilitation
 - E. EMS provider levels
 - 1. Dispatchers
 - 2. First Responder
 - 3. EMT-Basic
 - 4. EMT-Intermediate
 - 5. Paramedic
- IV. National EMS group involvement
 - A. Involved in the development, education, and implementation of EMS
 - 1. National organizations
 - 2. State organizations
 - 3. Regional organizations
 - 4. Local organizations
 - B. Benefits of involvement
 - 1. National associations
 - a. Information sharing
 - b. Promotes the profession
 - c. Enhances the status of the profession
 - d. Provides a means for a unified voice
 - 2. Joint Review Committee on Educational Programs for the EMT-Paramedic
 - 3. National Registry of EMTs
 - a. Contributes to the development of professional standards
 - b. Verifies competency by preparing and conducting examinations

- c. Vehicle for simplifying the process of state-to-state mobility (reciprocity)
 - d. Spreads costs of exam development, validation, across large user base
 - C. Roles of various EMS standard setting groups
 - 1. Establishes standards with input from the profession and the public
 - 2. Ensures public interest is served in standards development and implementation
 - 3. Protects the public
 - a. Prevents individuals who do not meet professional standards from licensure/ certification
 - V. Paramedic education
 - A. Initial education
 - 1. National standard curriculum
 - a. Competencies
 - b. Pre- or co-requisites
 - c. Provided minimum content for a standardized program of study
 - d. Includes cognitive, psychomotor, affective objectives
 - e. Clinical requirements
 - f. Length
 - (1) Minimum hours commitment
 - 2. Educational resources
 - a. Facilities
 - b. Instructors
 - c. Equipment
 - d. Clinical experiences
 - e. References
 - f. Texts
 - g. Other instructional materials
 - 3. Enhancement
 - a. Meets additional state or local needs
 - b. Needs to change to reflect current practice
 - B. Continuing education
 - 1. Benefits
 - a. Maintenance of core or minimal levels of knowledge
 - b. Maintenance of fundamental technical/ professional skills
 - c. Expansion of skills and knowledge
 - d. Cognizance of advances in the profession
 - VI. Licensure/ certification/ registration
 - A. Licensure
 - 1. Granting of a license to practice a profession
 - 2. A process of occupational regulation
 - 3. Permission granted by competent authority to engage in a business, profession, or activity otherwise unlawful
 - 4. Involves governmental activity
 - 5. May be required by state or local authorities to practice as a paramedic
 - B. Certification
 - 1. Grants authority to an individual who has met predetermined qualifications to participate in an activity

2. A document certifying fulfillment of requirements for practice in a field
 3. Usually refers to action of a non-governmental entity
 4. May be required by state or local authorities to practice as a paramedic
 5. Unfounded general belief that “licensed professionals” have greater status than those that are “certified” or “registered”
 6. A “certification” granted by a state, conferring a right to engage in a trade or profession, is in fact a “license”
- C. Registration
1. The act of registering
 2. To enroll one’s name in a “register” or book of record
- D. State and national certification/ recertification requirements
- VII. Professionalism
- A. Education should help produce a paramedic professional
- B. Profession
1. The existence of a specialized body of knowledge or expertise
 2. Generally, self regulating through licensure or certification verifying competence
 3. Maintains standards including initial and continuing educational requirements
- C. Professionalism
1. Professionals follow standards of conduct and performance for the profession
 2. Adherence to a code of ethics approved by the profession
- D. Health care professional
1. Conforms to the standards of health care professions
 2. Provides quality patient care
 3. Instills pride in the profession
 4. Strives for high standards
 5. Earns respect of others
 6. There are high societal expectations of professionals while on and off duty
 7. EMS personnel occupy positions of public trust
 8. Unprofessional conduct hurts the image of the profession
 9. Commitment to excellence is a daily activity
 10. Image and behavior
 - a. How you appear to others and to yourself is important
 - b. Vital to establishing credibility and instilling confidence
 - c. Highly visible role model
 - d. Paramedics represent a variety of persons
 - (1) Self
 - (2) EMS agency
 - (3) State/ county/ city/ district EMS office
 - (4) Peers
- E. Attributes of professionalism applied to the role of the paramedic
1. Integrity
 - a. Single, most important behavior
 - b. Honesty in all actions
 - c. Assumed by public in the role of a paramedic
 - d. Examples of behavior demonstrating integrity
 - (1) Tells the truth
 - (2) Does not steal

- (3) Complete and accurate documentation
- 2. Empathy
 - a. Identification with and understanding of the feelings, situations, and motives of others
 - b. Empathy must be demonstrated to patients, families, and other health care professionals
 - c. Examples of behavior demonstrating empathy
 - (1) Showing caring and compassion for others
 - (2) Demonstrating an understanding of patient and family feelings
 - (3) Demonstrating respect for others
 - (4) Exhibiting a calm, compassionate and helpful demeanor toward those in need
 - (5) Being supportive and reassuring of others
- 3. Self - motivation
 - a. Internal drive for excellence
 - b. Demonstrating self direction
 - c. Examples of behavior demonstrating motivation
 - (1) Taking initiative to complete assignments
 - (2) Taking initiative to improve and/ or correct behavior
 - (3) Taking on and following through on tasks without constant supervision
 - (4) Showing enthusiasm for learning and improvement
 - (5) Demonstrating a commitment to continuous quality improvement
 - (6) Accepting constructive feedback in a positive manner
 - (7) Taking advantage of learning opportunities
- 4. Appearance and personal hygiene
 - a. A person's manner of carrying and presenting oneself
 - b. Examples of behavior demonstrating good appearance and personal hygiene
 - (1) Clothing and uniform is neat, clean and in good repair
 - (2) Demonstrates good personal grooming
- 5. Self confidence
 - a. Trust or reliance on yourself
 - b. Having an accurate assessment of your personal and professional strengths and limitations
 - c. Examples of behavior demonstrating self confidence
 - (1) Demonstrates the ability to trust personal judgement
 - (2) Demonstrates an awareness of strengths and limitations
- 6. Communications
 - a. The exchange of thoughts, messages and information
 - b. Ability to convey information to others verbally and in writing
 - c. The ability to understand and interpret verbal and written messages
 - d. Examples of behavior demonstrating good communications
 - (1) Speaking clearly
 - (2) Writing legibly
 - (3) Listening actively
 - (4) Adjusting communication strategies to various situations
- 7. Time management
 - a. Organizing tasks to make maximum use of time
 - b. Prioritizing tasks

- c. Examples of behavior demonstrating good time management
 - (1) Is punctual
 - (2) Completes tasks and assignments on time
- 8. Teamwork and diplomacy
 - a. Teamwork is the ability to work with others to achieve a common goal
 - b. Diplomacy is tact and skill in dealing with people
 - c. Examples of behavior demonstrating teamwork and diplomacy
 - (1) Places the success of the team above self interest
 - (2) Does not undermine the team
 - (3) Helps and supports other team members
 - (4) Shows respect for all team members
 - (5) Remains flexible and open to change
 - (6) Communicates with co-workers in an effort to resolve problems
- 9. Respect
 - a. To feel and show deferential regard for others
 - b. Showing consideration and appreciation
 - c. Examples of behavior demonstrating respect
 - (1) Being polite to others
 - (2) Not using derogatory or demeaning terms
 - (3) Behavior in a manner to bring credit to yourself, your associations, and your profession
- 10. Patient advocacy
 - a. Acting in the best interest of the patient
 - b. Accepting other's right to differ
 - c. Not imposing your beliefs on others
 - d. Examples of behavior demonstrating patient advocacy
 - (1) Not allowing personal (religious, ethical, political, social, legal) biases to impact patient care
 - (2) Placing the needs of patients above own self interest
 - (3) Protecting patient confidentiality
- 11. Careful delivery of service
 - a. Delivers the highest quality of patient care with careful attention to detail
 - b. Critically evaluates performance and attitude
 - c. Examples of behavior demonstrating a careful deliver of service
 - (1) Mastering and refreshing skills
 - (2) Performing complete equipment checks
 - (3) Careful and safe ambulance operations
 - (4) Following policies, procedures, and protocols
 - (5) Following orders of superiors

- VIII. The roles and responsibilities of the paramedic
- A. Primary responsibilities
 - 1. Preparation
 - a. Physical, mental, emotional
 - (1) Positive health practices
 - b. Appropriate equipment and supplies
 - c. Adequate knowledge and skill maintenance
 - 2. Response

- a. Safety
- b. Timeliness
3. Scene assessment
 - a. Safety
 - b. Mechanism
4. Patient assessment
5. Recognition of injury or illness
 - a. Prioritization
6. Management
 - a. Following protocols
 - b. Interacting with medical direction physician, as needed
7. Appropriate disposition
 - a. Treat and transport
 - (1) Ground
 - (2) Air
 - b. Selection of the proper receiving facility
 - (1) Requires knowledge of the receiving facilities
 - (2) Hospital designation/ categorization
 - (3) Based on hospital resource capabilities with regard to optimal patient care
 - (4) Clinical capabilities and specialty availability
 - (a) Emergency department
 - (b) Operating suite
 - (c) Post-anesthesia recovery room or surgical intensive care unit
 - (d) Intensive care units for trauma patients
 - (e) Cardiac
 - (f) Neurology
 - (g) Acute hemodialysis capability
 - (h) Burn specialization
 - (i) Acute spinal cord/ head injury management capability
 - (j) Radiological special capability
 - (k) Rehabilitation
 - (l) Clinical laboratory service
 - (m) Toxicology
 - i) Hazmat/ decontamination
 - (n) Hyperbarics
 - (o) Reperfusion
 - (p) Pediatrics
 - (q) Psychiatric facilities
 - (r) Trauma centers
 - (s) High risk delivery
 - (t) Other
 - (5) Transfer agreements
 - (6) Payers and insurance systems
 - c. Treat and transfer with medical direction
 - d. Treat and refer with medical direction
8. Patient transfer
 - a. Acting as patient advocate

- b. Briefing hospital staff
 - 9. Documentation
 - a. Thorough, accurate patient care reports
 - b. Completed in timely manner
 - 10. Returning to service
 - a. Preparation of equipment and supplies
 - b. Preparing crew
 - (1) Debriefing
- B. Additional responsibilities
 - 1. Community involvement
 - a. Role modeling
 - b. Leader activities
 - c. Community activities
 - d. Prevention activities
 - e. Teaching in the community
 - (1) Helps improve health of the community
 - (a) Injury and illness prevention
 - (b) Enhances compliance with treatment regimes, etc.
 - (2) Ensures appropriate utilization of resources through public education
 - (a) When, where, how to use EMS
 - (3) Improves integration of EMS with other health care and public safety agencies
 - (a) Creates cooperative public education efforts
 - (4) Enhances visibility and positive image of EMS providers
 - 2. Supporting primary care efforts
 - a. Some systems may find it beneficial to utilize paramedics in a limited role
 - b. Can help improve the health of the community
 - c. Prevent injuries and illnesses
 - d. Enhance compliance with treatment regimes
 - e. Ensure more appropriate utilization of resources through public education
 - (1) When, where, how to use EMS, or need hospitalization
 - f. Reduce costs of overall system operation
 - (1) Ensure appropriate utilization of out-of-hospital and other non-EMS health care resources
 - (a) Less expensive transportation alternatives
 - (b) Non-hospital ED clinical providers, free standing emergency clinics, etc.
 - 3. Advocating citizen involvement in the EMS system
 - a. Improves EMS system
 - (1) Involvement in establishing needs, parameters
 - (2) Outside, objective view into quality improvement and problem resolution
 - (3) Creates informed, independent advocates for the EMS system
 - 4. Participate in leadership activities
 - a. Advocate/ conduct primary illness and injury prevention initiatives
 - b. Advocate media campaigns to promote EMS issues
 - c. Identify, develop as necessary, and distribute informational materials
 - d. Assist agency with sponsoring prevention activities
 - e. Organize formal and informal illness and injury risk surveys

- 5. Personal professional development
 - a. Explore alternative career paths
 - b. Continuing education
 - c. Mentoring
 - d. Professional organization involvement
 - e. Work-related issues impacting career growth
 - f. Conducting/ supporting research initiatives

- IX. Medical direction
 - A. Many services provided by paramedics are derived from medical practices
 - B. Paramedics operate as “physician extension”
 - C. Physicians regarded as the authorities on issues of medical care
 - D. Physicians, properly educated and motivated, are a vital component of EMS
 - E. Role of the EMS physician in providing medical direction
 - 1. Education and training of personnel
 - 2. Participation in personnel selection process
 - 3. Participation in equipment selection
 - 4. Development of clinical protocols, in cooperation with expert EMS personnel
 - 5. Participation in quality improvement and problem resolution
 - 6. Provides direct input into patient care
 - 7. Interfaces between EMS systems and other health care agencies
 - 8. Advocacy within the medical community
 - 9. Serve as the “medical conscience” of the EMS system
 - a. Advocate for quality patient care
 - 10. Types of medical direction
 - a. On-line/ direct
 - b. Off-line/ indirect
 - F. Benefits of medical direction
 - 1. On-line
 - a. Immediate and patient specific care
 - b. Telemetry
 - c. Continuous quality improvement
 - d. On-scene
 - 2. Off-line
 - a. Prospective
 - (1) Development of protocols/ standing orders, training
 - (2) Selection of equipment, supplies and personnel
 - b. Retrospective
 - (1) Patient care report review, continuous quality improvement
 - G. Interacting with a physician on the scene
 - 1. Origins of medical direction
 - 2. Use of standing orders
 - 3. Direct field supervision
 - 4. The non affiliated on-scene physician

- X. Improving system quality
 - A. Develop a system for continually evaluating and improving care
 - 1. Continuous quality improvement (CQI)

- a. Focus on the system and not an individual
- b. Fix system problems in areas such as
 - (1) Medical direction
 - (2) Financing
 - (3) Training
 - (4) Communication
 - (5) Prehospital treatment and transport
 - (6) Inter-facility transport
 - (7) Receiving facilities
 - (8) Specialty care units
 - (9) Dispatch
 - (10) Public information and education
 - (11) Audit and quality assurance
 - (12) Disaster planning
 - (13) Mutual aid
- 2. Dynamic process
 - a. Delineate system-wide problems identified
 - b. Elaborate on the cause(s) of the problem
 - c. Aid the problem and develop remedy(ies)
 - d. Lay out plan to correct the problem
 - e. Enforce the plan of correction
 - f. Reexamine the problem
- 3. Appropriate EMS research can help enhance quality improvement efforts

XI. EMS research

- A. Benefits of research
 - 1. Quality EMS research is beneficial to the future of EMS
 - a. Changes in professional standards, training, equipment, procedures
 - b. Based on empirical data, rather than “great ideas” or “new gadget” models
 - 2. EMS funding dependent on scientifically proving the value of EMS services
 - a. Anecdotes will not suffice
 - b. Reduced spending by managed care and governmental bodies
 - c. Outcome studies are needed to assure the continued funding for EMS
 - 3. Enhances recognition and respect for EMS professionals
- B. Basic principles
 - 1. Peer review and publication of research
 - 2. Finding research
 - 3. Types of research
 - a. Descriptive
 - b. Experimental
 - c. Prospective
 - d. Retrospective
 - e. Cross sectional
 - 4. Population
 - 5. Randomization and control
 - a. Sample
 - (1) Systematic sampling
 - (2) Alternative time sampling

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- (3) Convenience sampling
 - b. Sampling error
 - c. Selection bias
 - 6. Parameter
 - a. Nuisance variables
 - 7. Blinding
 - a. Unblinded
 - b. Single blinded
 - c. Double blinded
 - d. Triple blinded
 - 8. Basic statistics
 - a. Descriptive
 - (1) Qualitative
 - (2) Quantitative
 - (a) Mean
 - (b) Median
 - (c) Mode
 - (d) Standard deviation
 - b. Inferential
 - (1) Null hypothesis
 - (2) Research hypothesis
 - 9. Research ethics
 - a. Consent
 - 10. Research format
 - a. Introduction
 - b. Methods
 - c. Results
 - d. Discussion
 - e. Conclusion
 - C. Conducting research
 - 1. Prepare a question
 - 2. Write a hypothesis
 - 3. Decide what to measure and the best method to measure it
 - 4. Define the population
 - 5. Identify study limitations
 - 6. Seek study approval
 - 7. Obtain informed consent
 - 8. Gather data
 - a. Conduct pilot trials first
 - 9. Analyze the data
 - a. Understand the pitfalls of interpreting data
 - 10. Determine what to do with the research product
 - a. Publish
 - b. Present
 - c. Follow-up studies
 - D. Examples of research
 - 1. Conclusions based on scientifically sound procedures, techniques, and equipment
 - 2. Answering a clinically important question

- 3. Results leading to system improvements
- E. EMS providers role in data collection
- F. Evaluating and interpreting research
 - 1. Was the research peer reviewed?
 - 2. What was the research hypothesis?
 - 3. Was the study approved by an institutional review board and conducted ethically?
 - 4. What was the population being studied?
 - 5. What were the entry/ exclusion criteria for the study?
 - 6. What method was used to draw a sample of patients?
 - 7. How many groups were the patients divided into?
 - 8. How were patients assigned into the groups?
 - 9. What type of data were gathered?
 - 10. Does it appear that the study had enough patients enrolled?
 - 11. Do there appear to be any potential confounding variables that are not accounted for?
 - 12. Were the data properly analyzed?
 - 13. Is the author's conclusion logical based on the data?
 - 14. Does it apply in local EMS systems?
 - 15. Are patients in the study similar to those in the local EMS system?

REFERENCES

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UNIT TERMINAL OBJECTIVE

- 1-2 At the completion of this unit, the paramedic student will understand and value the importance of personal wellness in EMS and serve as a healthy role model for peers.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 1-2.1 Discuss the concept of wellness and its benefits. (C-1)
- 1-2.2 Define the components of wellness. (C-1)
- 1-2.3 Describe the role of the paramedic in promoting wellness. (C-1)
- 1-2.4 Discuss the components of wellness associated with proper nutrition. (C-1)
- 1-2.5 List principles of weight control. (C-1)
- 1-2.6 Discuss how cardiovascular endurance, muscle strength, and flexibility contribute to physical fitness. (C-2)
- 1-2.7 Describe the impact of shift work on circadian rhythms. (C-1)
- 1-2.8 Discuss how periodic risk assessments and knowledge of warning signs contribute to cancer and cardiovascular disease prevention. (C-1)
- 1-2.9 Differentiate proper from improper body mechanics for lifting and moving patients in emergency and non-emergency situations. (C-3)
- 1-2.10 Describe the problems that a paramedic might encounter in a hostile situation and the techniques used to manage the situation. (C-1)
- 1-2.11 Given a scenario involving arrival at the scene of a motor vehicle collision, assess the safety of the scene and propose ways to make the scene safer. (C-3)
- 1-2.12 List factors that contribute to safe vehicle operations. (C-1)
- 1-2.13 Describe the considerations that should be given to: (C-1)
 - a. Using escorts
 - b. Adverse environmental conditions
 - c. Using lights and siren
 - d. Proceeding through intersections
 - e. Parking at an emergency scene
- 1-2.14 Discuss the concept of "due regard for the safety of all others" while operating an emergency vehicle. (C-1)
- 1-2.15 Describe the equipment available for self-protection when confronted with a variety of adverse situations. (C-1)
- 1-2.16 Describe the benefits and methods of smoking cessation. (C-1)
- 1-2.17 Describe the three phases of the stress response. (C-1)
- 1-2.18 List factors that trigger the stress response. (C-1)
- 1-2.19 Differentiate between normal/ healthy and detrimental reactions to anxiety and stress. (C-3)
- 1-2.20 Describe the common physiological and psychological effects of stress. (C-1)
- 1-2.21 Identify causes of stress in EMS. (C-1)
- 1-2.22 Describe behavior that is a manifestation of stress in patients and those close to them and how these relate to paramedic stress. (C-1)
- 1-2.23 Identify and describe the defense mechanisms and management techniques commonly used to deal with stress. (C-1)
- 1-2.24 Describe the components of critical incident stress management (CISM). (C-1)
- 1-2.25 Provide examples of situations in which CISM would likely be beneficial to paramedics. (C-1)
- 1-2.26 Given a scenario involving a stressful situation, formulate a strategy to help cope with the stress. (C-3)
- 1-2.27 Describe the stages of the grieving process (Kubler-Ross). (C-1)
- 1-2.28 Describe the needs of the paramedic when dealing with death and dying. (C-1)
- 1-2.29 Describe the unique challenges for paramedics in dealing with the needs of children and other special populations related to their understanding or experience of death and dying. (C-1)

- 1-2.30 Discuss the importance of universal precautions and body substance isolation practices. (C-1)
- 1-2.31 Describe the steps to take for personal protection from airborne and bloodborne pathogens. (C-1)
- 1-2.32 Given a scenario in which equipment and supplies have been exposed to body substances, plan for the proper cleaning, disinfection, and disposal of the items. (C-3)
- 1-2.33 Explain what is meant by an exposure and describe principles for management. (C-1)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 1-2.34 Advocate the benefits of working toward the goal of total personal wellness. (A-2)
- 1-2.35 Serve as a role model for other EMS providers in regard to a total wellness lifestyle. (A-3)
- 1-2.36 Value the need to assess his/ her own lifestyle. (A-2)
- 1-2.37 Challenge his/ herself to each wellness concept in his/ her role as a paramedic. (A-3)
- 1-2.38 Defend the need to treat each patient as an individual, with respect and dignity. (A-2)
- 1-2.39 Assess his/ her own prejudices related to the various aspects of cultural diversity. (A-3)
- 1-2.40 Improve personal physical well-being through achieving and maintaining proper body weight, regular exercise and proper nutrition. (A-3)
- 1-2.41 Promote and practice stress management techniques. (A-3)
- 1-2.42 Defend the need to respect the emotional needs of dying patients and their families. (A-3)
- 1-2.43 Advocate and practice the use of personal safety precautions in all scene situations. (A-3)
- 1-2.44 Advocate and serve as a role model for other EMS providers relative to body substance isolation practices. (A-3)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 1-2.45 Demonstrate safe methods for lifting and moving patients in emergency and non-emergency situations. (P-2)
- 1-2.46 Demonstrate the proper procedures to take for personal protection from disease. (P-2)

DECLARATIVE

- I. Introduction
 - A. Wellness has three components
 - 1. Physical well-being
 - 2. Mental and emotional well-being
 - B. Implementing lifestyle changes can enhance personal wellness
 - C. Enhancing personal wellness can serve as a role model/ coach for others

- II. Wellness components
 - A. Physical well-being
 - 1. Nutrition
 - a. Nutrients
 - (1) Carbohydrates
 - (2) Fats
 - (3) Proteins
 - (4) Vitamins
 - (5) Minerals
 - (6) Water
 - b. Food groups
 - (1) Sugar
 - (2) Fats
 - (3) Proteins
 - (4) Dairy products
 - (5) Vegetables
 - (6) Fruits
 - (7) Grains
 - c. Principles of weight control
 - (1) Eat in moderation
 - (2) Limit fat consumption
 - (3) Exercise
 - d. Tips to change behavior
 - (1) Realistic goal
 - (2) Commitment to change
 - (3) Exercise
 - (4) Healthy eating
 - (5) Analyzing progress
 - 2. Physical fitness
 - a. Benefits
 - (1) Decrease in resting heart rate and blood pressure
 - (2) Increase oxygen carrying capacity
 - (3) Enhanced quality of life
 - (4) Increase muscle mass and metabolism
 - (5) Increased resistance to injury
 - (6) Improved personal appearance and self image
 - (7) Facilitate maintenance of motor skills throughout life
 - b. Cardiovascular endurance
 - (1) Fitness assessment

- (2) Heart rate target zone
 - c. Muscular strength
 - (1) Strength & endurance assessment
 - (2) Principles of training
 - (a) Isometric versus isotonic
 - (b) Resistance
 - (c) Sets
 - (d) Frequency
 - d. Muscular flexibility
 - (1) Flexibility assessment
 - (2) Principles of muscular flexibility
 - (a) Intensity of exercise
 - (b) Repetitions
 - (c) Frequency
 - (3) Prevention and rehabilitation of low back pain
3. Sleep
- a. Sleep deprivation
 - b. Disruption of circadian timing system
4. Disease prevention
- a. Cardiovascular disease
 - (1) Cardiovascular endurance
 - (2) Blood pressure
 - (3) Body composition
 - (4) Total cholesterol/ HDL ratio
 - (5) Triglycerides
 - (6) Estrogen use
 - (7) Stress
 - (8) Periodic risk assessment
 - b. Cancer
 - (1) Dietary changes
 - (2) Sun exposure
 - (3) Regular examinations
 - (4) Warning signs
 - (5) Periodic risk assessment
 - c. Infectious disease
 - (1) Hygiene
 - (2) Utilize engineering and work practices
 - (3) Report exposure promptly
 - (4) Periodic risk assessment
5. Injury prevention
- a. Body mechanics during lifting and moving
 - (1) Only move a patient you can safely handle
 - (2) Look where you're walking/ crawling
 - (3) Move forward rather than backward when possible
 - (4) Take short steps, if walking
 - (5) Bend at hips and knees
 - (6) Lift with legs, not back
 - (7) Keep load close to body

- (8) Keep patient's body in-line when moving
 - b. Hostile environments
 - (1) Avoidance
 - (2) Management
 - c. Rescue situations
 - (1) Use protective gear
 - (2) Appropriate training
 - (3) Safe rescue practices
 - d. Safe vehicle operation
 - (1) Factors in safe driving
 - (2) Using escorts
 - (3) Adverse environmental conditions
 - (4) Using lights and sirens
 - (5) Proceeding through intersections
 - (6) Parking at an emergency scene
 - (7) "Due regard for the safety of all others"
 - e. Safety equipment and supplies
 - (1) Body substance isolation equipment
 - (2) Head protection
 - (3) Eye protection
 - (4) Hearing protection
 - (5) Respiratory protection
 - (6) Gloves
 - (7) Boots
 - (8) Coveralls
 - (9) Turnout coat/ pants
 - (10) Specialty equipment
- B. Mental and emotional health
 - 1. Substance misuse/ abuse control
 - a. Addiction
 - (1) Addictive behaviors
 - (2) Methods of management
 - b. Smoking cessation
 - (1) Health ramifications of smoking
 - (2) Why people smoke
 - (3) Techniques
 - 2. Anxiety and stress
 - a. Stress results from the interaction of events (environmental stimuli) and the adjustive capabilities of the individual
 - (1) Usually seen as generating negative affect (fear, depression, guilt, etc.)
 - (2) Also experienced with positive events
 - b. Anxiety is uneasiness or dread about future uncertainties
 - c. Eustress is "good stress"--response to positive stimuli
 - d. Distress is "bad stress"--a negative response to an environmental stimulus
 - 3. Personal time/ meditation/ contemplation
 - 4. Family, peer, community connections
 - 5. Freedom from prejudice
 - a. Acceptance of cultural differences

- (1) Learn about other cultures
- (2) Recognize most variations among cultures as positive
- (3) Affirm the value of differences
- b. Acceptance of individual differences
 - (1) Recognize existence of differences
 - (2) Listen until you can tell the other person's story
 - (3) Work toward win-win solution

III. Stress

- A. Three phases of the stress response
 - 1. Alarm reaction
 - a. Fight or flight phenomenon
 - b. Considered to be positive; takes only seconds
 - c. Prepares individual for action/ self-defense
 - d. Mediated by the autonomic nervous system, coordinated by hypothalamus
 - e. Pituitary gland releases adrenocorticotrophic (stress) hormones
 - f. Stimulates glucose production
 - g. Sympathetic response
 - (1) Adrenal gland releases epinephrine and norepinephrine
 - h. Physiological response
 - (1) Increased heart rate
 - (2) Increased blood pressure
 - (3) Dilated pupils
 - (4) Relaxation of bronchial tree
 - (5) Increased blood sugar
 - (6) Slowed digestion
 - i. The reaction ends when the body realizes the event is not dangerous
 - 2. Resistance
 - a. Increased level of resistance to stressor
 - b. Reaction to stressor may change with time
 - 3. Exhaustion
 - a. As stress continues, coping mechanisms are exhausted
 - b. Adaptive resources utilized
 - c. Resistance to all stressors declines
 - d. Increased susceptibility to physical and psychological ailments
 - e. Rest and recovery are needed
- B. Factors that trigger the stress response
 - 1. Loss of something that is of value to the individual
 - 2. Injury or threat of injury to the body
 - 3. Poor health, nutrition
 - 4. Frustration of drives
 - 5. Ineffective coping
- C. Physiological and psychological effects of stress
 - 1. Normal/ healthy responses to stress
 - 2. Detrimental/ unhealthy responses to stress
 - 3. Signs and symptoms of stress
 - a. Physical
 - (1) Chest tightness/ pain, heart palpitations, cardiac rhythm disturbances

- (2) Difficult/ rapid breathing
- (3) Nausea, vomiting
- (4) Profuse sweating, flushed skin, diaphoresis
- (5) Sleep disturbances
- (6) Aching muscles and joints
- (7) Headache
- b. Emotional
 - (1) Panic reactions
 - (2) Fear
 - (3) Anger
 - (4) Denial
 - (5) Feeling overwhelmed
- c. Cognitive
 - (1) Difficulty making decisions
 - (2) Disorientation, decreased level of awareness
 - (3) Memory problems, poor concentration
 - (4) Distressing dreams
- d. Behavioral
 - (1) Crying spells
 - (2) Hyperactivity
 - (3) Withdrawal
 - (4) Changes in eating habits
 - (5) Increased smoking
 - (6) Increased alcohol consumption
- D. Causes of stress in EMS
 - 1. Environmental stress
 - a. Siren noise
 - b. Inclement weather
 - c. Confined work spaces
 - d. Rapid scene response
 - e. Life and death decision making
 - 2. Psychosocial stress
 - a. Family relationships
 - b. Conflicts with supervisors, coworkers
 - c. Abusive patients
 - 3. Personality stress
 - a. Need to be liked
 - b. Personal expectations
 - c. Feelings of guilt and anxiety
- E. Reactions to stress
 - 1. Reactions are individual and affected by
 - a. Previous exposure to the stressor
 - b. Perception of the event
 - c. Experience
 - d. Personal coping skills
 - 2. Adaptation
 - a. Dynamic evolving process
 - b. Defense

- (1) Adaptive function of personality
 - (2) Assists in adjusting to stressful situations that confront us
 - (3) Help to avoid dealing with problems, through denial or distortion
 - c. Coping
 - (1) Active, confronting process
 - (2) Information gathered/ used to change or adjust to a new situation
 - d. Problem solving
 - (1) Viewed as a healthy approach to everyday concerns
 - (2) Involves
 - (a) Problem analysis
 - (b) Generation of options for action
 - (c) Determination of course of action
 - e. Mastery
 - (1) Ability to see multiple options/ potential solutions for challenging situations
 - (2) Results from extensive experience with similar situations
- F. Stress management techniques
 - 1. Reframing
 - 2. Controlled breathing
 - 3. Progressive relaxation
 - 4. Guided imagery
- G. Critical incident stress management (CISM)
 - 1. Organized, formal, peer and mental health support network and process
 - a. Enables emergency personnel to vent feelings
 - b. Facilitates understanding of stressful situations
 - 2. Components of CISM
 - a. Pre-incident stress training
 - b. On-scene support to distressed personnel
 - c. Individual consults
 - d. Defusing services immediately after a large scale incident
 - e. Mobilization services after large scale incident
 - f. Critical incident stress debriefing 24 to 72 hours after an event
 - g. Follow-up services
 - h. Specialty debriefings to non-emergency groups in the community
 - i. Support during routine discussions of an incident
 - j. Advice to command staff during large scale incident
 - 3. Situations in which CISM should be considered
 - a. Line of duty injury or death
 - b. Disaster
 - c. Emergency worker suicide
 - d. Infant/ child death
 - e. Extreme threat to emergency worker
 - f. Prolonged incident which ends in loss or success
 - g. Victims known to operations personnel
 - h. Death/ injury of civilian caused by operations
 - i. Other significant event
 - 4. Techniques for reducing crisis-induced stress
 - a. Rest
 - b. Replace food and fluids

- c. Limiting exposure to incident
 - d. Change assignments
 - e. Provide post event defusing/ debriefing
- IV. Dealing with death, dying, grief and loss
- A. Patient and family needs
 - 1. Stages of the grieving process (Kubler-Ross)
 - a. Denial
 - (1) Inability/ refusal to believe the reality of the event
 - (2) Defense mechanism
 - b. Anger
 - (1) Frustration related to inability to control situation
 - (2) May focus on anyone or anything
 - c. Bargaining
 - (1) Attempt to "buy additional time"
 - (2) Make deals to put off or change expected outcome
 - d. Depression
 - (1) Sadness and despair
 - (2) Withdraw/ retreat
 - e. Acceptance
 - (1) Realization of fate
 - (2) Reasonable level of comfort with anticipated outcome
 - B. Common needs of the paramedic when dealing with death and dying
 - 1. Support from friends and family following the incident
 - 2. Opportunity to process specific incident
 - 3. Opportunities to process cumulative stress
 - C. Developmental considerations when dealing with death and dying
 - 1. Newborn to age three
 - a. Children will sense that something has happened in the family
 - b. Children will realize that people are crying and are sad all the time
 - c. Children will realize that there is much activity in their household
 - d. Watch for changes in
 - (1) Eating or sleeping patterns
 - (2) Irritability
 - e. Suggestions
 - (1) Be sensitive to the child's needs
 - (2) Try to maintain consistency in routines
 - (3) Maintain consistency with significant people in the child's life
 - 2. Three to six years of age
 - a. Child does not have concept of the finality of death
 - b. Believes that the person will return and will continually ask when the person will return
 - c. Believes in magical thinking (child may feel he was responsible for the death)
 - d. Child may believe that everyone else he loves will die also
 - e. Watch for changes in
 - (1) Behavior patterns with friends and at school
 - (2) Difficulty sleeping
 - (3) Changes in eating habits

- f. Suggestions
 - (1) Emphasize to the child that he was not responsible for the death
 - (2) Reinforce that when people are sad they cry; crying is normal and natural
 - (3) Encourage the child to draw pictures of his feelings, or talk about his feelings
 - 3. Six to nine years of age
 - a. Beginning to understand the finality of death
 - b. Will seek out detailed explanations for the death; differentiate fatal illness from "just being sick"
 - c. Will be afraid other significant people in their lives will die as well
 - d. Be uncomfortable in expressing feelings; may act silly or embarrassed when talking about death
 - e. Suggest
 - (1) Talk about the normal feelings of anger, sadness and guilt
 - (2) Share your own feelings about death; do not be afraid to cry in front of the child - this gives the child permission to express their feelings
 - 4. Nine to twelve years of age
 - a. Aware of the finality of death
 - b. Concerned with practical matters concerning the child's lifestyle
 - c. May want to know all the details surrounding the death
 - d. May try to "act like an adult", but then show regression to an earlier stage of emotional response
 - e. Suggestions
 - (1) Set aside time to talk about feelings
 - (2) Encourage sharing of memories to facilitate grief response
 - 5. Elderly
 - a. Concern about other family members
 - b. Concern about further loss of independence
 - c. Concern about cost
- V. Preventing disease transmission
- A. Terminology
 - 1. Air/ blood borne pathogens
 - 2. Exposure
 - a. Contact with a potentially infectious body fluid substance
 - b. Contact with other infectious agent
 - 3. Cleaning, disinfection, sterilization
 - 4. Body substance isolation, universal precautions
 - a. Practices designed to prevent contact with body substances
 - b. Practices designed to reduce contact with other agents
 - B. Common sources of exposure
 - 1. Needle stick
 - 2. Broken or scraped skin
 - 3. Mucous membranes of the eyes, nose or mouth
 - C. Protection from air/ blood borne pathogens
 - 1. Follow engineering and work practices
 - a. Puncture resistant containers
 - b. Laundry

- c. Labeling
- 2. Maintain good personal health and hygiene habits
 - a. Hand washing
 - b. General cleanliness
- 3. Maintain immunizations
 - a. Tetanus
 - b. Polio
 - c. Hepatitis B
 - d. MMR (measles, mumps and rubella)
 - e. Influenza
- 4. Periodic tuberculosis screening
- 5. Body substance isolation/ universal precautions
 - a. Gloves
 - b. Mask, gown, eye wear
 - c. Other equipment
- 6. Cleaning, disinfecting, and disposing of used materials/ equipment
- D. Periodic risk assessment
- E. Documenting and managing an exposure
 - 1. Wash the area of contact thoroughly and immediately
 - 2. Document the situation in which the exposure occurred
 - 3. Describe actions taken to reduce chances of infection
 - 4. Comply with all required reporting responsibilities and time frames
 - 5. Cooperate with incident investigation
 - 6. Check tuberculosis/ other screening for exposure
 - 7. Proper immunization boosters
 - 8. Complete medical follow-up

UNIT TERMINAL OBJECTIVE

- 1-3 At the completion of this unit, the paramedic student will be able to integrate the implementation of primary injury prevention activities as an effective way to reduce death, disabilities and health care costs.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 1.3-1 Describe the incidence, morbidity and mortality of unintentional and alleged unintentional events. (C-1)
- 1.3-2 Identify the human, environmental, and socioeconomic impact of unintentional and alleged unintentional events. (C-1)
- 1.3-3 Identify health hazards and potential crime areas within the community. (C-1)
- 1.3-4 Identify local municipal and community resources available for physical, socioeconomic crises. (C-1)
- 1.3-5 List the general and specific environmental parameters that should be inspected to assess a patient's need for preventative information and direction. (C-1)
- 1.3-6 Identify the role of EMS in local municipal and community prevention programs. (C-1)
- 1.3-7 Identify the local prevention programs that promote safety for all age populations. (C-2)
- 1.3-8 Identify patient situations where the paramedic can intervene in a preventative manner. (C-1)
- 1.3-9 Document primary and secondary injury prevention data. (C-1)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 1.3-10 Value and defend tenets of prevention in terms of personal safety and wellness. (A-3)
- 1.3-11 Value and defend tenets of prevention for patients and communities being served. (A-3)
- 1.3-12 Value the contribution of effective documentation as one justification for funding of prevention programs. (A-3)
- 1.3-13 Value personal commitment to success of prevention programs. (A-3)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 1.3-14 Demonstrate the use of protective equipment appropriate to the environment and scene. (P-3)

DECLARATIVE

- I. Epidemiology
 - A. Incidence, morbidity, mortality
 - 1. Injury surpassed stroke as third leading cause of death
 - 2. Estimated lifetime cost of injuries >\$114 billion
 - 3. Estimated 19 hospitalizations and 254 emergency department visits for each injury death
 - B. Effects of early release from hospital on EMS services
 - 1. Implications are increased access on EMS services for supportive care and intervention
 - C. Related terminology
 - 1. Injury
 - a. Defined as intentional or unintentional damage to the person resulting from acute exposure to thermal, mechanical, electrical or chemical energy or from the absence of such essentials as heat or oxygen
 - 2. Injury risk
 - a. Defined as real or potential hazardous situations that put individuals at risk for sustaining an injury
 - 3. Injury surveillance
 - a. Defined as ongoing systematic collection, analysis and interpretation of injury data essential to the planning, implementation and evaluation of public health practice, closely integrated with the timely dissemination of these data to those who need to know
 - b. The final link in the surveillance chain is the application of these data to prevention and control
 - 4. Primary injury prevention
 - a. Defined as keeping an injury from ever occurring
 - 5. Secondary and tertiary prevention
 - a. Defined as care and rehabilitation activities (respectively) that are preventing further problems from an event that has already occurred
 - 6. Teachable moment
 - a. Defined as the time after an injury has occurred when the patient and observers remain acutely aware of what has happened and may be more receptive to teaching about how the event or illness could be prevented
 - 7. Years of productive life
 - a. Defined as the calculation by subtracting age of death from 65
- II. Feasibility of EMS involvement
 - A. EMS providers are widely distributed amid the population
 - B. EMS providers often reflect the composition of the community
 - C. In a rural setting, the EMS provider may be the most medically educated individual
 - D. More than 600,000 EMS providers in the United States
 - E. EMS providers are high-profile role models
 - F. EMS providers are often considered as champion of the health care consumer
 - G. EMS providers are welcome in schools and other environments
 - H. EMS providers are considered authorities on injury and prevention
- III. Essential leadership activities
 - A. Protection of individual EMS providers from injury

1. Policies promoting response, scene and transport safety
 2. Appropriate equipment to providers for eye, back, skin safety
 3. Appropriate equipment to providers for prevention from communicable and chemical exposure
 4. Implementation of safety program
 5. Establish a wellness program for EMS providers
 - B. Provide education to EMS providers
 1. Fundamentals of primary injury prevention
 2. Incorporation into EMS primary and continuing education programs
 3. Establish liaison with public and private sector specialty groups for specific education and training
 - C. Support and promote collection and use of injury data
 1. Develop policies that promote documentation of injuries by EMS providers
 2. Modify data collection tools so prompt recording of data is feasible and realistic
 3. Contribute to local, statewide and national surveillance systems
 - D. Obtain support and resources for primary injury prevention activities
 1. Establish internal budgetary support
 2. Seek financial resource to sponsor injury prevention programs
 - a. "In-kind" services
 - b. Fees and equipment
 - c. Publicity
 - d. Network with other injury prevention organizations
 - e. Initiate and attend meetings of local organizations involved or requesting involvement in injury prevention
 - E. Empower individual EMS providers to conduct primary injury prevention activities
 1. Identify and encourage interest and support
 2. Establish internal budgetary support, where possible
 - a. Provide rotational assignment to prevention programs
 - b. Provide salary for off-duty injury prevention activities
 - c. Reward and/ or remunerate participation
- IV. Essential provider activities
- A. Education
 1. Implementation of primary personal injury prevention strategies
 - a. Wellness
 - (1) Exercise and conditioning
 - (2) Management of stress
 - (a) Personal
 - (b) Family
 - (c) Work environment
 - b. Safe driving
 - (1) Fundamental driving techniques
 - (2) Restraints
 - (a) Self
 - (b) Patient
 - (c) Riders
 - (3) Use of personal protective equipment
 - (a) Reflective clothing

- (b) Helmets
 - (4) Use of lights, sirens
 - (5) Approach to, parking at and leaving the scene
 - (6) Driving without drinking
 - c. Scene safety precautions
 - (1) Availability and use of law enforcement
 - (2) Traffic control
 - (a) Vehicles
 - (b) Bystanders
 - d. Lifting and moving techniques
 - e. Recognition of health hazards and potential high profile crime areas
 - f. Practice on-scene survival techniques
 - g. Use on-scene survival resources
 - 2. Review the maladies and injuries common to
 - a. Infancy
 - (1) Low birth weight
 - (2) Mortality and morbidity
 - b. Childhood
 - (1) Intentional events
 - (2) Unintentional events
 - (3) Alleged unintentional events
 - c. Childhood violence
 - (1) To self
 - (2) To others
 - d. Adult
 - e. Geriatrics
 - f. Recreation
 - g. Work hazards
 - h. Day care center
 - (1) Licensed
 - (2) Non-licensed
 - i. Early release from hospital
 - j. Discharge from urgent care, or other out-patient facilities
 - k. Signs of emotional stress that may lead to intentional and unintentional and alleged unintentional events
 - l. Self medication
 - (1) Dangers of non-compliance
 - (a) Borrowing
 - (b) Taking medications on time and finishing the regimen
 - (2) Storage
 - (3) Over-medication
- V. Implementation of prevention strategies
 - A. Preservation of safety of the response team
 - 1. As in IV A. 1, 2 above
 - B. Patient care considerations
 - 1. Recognize signs/ symptoms of suspected abuse
 - a. Recognition of abusive situations
-

- b. Resolving conflict without violence
- C. Recognize signs/ symptoms of exposure to
 1. Hazardous materials
 2. Temperature extremes
 3. Vector
 4. Communicable disease
 5. Assault, battery
 6. Structural risks
- D. Recognizing need for outside resource
 - a. Municipal
 - b. Community
 - c. Religious
- E. Documentation
 1. Record primary care
 2. Record primary injury data
 - a. Scene conditions
 - b. Mechanism of injury
 - c. Use of protective devices
 - d. Absence of protective devices
 - e. Risks overcome
 - f. Other as noted by the EMS agency
- F. On-scene education
 1. Recognize/ sense possible recurrence
 2. Effective communications
 - a. Recognizing the teachable moment
 - b. Non-judgmental
 - c. Objective
 - d. Sense of timing
 - e. Consideration of ethnic, religious and social diversity considerations
 3. Informing individuals how they can prevent recurrence
 4. Informing individuals on use of protective devices
- G. Resources identified for
 1. Devices
 2. Child protective services
 3. Sexual abuse
 4. Spousal abuse
 5. Elder abuse
 6. Food, shelter, clothing
 7. Employment
 8. Counseling
 9. Alternative health care
 - a. Free clinic
 10. Alternative means of transportation
 11. After-care services
 12. Rehabilitation
 13. Grief support
 14. Immunization programs
 15. Vector control

16. Disabled
17. Day care
18. Alternative modes of education
19. Work-study programs
20. Mental health resources and counseling

VI. Participation in prevention programs

A. Education and training

1. Population served
 - a. Ethnic
 - b. Cultural
 - c. Religious
 - d. Language
 - e. Learning disabled
 - f. Physically challenged

REFERENCES

Centers for Disease Control, 1991

Consensus Statement on the role of Emergency Medical Services in Primary Injury Prevention, February 1996

UNIT TERMINAL OBJECTIVE

- 1-4 At the completion of this unit, the paramedic student will understand the legal issues that impact decisions made in the out-of-hospital environment.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 1-4.1 Differentiate between legal and ethical responsibilities. (C-2)
- 1-4.2 Describe the basic structure of the legal system in the United States. (C-1)
- 1-4.3 Differentiate between civil and criminal law as it pertains to the paramedic. (C-1)
- 1-4.4 Identify and explain the importance of laws pertinent to the paramedic. (C-1)
- 1-4.5 Differentiate between licensure and certification as they apply to the paramedic. (C-1)
- 1-4.6 List the specific problems or conditions encountered while providing care that a paramedic is required to report, and identify in each instance to whom the report is to be made. (C-1)
- 1-4.7 Define the following terms: (C-1)
 - a. Abandonment
 - b. Advance directives
 - c. Assault
 - d. Battery
 - e. Breach of duty
 - f. Confidentiality
 - g. Consent (expressed, implied, informed, involuntary)
 - h. Do not resuscitate (DNR) orders
 - i. Duty to act
 - j. Emancipated minor
 - k. False imprisonment
 - l. Immunity
 - m. Liability
 - n. Libel
 - o. Minor
 - p. Negligence
 - q. Proximate cause
 - r. Scope of practice
 - s. Slander
 - t. Standard of care
 - u. Tort
- 1-4.8 Differentiate between the scope of practice and the standard of care for paramedic practice. (C-3)
- 1-4.9 Discuss the concept of medical direction, including off-line medical direction and on-line medical direction, and its relationship to the standard of care of a paramedic. (C-1)
- 1-4.10 Describe the four elements that must be present in order to prove negligence. (C-1)
- 1-4.11 Given a scenario in which a patient is injured while a paramedic is providing care, determine whether the four components of negligence are present. (C-2)
- 1-4.12 Given a scenario, demonstrate patient care behaviors that would protect the paramedic from claims of negligence. (C-3)
- 1-4.13 Explain the concept of liability as it might apply to paramedic practice, including physicians providing medical direction and paramedic supervision of other care providers. (C-2)
- 1-4.14 Discuss the legal concept of immunity, including Good Samaritan statutes and governmental immunity, as it applies to the paramedic. (C-1)

- 1-4.15 Explain the importance and necessity of patient confidentiality and the standards for maintaining patient confidentiality that apply to the paramedic. (C-1)
- 1-4.16 Differentiate among expressed, informed, implied, and involuntary consent. (C-2)
- 1-4.17 Given a scenario in which a paramedic is presented with a conscious patient in need of care, describe the process used to obtain consent. (C-2)
- 1-4.18 Identify the steps to take if a patient refuses care. (C-1)
- 1-4.19 Given a scenario, demonstrate appropriate patient management and care techniques in a refusal of care situation. (C-3)
- 1-4.20 Describe what constitutes abandonment. (C-1)
- 1-4.21 Identify the legal issues involved in the decision not to transport a patient, or to reduce the level of care being provided during transportation. (C-1)
- 1-4.22 Describe how hospitals are selected to receive patients based on patient need and hospital capability and the role of the paramedic in such selection. (C-1)
- 1-4.23 Differentiate between assault and battery and describe how to avoid each. (C-2)
- 1-4.24 Describe the conditions under which the use of force, including restraint, is acceptable. (C-1)
- 1-4.25 Explain the purpose of advance directives relative to patient care and how the paramedic should care for a patient who is covered by an advance directive. (C-1)
- 1-4.26 Discuss the responsibilities of the paramedic relative to resuscitation efforts for patients who are potential organ donors. (C-1)
- 1-4.27 Describe the actions that the paramedic should take to preserve evidence at a crime or accident scene. (C-1)
- 1-4.28 Describe the importance of providing accurate documentation (oral and written) in substantiating an incident. (C-1)
- 1-4.29 Describe the characteristics of a patient care report required to make it an effective legal document. (C-1)
- 1-4.30 Given a scenario, prepare a patient care report, including an appropriately detailed narrative. (C-2)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 1-4.31 Advocate the need to show respect for the rights and feelings of patients. (A-3)
- 1-4.32 Assess his/ her personal commitment to protecting patient confidentiality. (A-3)
- 1-4.33 Given a scenario involving a new employee, explain the importance of obtaining consent for adults and minors. (A-2)
- 1-4.34 Defend personal beliefs about withholding or stopping patient care. (A-3)
- 1-4.35 Defend the value of advance medical directives. (A-3)

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

- I. Introduction
 - A. Legal duties and ethical responsibilities
 - 1. Legal duties are to the patient, medical director, and public
 - a. Set by statutes and regulations
 - b. Based on generally accepted standards
 - 2. Ethical responsibilities as a professional
 - a. Principles that identify conduct deemed morally desirable
 - b. Ethical responsibilities include
 - (1) Responding to the physical and emotional needs of every patient with respect
 - (2) Maintaining mastery of skills
 - (3) Participating in continuing education/ refresher training
 - (4) Critically reviewing performance and seeking improvement
 - (5) Reporting honestly and respecting confidentiality
 - (6) Working cooperatively and with respect for other emergency professionals
 - c. NAEMT Code of Ethics exemplifies ethical guidelines for the paramedic
 - B. Failing to perform the job appropriately can result in civil or criminal liability
 - C. The best legal protection is provision of appropriate assessment and care coupled with accurate and complete documentation
 - D. Laws differ from state to state and area to area - get competent legal advice
- II. The legal system
 - A. Types of law
 - 1. Legislative law
 - a. Enacted at federal, state and local levels by legislative branches of government
 - b. Product of Congress, city councils, district boards, and general assemblies
 - 2. Administrative law
 - a. Regulations developed by a governmental agency
 - b. Agency has the authority to enforce rules, regulations, and statutes
 - 3. Common law
 - a. "Case" or "judge-made" law
 - b. Derived from society's acceptance of customs or norms over time
 - 4. Criminal law
 - a. Area of law in which the federal, state, or local government prosecutes individuals on behalf of society for violating laws designed to safeguard society
 - b. Violation punished by fine, imprisonment or both
 - 5. Civil (tort) law
 - a. Area of law dealing with private complaints brought by a plaintiff against a defendant for an illegal act or wrongdoing (tort)
 - b. Enforced by bringing a civil lawsuit in which the plaintiff requests the court to award damages
 - B. How laws affect the paramedic
 - 1. Scope of practice
 - a. Range of duties and skills a paramedic is allowed and expected to perform when necessary

- b. Usually set by state law or regulation and by local medical direction
 - 2. Medical direction
 - a. Required for paramedic practice
 - b. May be off-line or on-line, depending on state and local requirements
 - c. Each system should have a policy to guide paramedics in dealing with on-scene physician
 - 3. Medical practice act
 - a. Legislation that governs the practice of medicine; varies from state to state
 - b. May prescribe how and to what extent a physician may delegate authority to a paramedic to perform medical acts
 - 4. Licensure and/ or certification
 - a. Certification
 - (1) Grants recognition to an individual who has met predetermined qualifications to participate in an activity
 - (2) Usually granted by a certifying agency or professional association, not necessarily a government agency
 - b. Licensure
 - (1) A process of occupational regulation
 - (2) Governmental agency, such as state medical board, grants permission to an individual who meets established qualifications to engage in the profession or occupation
 - c. Either or both may be required by state or local authorities to practice as a paramedic
 - 5. Motor vehicle laws
 - a. Motor vehicle code varies from state to state
 - b. Set standards for equipping and operating an emergency vehicle
 - 6. Mandatory reporting requirements
 - a. Vary from state to state, but often include
 - (1) Child abuse and neglect; elder abuse; spouse abuse
 - (2) Sexual assault
 - (3) Gunshot and stab wounds
 - (4) Animal bites
 - (5) Communicable diseases
 - b. Content of report and to whom it must be made is set by law, regulation or policy
 - 7. Protection for the paramedic
 - a. Infectious disease exposure notification
 - b. Immunity statutes
 - (1) Governmental immunity
 - (2) Good Samaritan laws
 - c. Special crimes against a paramedic
 - (1) Assault or battery to paramedic while performing duties
 - (2) Obstruction of paramedic activity
- C. The legal process
 - 1. The role of the courts
 - a. Trial court
 - (1) Determines outcomes of individual cases
 - (2) Cases may be determined by judge or jury
 - b. Appellate court

- (1) Hears appeals of decisions by trial courts or other appeals courts
 - (2) Decisions may set precedent for later cases
 2. Anatomy of a lawsuit
 - a. Incident occurs
 - b. Investigation is conducted by plaintiff's representative
 - c. Complaint is filed in court and served on defendant
 - d. Complaint is answered by defendant
 - e. Discovery occurs
 - (1) Depositions (oral) or interrogatives (written) are taken
 - (2) Documents are gathered (e.g., patient records, patient care reports, etc.)
 - f. Trial is conducted
 - g. Decision is handed down by judge or jury
 - (1) Determines guilt or liability
 - (2) Determines damages and award, if any, to the plaintiff
 - h. Decision may be appealed
 - (1) Either side may appeal
 - (2) Usually can only be based on errors in law made by the court
 - i. Settlement occurs
 - (1) May occur at any stage of the lawsuit
 - (2) Plaintiff agrees to accept settlement in exchange for promise not to pursue case
- III. Legal accountability of the paramedic
 - A. Responsible to act in a reasonable and prudent manner
 - B. Responsible to provide a level of care and transportation consistent with education/ training
 - C. Negligence can result in legal accountability and liability
 1. Components of negligence
 - a. Duty to act
 - (1) May be a formal contractual or an informal duty
 - (2) Duty may be undertaken voluntarily by beginning to care for a patient
 - (3) Duties include
 - (a) Duty to respond and render care
 - (b) Duty to obey laws and regulations
 - (c) Duty to operate emergency vehicle reasonably and prudently
 - (d) Duty to provide care and transportation to the expected standard
 - (e) Duty to provide care and transportation consistent with the scope of practice and local medical protocols
 - (f) Duty to continue care and transportation through to its appropriate conclusion
 - b. Breach of duty
 - (1) Standard of care
 - (a) Exercising the degree of care, skill, and judgement which would be expected under like or similar circumstances by a similarly trained, reasonable paramedic in the location involved
 - (b) Standard of care is established by court testimony and reference to published codes, standards, criteria and guidelines applicable to the situation
 - (2) Breach of duty may occur by

- (a) Malfeasance - performing a wrongful or unlawful act
 - (b) Misfeasance - performing a legal act in a manner which is harmful or injurious
 - (c) Non-feasance - failure to perform a required act or duty
 - (3) In some cases, negligence may be so obvious that it does not require extensive proof
 - (a) Res ipsa loquitur - the injury could only have been caused by negligence
 - (b) Negligence per se - negligence is shown by the fact that a statute was violated and injury resulted
 - c. Damage to patient or other individual (i.e., the plaintiff)
 - (1) Proof that the plaintiff suffered compensable physical or psychological damages, such as
 - (a) Medical expenses
 - (b) Lost earnings
 - (c) Conscious pain and suffering
 - (d) Wrongful death
 - (2) Punitive (punishing) damages could be awarded
 - (a) Awarded to punish gross negligence or willful and wanton misconduct
 - (b) Punitive damages are usually not covered by malpractice insurance
 - d. Proximate cause
 - (1) The action or inaction of the paramedic was the cause of or worsened the damage
 - (2) The fact that the paramedic's act or inaction would result in the damage must have been reasonably foreseeable by the paramedic
 - (3) Usually established by expert testimony
2. Defenses to negligence
 - a. Good Samaritan laws
 - (1) Do not generally protect providers from acts of gross negligence, reckless disregard, or willful or wanton conduct
 - (2) Do not generally prohibit the filing of a lawsuit
 - (3) May provide coverage for paid or volunteer providers
 - (4) Varies from state to state
 - b. Governmental immunity
 - (1) Trend is toward limiting protection
 - (2) May only protect governmental agency, not provider
 - (3) Varies from state to state
 - c. Statute of limitations
 - (1) Limit the number of years after an incident during which a lawsuit can be filed
 - (2) Set by law and may differ for cases involving adults and children
 - (3) Varies from state to state
 - d. Contributory negligence
 - (1) Plaintiff may be found to have contributed to his or her own injury
 - (2) Damages awarded may be reduced or eliminated based on the plaintiff's contribution to his or her injury

- e. Liability insurance
 - D. Special liability concerns
 - 1. Liability of the paramedic medical director
 - a. On-line - direct supervision regarding patient care
 - b. Off-line
 - (1) Provided by use of protocols, including standing orders
 - (2) Indirect supervision
 - 2. Liability for "borrowed servants"
 - a. Liability for actions of EMT-Basic supervised by the paramedic
 - b. Depends on degree of supervision and control given to the paramedic
 - 3. Civil rights
 - a. May not discriminate in providing service to a patient by reason of race, color, sex, national origin, or, in some cases, ability to pay
 - b. Patients should be provided with appropriate care regardless of disease condition (e.g., AIDS/ HIV, other communicable disease, etc.)
 - 4. Off-duty paramedic
 - a. May not have authority to perform paramedic procedures which require delegation from a physician
 - b. Varies from state to state
 - E. Protection against negligence claims
 - 1. Appropriate education/ training and continuing education
 - 2. Appropriate medical direction -- on- and off-line
 - 3. Accurate, thorough documentation
 - 4. Professional attitude and demeanor
- IV. Paramedic - patient relationships
- A. Confidentiality
 - 1. Confidential information
 - a. Patient history
 - b. Assessment findings
 - c. Treatment rendered
 - 2. Release of information
 - a. Requires written permission from patient or legal guardian
 - b. Permission not required for release of select information
 - (1) To other providers with a need to know in order to provide care
 - (2) When required by law
 - (3) When required for third party billing
 - (4) In response to a proper subpoena
 - 3. Improper release of information or release of inaccurate information can result in liability
 - a. Invasion of privacy
 - (1) Release, without legal justification, of information on a patient's private life which might reasonably expose the individual to ridicule, notoriety or embarrassment
 - (2) The fact that the information is true is not a defense
 - b. Defamation - making an untrue statement about someone's character or reputation without legal privilege or consent of the individual
 - (1) Libel
 - (a) False statements about a person made in writing or through the

- mass media
 - (b) Made with malicious intent or reckless disregard for the falsity of the statements
 - (2) Slander
 - (a) False verbal statements about a person
 - (b) Made with malicious intent or reckless disregard for the falsity of the statements
- B. Consent
 - 1. Conscious, competent patients have the right to decide what medical care and transportation to accept
 - a. Patient must be of legal age and able to make a reasoned decision
 - b. Patient must be properly informed
 - (1) Nature of the illness or injury
 - (2) Treatment recommended
 - (3) Risks and dangers of treatment
 - (4) Alternative treatment possible and the risks
 - (5) Dangers of refusing treatment (including transport)
 - c. Conscious, competent patient can revoke consent at any time during care and transport
 - 2. Types of consent
 - a. Expressed consent
 - (1) Patient directly agrees to treatment and gives permission to proceed
 - (2) Consent can be expressed non-verbally by action or allowing care to be rendered
 - b. Informed consent - consent given based on full disclosure of information
 - c. Implied consent
 - (1) Consent assumed from a patient requiring emergency intervention who is mentally, physically or emotionally unable to provide expressed consent; sometimes called emergency doctrine
 - (2) Is effective only until patient no longer requires emergency care or regains competence to make decisions
 - d. Involuntary consent
 - (1) Treatment allowed in certain situations granted by authority of law
 - (2) Patients held for mental health evaluation or as directed by law enforcement personnel who have the patient under arrest
 - 3. Special consent situations
 - a. Minors
 - (1) In most states, a person is a minor until age 18, unless emancipated
 - (2) Emancipation may include
 - (a) Minors who are married, parents, or in the armed services
 - (b) Individual living independently and self-supporting (e.g., college student not living at home or receiving financial aid from parents)
 - (3) Unemancipated minors are not able to give or withhold consent - consent of parent, legal guardian or court-appointed custodian is usually required
 - (4) Emergency doctrine applies to minors when parent or guardian cannot be contacted
 - b. Mentally incompetent adults
 - (1) If there is a legal guardian, consent may be given or withheld by the

- guardian
 - (2) Emergency doctrine applies if no one legally able to give consent can be contacted
 - c. Prisoners or arrestees
 - (1) Court or police who have custody may authorize emergency treatment
 - (2) Usually limited to care needed to save life or limb
 - d. Refusal of care or transport
 - (1) Patient must be conscious and able to make a reasonable decision
 - (2) Make multiple attempts to convince the patient to accept care
 - (3) Enlist the help of others to convince the patient
 - (4) Assure that the patient is informed about the implication of the decision and potential for harm
 - (5) Consult medical direction
 - (6) Request patient and a disinterested witness to sign a "release from liability" form
 - (7) Advise the patient that he or she may call again for help if needed
 - (8) Attempt to get family or friends to stay with the patient
 - (9) Document situation and actions thoroughly on patient care report
 - e. Decisions not to transport
 - (1) Involve medical direction
 - (2) Thoroughly document reasons for decision
4. Legal complications related to consent
 - a. Abandonment
 - (1) Terminating care when it is still needed and desired by the patient, and without assuring that appropriate care continues to be provided by another qualified provider
 - (2) May occur in the field or when a patient is delivered to the emergency department
 - b. False imprisonment
 - (1) May be charged by a patient who is transported without consent or who is restrained without proper cause or authority
 - (2) May be a civil or criminal violation
 - c. Assault
 - (1) Threatening, attempting or causing fear of offensive physical contact with a patient or other individual (for example, threatening to restrain a patient unless he or she quiets down)
 - (2) May be a civil or criminal violation
 - d. Battery
 - (1) Unlawful touching of another person without consent (for example, drawing a patient's blood without permission)
 - (2) May be a civil or criminal violation
- C. Use of force
 - 1. Unruly or violent patients
 - 2. Use of restraints
 - 3. Involve law enforcement, if possible
 - 4. Use only force considered to be "reasonable" to prevent harm to the patient or others
 - 5. Must never be punitive
- D. Transportation of patients

1. Level of care during transportation
 - a. Level of personnel attending the patient
 - b. Complications resulting from changing the level of care delivered
 2. Use of emergency vehicle operating privileges
 - a. Must operate in conformity to laws, regulations and policies
 - b. Must operate in a manner which safeguards the patient, crew and public
 3. Choice of patient destination
 - a. Hospitals selected based on patient need and hospital capability
 - b. Protocols, the paramedic, medical direction, and patient play a role
 - c. Patients choice should be honored unless situation or patient's condition dictates otherwise
 4. Payor protocols
- V. Resuscitation issues
- A. Withholding or stopping resuscitation
 1. Procedure should be established by local protocols
 2. Role of medical direction should be clearly delineated
 - B. Advance directives
 1. Status depends on state laws and local protocols
 2. Written patient statements of preference for future medical treatment
 - a. Living will
 - b. Durable power of attorney for health care
 - c. Do not resuscitate (DNR) orders
 3. Authority granted in part by the Patient Self-Determination Act of 1990
 4. Medical direction must establish and implement policies for dealing with advance directives
 - a. Policy should specify paramedic care for the patient with an advance directive
 - b. Must provide for reasonable measures of comfort to the patient and emotional support to family and loved ones
 - C. Potential organ donation
 1. Identify the patient as a potential donor
 2. Establish communication with medical direction
 3. Provide emergency care that will help maintain viable organs
 - D. Death in the field
 1. Follow state or local protocols
 2. Consult medical direction for guidance
- VI. Crime and accident scene responsibilities
- A. Crime scene
 1. Protect self and other EMS personnel
 2. Care for the patient(s) as necessary
 3. Notify law enforcement if not already involved
 4. Observe and document any items moved or anything unusual at the scene
 5. Protect potential evidence
 - a. Leave holes in clothing from bullet or stab wounds intact, if possible
 - b. Do not touch or move items at scene unless necessary in delivery of care
 - B. Accident scene
 1. Protect self and other EMS personnel

2. Care for the patient(s) as necessary
3. Summon additional personnel if needed

VII. Documentation

A. Importance

1. If it is not written down, it was not done.
2. Memory is fallible - claims may not be filed until years after an event

B. Characteristics of an effective patient care report

1. Completed promptly
 - a. A report made "in the course of business", not long after the event
 - b. Prompt completion essential to the patient care report becoming part of the hospital record
2. Completed thoroughly
 - a. Coverage of assessment, treatment and other relevant facts
 - b. Should paint a complete, clear picture of patient condition and care
3. Completed objectively
 - a. Observations rather than assumptions or conclusions
 - b. Avoid use of emotionally and value-loaded words or phrases
4. Completed accurately
 - a. Descriptions should be as precise as possible
 - b. Avoid using abbreviations or jargon not commonly understood
5. Confidentiality maintained
 - a. Should have a standard policy on release of information
 - b. Whenever possible, patient consent should be obtained prior to release of information

C. Copy to become part of patient's hospital record

D. Maintained at least for extent of statute of limitations

UNIT TERMINAL OBJECTIVE

- 1-5 At the completion of this unit, the paramedic student will understand the role that ethics plays in decision making in the out-of-hospital environment.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 1-5.1 Define ethics. (C-1)
- 1-5.2 Distinguish between ethical and moral decisions. (C-3)
- 1-5.3 Identify the premise that should underlie the paramedic's ethical decisions in out-of hospital care. (C-1)
- 1-5.4 Analyze the relationship between the law and ethics in EMS. (C-3)
- 1-5.5 Compare and contrast the criteria that may be used in allocating scarce EMS resources. (C-3)
- 1-5.6 Identify the issues surrounding the use of advance directives, in making a prehospital resuscitation decision. (C-1)
- 1-5.7 Describe the criteria necessary to honor an advance directive in your state. (C-1)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 1-5.8 Value the patient's autonomy in the decision-making process. (A-2)
- 1-5.9 Defend the following ethical positions: (A-3)
 - a. The paramedic is accountable to the patient.
 - b. The paramedic is accountable to the medical director.
 - c. The paramedic is accountable to the EMS system.
 - d. The paramedic is accountable for fulfilling the standard of care.
- 1-5.10 Given a scenario, defend or challenge a paramedic's actions concerning a patient who is treated against his/ her wishes. (A-3)
- 1-5.11 Given a scenario, defend a paramedic's actions in a situation where a physician orders therapy the paramedic feels to be detrimental to the patient's best interests. (A-3)

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

- I. Introduction
 - A. Ethical dilemmas are present in out-of-hospital care
 - B. Ethical dilemma today may be decided by law tomorrow

- II. Ethics overview
 - A. Ethics defined
 - 1. Socrates: "How should one live?"
 - 2. Larger issue than paramedic practice
 - 3. Morals relate to social standards
 - 4. Ethics relate to personal standards
 - B. Answering ethical questions
 - 1. Emotion should not be a factor
 - 2. The question should be answered with reason
 - 3. Answer must not be based on what people think is wrong or right
 - a) The individual must answer the question for him/ her self
 - 4. Never do what is morally wrong
 - C. The need for an out-of-hospital ethical code
 - D. How ethics impact individual practice
 - 1. A personal code
 - 2. The importance of reflecting on one's own practice.
 - a) "An unexamined life is not worth living"
 - E. How ethics impact institutional practice

- III. Ethical tests in healthcare
 - A. Fundamental question
 - 1. What is in the patient's best interest?
 - 2. Determining what the patient wants
 - a) Patient statement
 - b) Written statement
 - c) Family input
 - 3. The role of "good faith" in making ethical decisions
 - B. Global concepts
 - 1. Provide patient benefit
 - 2. Avoid harm
 - 3. Recognize patient autonomy
 - C. Resolving ethical dilemmas when global concepts are in conflict
 - 1. Within healthcare community
 - a) Establishment of norms (standards of care)
 - b) Research and treatment protocols
 - c) Prospective and retrospective reviews of decisions
 - 2. Within the public
 - a) Creation of laws protecting patient rights
 - b) Use of advance directives, etc. to make patient wishes known

- IV. Ethical issues in contemporary paramedic practice
 - A. Allocation of resources
 - 1. True parity

2. Need
3. Earned
- B. Decisions surrounding resuscitation
 1. What the patient really wants
 2. When in doubt, resuscitate
 3. Resuscitation after an advance directive is found
- C. Confidentiality
 1. A fundamental right
 2. Ethics and confidential information
 - a) Legally required
 - (1) Does this supersede ethical considerations?
 - (2) What if the public health would benefit?
- D. Consent
 1. Patient right to make decisions regarding health care
 - a) "Fundamental element of the patient-physician relationship"
 - b) AMA code of medical ethics
 2. Ethics of implied consent
 - a) Does the patient understand the issues at hand?
 - b) Can the patient make an informed decision in his/ her best interest
- E. Applications of ethical principles to patient care situations
 1. Care in futile situations
 - a) Defining futile
 - b) Who makes the decision?
 2. Obligation to provide care
 - a) Good Samaritan
 - b) Inability to pay
 - c) Isn't in the "health plan"
 - d) Patient "dumping"
 - e) Economic triage
 3. Advocacy
 4. Paramedic accountability
 - a) Patient
 - b) Physician medical director
 - c) System/ HMO protocols
 5. Role as physician extender
 - a) The physician orders something which
 - (1) The paramedic believes is contraindicated
 - (2) The paramedic believes is medically acceptable but not in the patient's best interests
 - (3) The paramedic believes is medically acceptable but morally wrong

UNIT TERMINAL OBJECTIVE

1-6 At the completion of this unit, the paramedic student will be able to apply the general concepts of pathophysiology for the assessment and management of emergency patients.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 1-6.1 Discuss cellular adaptation. (C-1)
- 1-6.2 Describe cellular injury and cellular death. (C-1)
- 1-6.3 Describe the factors that precipitate disease in the human body. (C-1)
- 1-6.4 Describe the cellular environment. (C-1)
- 1-6.5 Discuss analyzing disease risk. (C-1)
- 1-6.6 Describe environmental risk factors. (C-1)
- 1-6.7 Discuss combined effects and interaction among risk factors. (C-1)
- 1-6.8 Describe aging as a risk factor for disease. (C-1)
- 1-6.9 Discuss familial diseases and associated risk factors. (C-1)
- 1-6.10 Discuss hypoperfusion. (C-1)
- 1-6.11 Define cardiogenic, hypovolemic, neurogenic, anaphylactic and septic shock. (C-1)
- 1-6.12 Describe multiple organ dysfunction syndrome. (C-1)
- 1-6.13 Define the characteristics of the immune response. (C-1)
- 1-6.14 Discuss induction of the immune system. (C-1)
- 1-6.15 Discuss fetal and neonatal immune function. (C-1)
- 1-6.16 Discuss aging and the immune function in the elderly. (C-1)
- 1-6.17 Describe the inflammation response. (C-1)
- 1-6.18 Discuss the role of mast cells as part of the inflammation response. (C-1)
- 1-6.19 Describe the plasma protein system. (C-1)
- 1-6.20 Discuss the cellular components of inflammation. (C-1)
- 1-6.21 Describe the systemic manifestations of the inflammation response. (C-1)
- 1-6.22 Describe the resolution and repair from inflammation. (C-1)
- 1-6.23 Discuss the effect of aging on the mechanisms of self-defense. (C-1)
- 1-6.24 Discuss hypersensitivity. (C-1)
- 1-6.25 Describe deficiencies in immunity and inflammation. (C-1)
- 1-6.26 Describe homeostasis as a dynamic steady state. (C-1)
- 1-6.27 List types of tissue. (C-1)
- 1-6.28 Describe the systemic manifestations that result from cellular injury. (C-1)
- 1-6.29 Describe neuroendocrine regulation. (C-1)
- 1-6.30 Discuss the inter-relationships between stress, coping, and illness. (C-1)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 1-6.31 Advocate the need to understand and apply the knowledge of pathophysiology to patient assessment and treatment. (A-2)

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

- I. Introduction
 - A. Correlation of pathophysiology with disease process
 - 1. Cells appear similar to multicellular "social" organism
 - 2. Cells communicate electrochemically - when interrupted disease processes can initiate and advance
 - 3. Knowledge of coordination of specific bodily functions leads to better understanding of the disease process
 - a. Endocrine
 - b. Exocrine
 - c. Other coordinating receptors
 - (1) Chemoreceptors
 - (2) Baroreceptors
 - (3) Adrenergic
 - (4) Others
 - B. Correlation of disease process with care provided to patients by paramedics
 - 1. Understanding disease process is important for paramedics to better understand, anticipate, correct, and provide appropriate care
 - a. Once knowledge of physical laws and principles have been gained paramedics can apply these to the mechanisms and complications of disease
 - b. Cells of the immune system and inflammatory responses are found with every type of trauma or disease process
- II. Basic cellular review
 - A. Major classes of cells - living cells divided into two major divisions
 - B. Chief cellular functions
 - 1. Cells become specialized through process of differentiation, or maturation
 - 2. Eventually perform one function or act in concert with other cells to perform a more complex task
 - C. Cellular components
 - 1. Structure & function
 - 2. Three main components
 - D. Tissue types
 - 1. Epithelial tissue
 - 2. Connective tissue
 - 3. Muscle tissue
 - 4. Nervous tissue
- III. Alterations in cells and tissues
 - A. Cellular adaptation - cells adapt to their environment to avoid and protect themselves from injury; adapted cells are neither normal or injured (they are somewhere between these two states)
 - 1. Cellular adaptations are common and a central part of many disease states
 - a. Early stages of a successful adaptation response may enhance the cell's function
 - b. Difficult to determine pathological responses versus an extreme adaptation to an excessive functional demand
 - 2. Atrophy

3. Hypertrophy
 4. Hyperplasia
 5. Dysplasia
 6. Metaplasia
- B. Cellular injury
1. Hypoxic injury
 - a. Most common cause of cellular injury
 - b. May result from
 - (1) Decreased amounts of oxygen in the air
 - (2) Loss of hemoglobin or hemoglobin function
 - (3) Decreased number of red blood cells
 - (4) Disease in respiratory or cardiovascular system
 - (5) Loss of cytochromes
 2. Chemical injury
 - a. Chemical agents causing cellular injury
 - (1) Poisons
 - (2) Lead
 - (3) Carbon monoxide
 - (4) Ethanol
 - (5) Pharmacological
 3. Infectious injury
 - a. Virulence or pathogenicity of microorganisms depends on their ability to survive and reproduce in the human body, where they injure cells and tissues
 - (1) Disease producing potential depends upon its ability to
 - (a) Invade and destroy cells
 - (b) Produce toxins
 - (c) Produce hypersensitivity reactions
 - b. Bacteria
 - (1) Survival and growth depend upon the effectiveness of the body's defense mechanisms and the bacteria's ability to resist the mechanisms
 - (a) Coating protects the bacterium from ingestion and destruction by phagocytes and capsules may also function as exotoxins
 - (b) Not all virulent extracellular pathogens are encapsulated - mycobacterium tuberculosis can survive and be transported by phagocytes
 - (2) Bacteria also produce substances such as enzymes or toxins which can injure or destroy cells
 - (a) Toxins are produced by many microorganisms
 - i) Exotoxins
 - ii) Endotoxins
 - (b) Fever is caused by the release of endogenous pyrogens from macrophages or circulating white blood cells that are attracted to the injury site
 - (c) Inflammation is one of the body's responses to the presence of bacteria
 - (d) Ability to produce hypersensitivity reactions is an important pathogenic mechanism of bacteria toxins
 - (e) Bacteremia or septicemia is proliferation of microorganisms in the

- 2. Starling's hypothesis
- 3. Role of capillary and membrane permeability
- E. Alterations in water movement
 - 1. Edema
 - a. Pathophysiology
 - (1) Increased capillary permeability
 - (2) Decreased oncotic pressure
 - (3) Increased capillary hydrostatic pressure
 - (4) Hydrostatic pressure
 - (5) Lymphatic vessel obstruction
 - b. Clinical manifestations
 - (1) Local
 - (2) Generalized
 - c. Evaluation and treatment
- F. Water balance and the role of electrolytes
 - 1. Water balance
 - a. Role of antidiuretic hormone (ADH)
 - b. Receptors
 - (1) Osmoreceptors
 - (2) Volume sensitive receptors
 - (3) Baroreceptors
 - 2. Sodium and chloride balance
 - a. Role and function of sodium as a cation
 - b. Role and function of chloride as an anion
 - c. Hormone regulation by aldosterone and natriuretic hormone
 - d. Role of renin-angiotensin system
 - 3. Alterations in sodium, chloride, and water balance
 - a. Isotonic alterations
 - (1) Isotonic volume depletions
 - (2) Isotonic volume excesses
 - b. Hypertonic alterations
 - (1) Hypernatremia
 - (2) Water deficit
 - (3) Hyperchloremia
 - c. Hypotonic alterations
 - (1) Hyponatremia
 - (2) Water excess
 - (3) Hypochloremia
 - 4. Alterations in potassium, calcium, phosphate, and magnesium balance
 - a. Potassium
 - (1) Hypokalemia
 - (2) Hyperkalemia
 - b. Calcium and phosphate
 - (1) Hypocalcemia
 - (2) Hypercalcemia
 - (3) Hypophosphatemia
 - (4) Hyperphosphatemia
 - c. Magnesium

- (1) Hypomagnesemia
 - (2) Hypermagnesemia
 - G. Acid - base balances
 - 1. Hydrogen ion and pH
 - 2. Buffer systems
 - a. Carbonic acid-bicarbonate buffering
 - b. Protein buffering
 - c. Renal buffering
 - d. Other buffers
 - 3. Acid-base imbalances
 - a. Metabolic acidosis
 - (1) Pathophysiology
 - (2) Clinical presentation
 - (3) Evaluation and treatment
 - b. Metabolic alkalosis (rare)
 - (1) Pathophysiology
 - (2) Clinical presentation
 - (3) Evaluation and treatment
 - c. Respiratory acidosis
 - (1) Pathophysiology
 - (2) Clinical presentation
 - (3) Evaluation and treatment
 - d. Respiratory alkalosis
 - (1) Pathophysiology
 - (2) Clinical presentation
 - (3) Evaluation and treatment
- V. Genetics and familial diseases
 - A. Factors causing disease
 - 1. Genetic
 - 2. Environmental
 - a. Microorganisms and immunologic exposures
 - b. Personal habits and life-style
 - c. Chemical substances
 - d. Physical environment
 - e. Psychosocial environment
 - 3. Age and gender
 - a. Accumulative affects of both genetic and environmental factors
 - b. Life-style, anatomic, or hormonal differences
 - B. Analyzing disease risk
 - 1. Disease rates
 - a. Incidence rate
 - b. Prevalence rate
 - c. Mortality rate
 - 2. Risk factor analysis
 - a. Causal risk factors
 - b. Noncausal risk factors
 - C. Combined effects and interaction among risk factors

1. Familial disease tendency
2. Aging and age-related disorders
- D. Common familial disease and associated risk factors
 1. Immunologic disorders
 - a. Allergies
 - b. Asthma
 - c. Rheumatic fever
 2. Cancer
 - a. Breast cancer
 - b. Colorectal cancer
 - c. Lung cancer
 3. Endocrine disorders
 - a. Diabetes mellitus
 - (1) Insulin-dependent diabetes mellitus
 - (2) Non-insulin dependent diabetes mellitus
 4. Hematologic disorders
 - a. Drug-induced hemolytic anemia
 - b. Hemophilia
 - c. Hematochromatosis
 5. Cardiovascular disorders
 - a. Long QT syndrome (autosomal dominant disorder)
 - b. Cardiac myopathies
 - c. Mitral valve prolapse
 - d. Coronary heart disease
 - (1) Family history and CHD risk
 - (2) Genetic factors and predisposition
 - e. Hypertension and stroke
 6. Renal disorders
 - a. Gout (uric acid accumulation)
 - b. Kidney stones
 7. Gastrointestinal disorders
 - a. Malabsorption disorders
 - (1) Lactose intolerance
 - (2) Ulcerative colitis
 - (3) Crohn's disease
 - b. Peptic ulcers
 - c. Gallstones
 - d. Obesity
 - (1) Associated disease processes
 - (2) Causal risk factors
 8. Neuromuscular disorders
 - a. Huntington disease
 - b. Muscular dystrophy
 - c. Multiple sclerosis
 - d. Alzheimer disease
 9. Psychiatric disorders
 - a. Schizophrenia
 - b. Manic-depressive

- VI. Hypoperfusion
 - A. Pathogenesis
 - 1. Decreased cardiac output
 - 2. Compensatory mechanisms
 - a. Catecholamine release
 - (1) Epinephrine and norepinephrine
 - (2) Increase in systemic vascular resistance
 - b. Role of aldosterone renin-angiotensin, and ADH
 - (1) Adequate or increased blood volume
 - (2) Vasoconstriction increases systemic blood pressure
 - c. Shift of interstitial fluid
 - d. Splenic discharge
 - 3. Increased preload, stroke volume, and heart rate
 - a. Increased myocardial oxygen demand
 - b. Systemic and pulmonary edema
 - (1) Dyspnea
 - (2) Dusky skin color
 - (3) Low blood pressure
 - (4) Oliguria
 - (5) Impaired mentation
 - c. Decreased cardiac output and ejection fraction
 - (1) Decreased blood pressure
 - (2) Decreased tissue perfusion
 - (3) Impaired cellular metabolism
 - B. Types of Shock
 - 1. Cardiogenic shock
 - a. Defined
 - b. Pathophysiology
 - c. Evaluation and treatment
 - 2. Hypovolemic shock
 - a. Defined
 - b. Pathophysiology
 - c. Evaluation and treatment
 - 3. Neurogenic shock
 - a. Defined
 - b. Pathophysiology
 - c. Evaluation and treatment
 - 4. Anaphylactic shock
 - a. Defined
 - b. Pathophysiology
 - c. Evaluation and treatment
 - 5. Septic Shock
 - a. Defined
 - b. Pathophysiology
 - c. Evaluation and treatment
 - C. Multiple organ dysfunction syndrome (MODS)
 - 1. Defined

- a. Progressive failure of two or more organ systems
- b. Occurs after severe illness or injury
- c. New diagnosis first described in 1975
- d. Mortality rate of 60% - 90%
- e. Major cause of death following septic, traumatic, and burn injuries
- 2. Pathophysiology
 - a. Injury or endotoxin release
 - b. Vascular endothelial damage, neuroendocrine response, and release of inflammatory mediators
 - c. Activation of complement, coagulation, and kallikrein/ kinin systems
 - d. Massive systemic immune/ inflammatory and coagulation responses
 - e. Vascular changes
 - (1) Vasodilation
 - (2) Increase in capillary permeability
 - (3) Selective vasoconstriction
 - (4) Microvascular thrombi
 - f. Maldistribution of systemic and organ blood flow
 - g. Hypermetabolism
 - h. Oxygen supply/ demand imbalance
 - i. Tissue hypoxia
 - (1) Tissue hypoperfusion
 - (2) Exhaustion of fuel supply (i.e. ATP, glucose, etc)
 - (3) Metabolic failure
 - (4) Lysosome breakdown
 - (5) Anaerobic metabolism
 - (6) Acidosis and impaired cellular function
 - j. Organ dysfunction
 - (1) Decreased cardiac function and myocardial depression
 - (2) Renal failure
 - (3) Failure of smooth muscle of vascular system
 - (a) Release of capillary sphincters
 - (b) Vasodilation
- 3. Clinical presentation - 24 hours after initial resuscitation
 - a. Low-grade fever due to inflammatory responses
 - b. Tachycardia
 - c. Dyspnea and adult respiratory distress syndrome (ARDS)
 - d. Altered mental status
 - e. Hyperdynamic state
 - f. Hypermetabolic states
 - g. Renal and liver failure (14 - 21 days)
 - h. Gastrointestinal and immune collapse (14 - 21 days)
 - i. Cardiovascular collapse and death (21 - 28 days)
- D. Cellular metabolism impairment
 - 1. Oxygen impairment
 - a. Anaerobic metabolism
 - b. Increased lactate
 - c. Metabolic acidosis
 - d. Decreased oxygen affinity for hemoglobin

- e. Decreased ATP
- f. Changes in cellular electrolytes
- g. Cellular edema
- h. Release of lysosomal enzymes
- 2. Impaired glucose use
 - a. Increase serum glucose
 - b. Catecholamines, cortisol, growth hormone release
 - c. Increased gluconeogenesis, gluconeolysis, and lipolysis

VII. Self-defense mechanisms

- A. Introduction - lines of defense
 - 1. Anatomic barriers
 - 2. Inflammatory response
 - 3. Immune response
- B. Characteristics of the immune response
 - 1. Natural versus acquired immunity
 - a. Natural or native immunity
 - b. Acquired immunity
 - (1) Active acquired immunity
 - (2) Passive acquired immunity
 - 2. Primary versus secondary immunity
 - a. Primary or initial immune response
 - b. Secondary or anamnestic immune response
 - 3. Humoral versus cell-mediated immunity
 - a. B-cell lymphocyte
 - b. T-cell lymphocyte
- C. Induction of the immune response
 - 1. Antigen and immunogens
 - a. Antigen
 - b. Immunogen
 - c. Tolerance
 - d. Molecular size
 - (1) Larger - proteins, polysaccharides, and nucleic acids
 - (2) Smaller - amino acids, monosaccharides, and fatty acids
 - (3) Haptens - smaller molecules which become immunogenic
 - 2. Histocompatibility antigens (HLA antigens)
 - a. HLA complexes or major histocompatibility complexes (MHC)
 - b. Role of HLA antigens
 - 3. Blood group antigens
 - a. Rh system
 - b. ABO system
- D. Humoral immune response
 - 1. B-cell lymphocytes
 - a. Formation
 - (1) Lymphoid stem cell
 - (2) Generation of clonal diversity
 - (3) Clonal selection
 - (4) Activated B-cell

- (a) Immunoglobulin-secreting plasma cells found in blood and secondary lymphoid organs
- (b) Memory cells - responsible for long term immunity
- 2. Immunoglobulins
 - a. Differences between immunoglobulins and antibodies
 - b. Structure of immunoglobulin molecules
 - c. Function of antibodies
 - (1) Agglutination
 - (2) Precipitation
 - (3) Neutralization
 - (a) Bacterial toxins
 - (b) Viruses
 - (c) Opsonization of bacteria
 - (d) Activation of inflammatory processes
 - (e) Classes of immunoglobulins
 - (f) Antibodies as antigens
 - (4) Isotypic antigens
 - (5) Allotypic antigens
 - (6) Idiotypic antigenic determinants
 - d. Monoclonal antibodies
- 3. Secretory immune system
 - a. Mucosal-associated lymphoid tissue
 - (1) Lacrimal glands
 - (2) Salivary glands
 - (3) Bronchial-associated lymphoid tissue
 - (4) Mammary-associated lymphoid tissue
 - (5) Gut-associated lymphoid tissue
 - (6) Genital-associated lymphoid tissue
 - b. Circulates independently of other lymphocytes
 - (1) Mucosal-associated lymphoid tissue
 - (2) Regional lymph nodes
 - (3) Thoracic duct
 - (4) Blood
 - c. One of body's first lines of defense
 - d. Occurs locally rather than systemically
- E. Cell-mediated immune response
 - 1. T-cells
 - a. Five types of mature T-cells
 - (1) Memory cells
 - (2) Td cells or lymphokine-producing cells
 - (3) Tc cells or cytotoxic cells
 - (4) Th cells or helper T-cells
 - (5) Ts cells or suppressor T-cells
 - b. Proliferation and differentiation
 - 2. Major effects of cell-mediated immune response
 - a. Cytotoxicity
 - b. Delayed hypersensitivity
 - c. Memory

- d. Control
- F. Cellular interactions in the immune response
 - 1. Cytokines
 - a. Lymphokines
 - b. Monokines
 - 2. Antigen processing, presentation, and recognition
 - a. Antigen degradation
 - b. Classes of histocompatible antigens (HLA)
 - c. T-cell receptors
 - d. Interleukin - 1 (IL-1)
 - 3. T-cell and B-cell differentiation
 - a. T-cell differentiation
 - b. B-cell differentiation
 - c. Control of B and T-cell development
- G. Fetal and neonatal immune function
 - 1. Fetal immunological capabilities
 - a. Immunologic responses
 - b. Antibody capabilities
 - 2. Antibody levels
 - a. Umbilical cord blood
 - b. Neonatal circulation
 - 3. Trophoblasts
- H. Aging and the immune response in elderly
 - 1. T-cell function
 - 2. Antibody production

VIII. Inflammation

- A. The acute inflammatory response
 - 1. Triggers
 - a. Lethal cellular injury
 - b. Non-lethal cellular injury
 - c. Other microorganisms
 - 2. Response
 - a. Vascular responses to inflammation
 - b. Cellular responses to inflammation
- B. Mast cells
 - 1. Degranulation of vasoactive amines and chemotactic factors
 - a. Stimulation of degranulation
 - (1) Physical injury
 - (2) Chemical agents
 - (3) Immunological (IgE-mediated hypersensitivity)
 - b. Vasoactive amines
 - (1) Histamine
 - (2) Serotonin
 - c. Chemotactic factors
 - (1) Neutrophil
 - (2) Eosinophil
 - 2. Synthesis of leukotrienes and prostaglandins

- a. Leukotrienes or slow-reacting substances of anaphylaxis (SRS-A)
 - (1) Composition
 - (2) Function
- b. Prostaglandins
 - (1) Composition
 - (2) Function
- C. Plasma protein systems
 - 1. Complement system
 - a. Structure and function
 - b. Activation
 - (1) Classic pathway
 - (2) Alternative pathway
 - 2. Clotting system
 - a. Structure and function
 - b. Activation
 - (1) Extrinsic pathway
 - (2) Intrinsic pathway
 - 3. Kinin system
 - a. Structure and function
 - b. Activation
 - (1) Plasma kinin cascade
 - 4. Control and interaction of the plasma protein system
 - a. Reason for control
 - b. Types of control
 - (1) Antagonists
 - (2) Histamine control
 - (3) Interaction of control processes
- D. Cellular components of inflammation
 - 1. Functions of phagocytes
 - a. Margination
 - b. Diapedesis
 - c. Exudation into inflamed tissue
 - d. Process of phagocytosis
 - 2. Polymorphonuclear neutrophils
 - a. Predominance in early inflammatory response
 - b. Role
 - 3. Monocytes and macrophages
 - a. Monocyte - young macrophage
 - (1) Structure
 - (2) Role
 - b. Macrophages
 - (1) Structure
 - (2) Role
 - 4. Eosinophils
 - a. Structure
 - b. Role
- E. Cellular products
 - 1. Interleukins (ILs)

- a. Interleukin - 1
- b. Interleukin - 2
- 2. Lymphokines
 - a. Production
 - b. Types and effects
 - (1) Migration-inhibitory factor
 - (2) Macrophage-activating factor
- 3. Interferon
 - a. Structure
 - b. Actions and effects
- F. **Systemic responses of acute inflammation**
 - 1. **Fever**
 - a. **Activation**
 - b. **Effects**
 - 2. **Leukocytosis**
 - a. **Activation**
 - b. **Effects**
 - 3. **Increase in circulating plasma proteins or acute-phase reactants**
 - a. **Activation**
 - b. **Effects**
- G. **Chronic inflammation responses**
 - 1. **Causes**
 - a. **Unsuccessful acute inflammatory response due to foreign body**
 - b. **Persistence of infection or antigen**
 - 2. **Characteristics**
 - a. **Persistence of acute inflammation response**
 - b. **Neutrophil degranulation and death**
 - c. **Lymphocyte activation**
 - d. **Fibroblast activation**
 - e. **Infiltration (pus)**
 - f. **Tissue repair (scar)**
- H. **Local inflammation responses**
 - 1. **Vascular changes**
 - a. **Vasodilation**
 - b. **Increased capillary permeability**
 - 2. **Exudation**
 - a. **Functions**
 - b. **Compositions**
- I. Phases of resolution and repair
 - 1. Definitions
 - a. Regeneration
 - b. Repair
 - c. Debridement
 - d. Primary intention
 - e. Secondary intention
 - 2. Reconstruction phase
 - a. Initial wound response
 - b. Granulation

- c. Epithelialization
- 3. Maturation Phase
 - a. Completion of contraction, differentiation, and remodeling of scar tissue
 - b. Disappearance of capillaries from scar tissue
- 4. Dysfunctional wound healing
 - a. Dysfunction during the inflammatory response
 - b. Dysfunction during the reconstruction phase
 - (1) Impaired collagen synthesis
 - (2) Impaired epithelialization
 - (3) Wound disruption
 - (4) Impaired contraction
- J. Aging and self-defense mechanisms
 - 1. Newborn
 - 2. Elderly

IX. **Variations in immunity and inflammation**

- A. **Hypersensitivity: allergy, autoimmunity, and isoimmunity**
 - 1. **Definitions**
 - a. **Hypersensitivity**
 - b. **Allergy**
 - c. **Autoimmunity**
 - d. **Isoimmunity**
 - 2. **Mechanisms of hypersensitivity**
 - a. **Immediate versus delayed reactions**
 - b. **IgE reactions**
 - (1) Role of IgE
 - (2) Mechanism of IgE
 - (3) Clinical indications
 - (4) Genetic predisposition
 - (5) IgE-mediated hypersensitivity tests
 - (6) Desensitization
 - c. Tissue-specific reactions
 - (1) Tissue-specific antigens
 - (2) Mechanisms
 - d. Immune-complex mediated injury
 - (1) Mechanisms
 - (2) Immune-complex disease
 - e. Cell-mediated tissue destruction
 - (1) Mechanisms
 - (2) Clinical instances
 - 3. Targets of hypersensitivity
 - a. Allergy
 - (1) Allergens
 - (2) Neoantigen
 - b. Autoimmunity
 - (1) Breakdown of tolerance
 - (2) Original insult
 - (3) Genetic factors

- c. Isoimmunity
 - (1) Transient neonatal diseases
 - (2) Transplant rejections and transfusion reactions
- 4. Autoimmune and isoimmune diseases
 - a. Grave's disease
 - b. Rheumatoid arthritis
 - c. Myasthenia gravis
 - d. Immune thrombocytopenic purpura
 - e. Isoimmune neutropenia
 - f. Systemic lupus erythematosus (SLE)
 - g. Rh and ABO isoimmunization
- B. **Immunity and inflammation deficiencies**
 - 1. **Congenital immune deficiencies**
 - 2. **Acquired deficiencies**
 - a. **Nutritional deficiencies**
 - b. **Iatrogenic deficiencies**
 - c. **Deficiencies caused by trauma**
 - d. **Deficiencies caused by stress**
 - e. **AIDS**
 - 3. Replacement therapies for immune deficiencies
 - a. Gamma globulin therapy
 - b. Transplantation and transfusion
 - c. Gene therapy
- X. **Stress and disease**
 - A. **Concepts of stress**
 - 1. **Triad of manifestations**
 - 2. **General adaptation syndrome (Selye)**
 - a. **Alarm stage**
 - b. **Resistance or adaptation stage**
 - c. **Exhaustion stage**
 - d. **Definition of physiological stress**
 - 3. **Psychologic mediators and specificity**
 - a. **Psychologic factors effects on physiological responses to stress**
 - b. **Pituitary gland and adrenal cortex sensitivity to emotional, psychologic and social influences**
 - 4. **Homeostasis as a dynamic steady state**
 - a. **Definitions**
 - (1) **Dynamic steady state**
 - (2) **Turnover**
 - b. **Reaction of body to stressors**
 - B. **Stress responses**
 - 1. **Psychoneuroimmunologic response**
 - a. **Interaction of consciousness, brain and central nervous system, and the body's defense mechanisms**
 - b. **Stress response**
 - 2. **Neuroendocrine regulation**
 - a. **Catecholamines**

- (1) Components
 - (a) Epinephrine
 - (b) Norepinephrine
 - (2) Physiologic actions of alpha and beta receptors
 - (a) Alpha₁
 - (b) Alpha₂
 - (c) Beta₁
 - (d) Beta₂
 - (3) Physiologic effects of catecholamines
 - (a) Brain
 - (b) Cardiovascular
 - (c) Pulmonary
 - (d) Muscle
 - (e) Liver
 - (f) Adipose Tissue
 - (g) Skin
 - (h) Skeleton
 - (i) G.I. and G.U. systems
 - (j) Lymphoid tissue
- b. Cortisol
- (1) Source
 - (2) Primary effects of cortisol
 - (a) Stimulation of gluconeogenesis
 - (b) Formation of glycogen
 - (c) Cortisol effects on cell-mediated immunity
 - (3) Other physiologic effects of cortisol
 - (a) Protein metabolism
 - (b) Digestive function
 - (c) Urinary function
 - (d) Connective tissue function
 - (e) Muscle function
 - (f) Bone function
 - (g) Vascular system and myocardial function
 - (h) Central nervous system function
- c. Other hormones
- (1) Endorphins
 - (2) Growth hormone
 - (3) Prolactin
 - (4) Testosterone
- d. Role of the immune system
- (1) Interaction of immune, nervous, and endocrine systems during a stress response
 - (2) Influence of stress response on immune system
 - (3) Relationship between stress and immune-related conditions and diseases
 - (a) Cardiovascular
 - (b) Muscles
 - (c) Connective tissue
 - (d) Pulmonary system

- (e) Immune system
 - (f) G.I. system
 - (g) G.U. system
 - (h) Skin
 - (i) Endocrine system
 - (j) Central nervous system
- C. Stress, coping, and illness interrelationships
- 1. Stress as interdependent processes
 - a. Definition of physiologic stress and psychologic distress
 - b. Effects of psychologic distress
 - c. Relationship between distress and immune dysfunction
 - 2. Potential stress effects on
 - a. Healthy individuals
 - (1) Ineffective coping
 - (2) Effective coping
 - b. Symptomatic individuals
 - (1) Ineffective coping
 - (2) Effective coping
 - c. Medical interventions
 - (1) Ineffective coping
 - (2) Effective coping

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McCance, K.L., Heuther, S.E., (1994). *Pathophysiology: The Biological Basis for Disease in Adults and Children* (2nd ed.) St. Louis: Mosby-Yearbook.

UNIT TERMINAL OBJECTIVE

- 1-7 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles of pharmacology and the assessment findings to formulate a field impression and implement a pharmacologic management plan.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 1-7.1 Describe historical trends in pharmacology. (C-1)
- 1-7.2 Differentiate among the chemical, generic (nonproprietary), and trade (proprietary) names of a drug. (C-3)
- 1-7.3 List the four main sources of drug products. (C-1)
- 1-7.4 Describe how drugs are classified. (C-1)
- 1-7.5 List the authoritative sources for drug information. (C-1)
- 1-7.6 List legislative acts controlling drug use and abuse in the United States. (C-1)
- 1-7.7 Differentiate among Schedule I, II, III, IV, and V substances. (C-3)
- 1-7.8 List examples of substances in each schedule. (C-1)
- 1-7.9 Discuss standardization of drugs. (C-1)
- 1-7.10 Discuss investigational drugs, including the Food and Drug Administration (FDA) approval process and the FDA classifications for newly approved drugs. (C-1)
- 1-7.11 Discuss special consideration in drug treatment with regard to pregnant, pediatric and geriatric patients. (C-1)
- 1-7.12 Discuss the paramedic's responsibilities and scope of management pertinent to the administration of medications. (C-1)
- 1-7.13 Review the specific anatomy and physiology pertinent to pharmacology with additional attention to autonomic pharmacology. (C-1)
- 1-7.14 List and describe general properties of drugs. (C-1)
- 1-7.15 List and describe liquid and solid drug forms. (C-1)
- 1-7.16 List and differentiate routes of drug administration. (C-3)
- 1-7.17 Differentiate between enteral and parenteral routes of drug administration. (C-3)
- 1-7.18 Describe mechanisms of drug action. (C-1)
- 1-7.19 List and differentiate the phases of drug activity, including the pharmaceutical, pharmacokinetic, and pharmacodynamic phases. (C-3)
- 1-7.20 Describe the process called pharmacokinetics, pharmacodynamics, including theories of drug action, drug-response relationship, factors altering drug responses, predictable drug responses, iatrogenic drug responses, and unpredictable adverse drug responses. (C-1)
- 1-7.21 Differentiate among drug interactions. (C-3)
- 1-7.22 Discuss considerations for storing and securing medications. (C-1)
- 1-7.23 List the component of a drug profile by classification. (C-1)
- 1-7.24 List and describe drugs that the paramedic may administer according to local protocol. (C-1)
- 1-7.25 Integrate pathophysiological principles of pharmacology with patient assessment. (C-3)
- 1-7.26 Synthesize patient history information and assessment findings to form a field impression. (C-3)
- 1-7.27 Synthesize a field impression to implement a pharmacologic management plan. (C-3)
- 1-7.28 Assess the pathophysiology of a patient's condition by identifying classifications of drugs. (C-3)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 1-7.29 Serve as a model for obtaining a history by identifying classifications of drugs. (A-3)

- 1-7.30 Defend the administration of drugs by a paramedic to affect positive therapeutic affect. (A-3)
1-7.31 Advocate drug education through identification of drug classifications. (A-3)

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

- I. Historical trends in pharmacology
 - A. Ancient health care
 - B. The pre- and post-renaissance period
 - C. Modern health care
 - D. The present period of change
 - E. New trends in health care and pharmaceuticals
 - 1. Expansion of consumer health education results from the consumer's motivation to take responsibility for their health and disease prevention
 - 2. Research is directed to discover new treatments, cures, or methods to prevent disease processes that limit growth, everyday living, or average life span
 - 3. Orphan drugs developed to treat rare and chronic diseases

- II. Names of drugs
 - A. Drugs - chemical agents used in the diagnosis, treatment, or prevention of disease
 - B. Pharmacology - the study of drugs and their actions on the body
 - C. Chemical name - a precise description of the drug's chemical composition and molecular structure
 - D. Generic name or non-proprietary name
 - 1. Official name approved by the FDA
 - 2. Usually suggested by the first manufacturer
 - E. Trade or proprietary name - the brand name registered to a specific manufacturer or owner
 - F. Official name - the name assigned by USP

- III. Sources of drugs
 - A. Plants
 - 1. Alkaloids
 - 2. Glycosides
 - 3. Gums
 - 4. Oils
 - B. Animals and humans
 - C. Minerals or mineral products
 - D. Chemical substances made in the laboratory

- IV. Drug Classification
 - A. Drugs are classified
 - 1. By body system
 - 2. Class of agent
 - 3. Mechanism of action

- V. Sources of drug information
 - A. AMA Drug Evaluation
 - B. Physician's Desk Reference (PDR)
 - C. Hospital Formulary (HF)
 - D. Drug inserts
 - E. Other texts, sources

- VI. United States drug legislation

- A. Purpose for drug legislation
 - 1. To protect the public from adulterated or mislabeled drugs
 - B. History of drug legislation and its effects
 - 1. Pure Food and Drug Act, 1906
 - 2. Harrison Narcotic Act, 1914
 - 3. Federal Food, Drug, and Cosmetic Act, 1938
 - C. Food and Drug Administration
- VII. Schedule of controlled substances
- A. Controlled Substances Act, 1970 (Comprehensive Drug Abuse Prevention and Control Act, 1970)
 - B. Purpose for scheduling controlled substances, based upon abuse potential
 - C. Classification of drugs into numbered levels or schedules (I to V)
 - D. Schedules
 - 1. Schedule I
 - a. High abuse potential
 - b. No currently accepted medical use
 - (1) For research, analysis, or instruction only
 - (2) May lead to severe dependence
 - c. Examples
 - (1) Heroin
 - (2) LSD
 - (3) Mescaline
 - 2. Schedule II
 - a. High abuse potential
 - b. Accepted medical uses; may lead to severe physical and/ or psychological dependence
 - c. Examples
 - (1) Opium
 - (2) Morphine
 - (3) Codeine
 - (4) Oxycodone
 - (5) Methadone
 - (6) Cocaine
 - (7) Secobarbital
 - 3. Schedule III
 - a. Less abuse potential than drugs in Schedules I and II
 - b. Accepted medical uses - may lead to moderate/ low physical dependence or high psychologic dependence
 - c. Examples
 - (1) Preparations containing limited opioid quantities, or combined with one or more active ingredients that are noncontrolled substances
 - (a) Acetaminophen with codeine
 - (b) Aspirin with codeine
 - 4. Schedule IV
 - a. Lower abuse potential compared to Schedule III
 - b. Accepted medical uses - may lead to limited physical or psychological dependence
 - c. Examples

- (1) Phenobarbital
 - (2) Diazepam
 - (3) Lorazepam
5. Schedule V
- a. Low abuse potential compared to schedule IV
 - b. Accepted medical uses - may lead to limited physical or psychologic dependence
 - c. Examples
 - (1) Medications, generally for relief of coughs or diarrhea, containing limited quantities of certain opioid controlled substances

VIII. Standardization of drugs

- A. Standardization is a necessity
- B. Techniques for measuring a drug's strength and purity
 - 1. Assay
 - 2. Bioassay
- C. The United States Pharmacopeia (USP)
 - 1. Official volumes of drug standards
- D. Other reference books and guides

IX. Investigational drugs

- A. Prospective drugs may take years to progress through the FDA testing sequence
 - 1. Animal studies to ascertain
 - a. Toxicity
 - b. Therapeutic index
 - c. Modes of absorption, distribution, metabolism (biotransformation), and excretion
 - 2. Human studies
- B. FDA approval process
 - 1. Phases of investigation
 - 2. New drug application
 - 3. Abbreviated new drug application
- C. FDA classifications for newly approved drugs, 1992
 - 1. Numerical classification
 - 2. Letter classification

X. Special considerations in drug therapy

- A. Pregnant patients
 - 1. Before using any drug during pregnancy, the expected benefits should be considered against the possible risks to the fetus
 - 2. The FDA has established a scale (Categories A, B, C, D, and X) to indicate drugs that may have documented problems in animals and/ or humans during pregnancy
 - 3. Many drugs are unknown to cause problems in animals and/ or humans during pregnancy
 - 4. Pregnancy causes a number of anatomical and physiological changes
 - 5. Drugs may cross the placenta or through lactation
- B. Pediatric patients
 - 1. Based on the child's weight or body surface area
 - 2. Special concerns for neonates
 - 3. Length-based resuscitation tape
- C. Geriatric patients

1. The physiological effects of aging can lead to altered pharmacodynamics and pharmacokinetics
- XI. The scope of management
- A. Paramedics are held responsible for safe and therapeutically effective drug administration
 - B. Paramedics are personally responsible - legally, morally, and ethically - for each drug they administer
 - C. Paramedics
 1. Use correct precautions and techniques
 2. Observe and document the effects of drugs
 3. Keep their knowledge base current to changes and trends in pharmacology
 4. Establish and maintain professional relationships
 5. Understand pharmacology
 6. Perform evaluation to identify drug indications and contraindications
 7. Seek drug reference literature
 8. Take a drug history from their patients including:
 - a. Prescribed medications
 - (1) Name
 - (2) Strength
 - (3) Daily dosage
 - b. Over-the-counter medications
 - c. Vitamins
 - d. Drug reactions
 9. Consult with medical direction
- XII. Autonomic pharmacology
- A. Nervous system organization and function
 1. Characteristics of nervous system components
 - a. Central nervous system
 - b. Peripheral nervous system
 - c. Somatic system
 - d. Autonomic nervous system (ANS)
 - e. Sympathetic branch of ANS
 - f. Parasympathetic branch of ANS
 - B. Peripheral nervous system characteristics
 - C. Autonomic nervous system characteristics
 1. Parasympathetic and sympathetic characteristics
 2. Autonomic antagonists
 3. Physiological antagonism between sympathetic and parasympathetic discharge - organ responses
 - D. Direction of sympathetic influences
 - E. Neurochemical transmission
 1. Events involved in neurochemical transmission
 2. Activities within the synapse
 3. Synthesis of acetylcholine
 - F. Other receptors
 1. Catecholamines and related substances
 - a. Dopamine

- b. Norepinephrine
 - c. Epinephrine
 - d. Serotonin
 - 2. Agonist-gated ion channel receptors and G-protein-linked receptors
 - 3. Neuroactive peptides
 - a. Endorphins
 - G. Effector cell response
 - 1. Second messenger cellular amplification systems
 - 2. Receptor down-regulation
 - 3. Receptor up-regulation
 - H. Termination of neurotransmission
 - I. Altering neurotransmission with drugs
 - 1. Modification of chemical transmission by drugs
 - J. Receptor location and selective drug action
 - 1. Autonomic neurotransmitters
 - 2. Acetylcholine (cholinergic) receptor locations
 - 3. Norepinephrine (adrenergic) receptor locations
 - K. Selective drug action - nicotinic and muscarinic receptors
 - 1. Nicotinic receptor locations
 - 2. Muscarinic receptor locations
 - L. Biological model systems and receptor characterization
 - M. Receptor structure
 - N. Synaptic control mechanisms
- XIII. General properties of drugs
 - A. Drugs do not confer any new functions on a tissue or organ in the body, they only modify existing functions
 - B. Drugs in general exert multiple actions rather than a single effect
 - C. Drug action results from a physiochemical interaction between the drug and a functionally important molecule in the body
 - D. Drugs that interact with a receptor to stimulate a response are known as agonists
 - E. Drugs that attach to a receptor but do not stimulate a response are called antagonists
 - F. Drugs that interact with a receptor to stimulate a response, but inhibit other responses are called partial agonists
 - G. Once administered, drugs go through four stages
 - 1. Absorption
 - 2. Distribution
 - 3. Metabolism
 - 4. Excretion
- XIV. Drug forms
 - A. Liquid drugs
 - 1. Solutions
 - 2. Tinctures
 - 3. Suspensions
 - 4. Spirits
 - 5. Emulsions
 - 6. Elixirs

- 7. Syrups
 - B. Solid drug forms
 - 1. Pills
 - 2. Powders
 - 3. Tablets
 - 4. Suppositories
 - 5. Capsules
 - C. Gas forms
- XV. Overview of the routes of drug administration
- A. The mode of drug administration affects the rate at which onset of action occurs and may affect the therapeutic response that results
 - B. The choice of the route of administration is crucial in determining the suitability of a drug
 - C. Drugs are given for either their local or systemic effects
 - D. The routes of drug administration are categorized as
- XVI. Routes of medication administration
- A. Inhalation route (nebulized medications)
 - B. Enteral (drugs administered along any portion of the gastrointestinal tract)
 - a. Sublingual
 - b. Buccal
 - c. Oral
 - d. Rectal
 - e. Nasogastric
 - C. Parenteral (any medication route other than the alimentary canal)
 - a. Subcutaneous
 - b. Intramuscular
 - c. Intravenous
 - d. Intrathecal
 - e. Pulmonary
 - f. Intralingual
 - g. Intradermal
 - h. Transdermal
 - i. Umbilical
 - j. Intraosseous
 - k. Nasal
 - D. Endotracheal
- XVII. Mechanisms of drug action
- A. To produce optimal desired or therapeutic effects, a drug must reach appropriate concentrations at its site of action
 - B. Molecules of the chemical compound must proceed from point of entry into the body to the tissues with which they react
 - C. The magnitude of the response depends on the dosage and the time course of the drug in the body
 - D. Concentration of the drug at its site of action is influenced by various processes, which are divided into three phases of drug activity
 - 1. Pharmaceutical

- a. Disintegration of dosage form
- b. Dissolution of drug
- 2. Pharmacokinetic
 - a. Absorption
 - b. Distribution
 - c. Metabolism
 - d. Excretion
- 3. Pharmacodynamic
 - a. Drug-receptor interaction

XVIII. Pharmacokinetics

- A. Passive transport
- B. Active transport
- C. Absorption
 - 1. Variables that affect drug absorption
 - a. Nature of the absorbing surface
 - b. Blood flow to the site of administration
 - c. Solubility of the drug
 - d. pH
 - e. Drug concentration
 - f. Dosage form
 - g. Routes of drug administration
 - h. Bioavailability
 - 2. Mechanisms involved in absorption
 - a. Diffusion
 - b. Osmosis
 - c. Filtration
- D. Distribution
 - 1. Drug reservoirs
 - a. Plasma protein binding
 - b. Tissue binding
 - 2. Barriers to drug distribution
 - a. Blood-brain barrier
 - b. Placental barrier
- E. Biotransformation
 - 1. Active metabolites
 - 2. Inactive metabolites
- F. Excretion
 - 1. Organs of excretion
 - a. Kidneys
 - b. Intestine
 - c. Lungs
 - d. Sweat and salivary glands
 - e. Mammary glands

XIX. Pharmacodynamics

- A. Theories of drug action - most drugs produce their effects by one of the following ways
 - 1. Drug-receptor interaction

- a. Agonists
- b. Antagonists
- c. Affinity
- d. Efficacy
- e. Types of receptors
 - (1) Beta₁
 - (2) Beta₂
 - (3) Alpha₁
 - (4) Alpha₂
 - (5) Dopaminergic
 - (6) Others
- 2. Drug-enzyme interaction
- 3. Nonspecific drug interaction
- B. Drug-response relationship
 - 1. Plasma level profile of a drug
 - 2. Biologic half-life
 - 3. Therapeutic threshold or minimum effective concentration
 - 4. Therapeutic index
- C. Factors altering drug responses
 - 1. Age
 - 2. Body mass
 - 3. Sex
 - 4. Environmental milieu
 - 5. Time of administration
 - 6. Pathologic state
 - 7. Genetic factors
 - 8. Psychologic factors
- D. Predictable responses
 - 1. Desired action
 - 2. Side effects
- E. Iatrogenic responses (adverse effects produced unintentionally)
- F. Unpredictable adverse responses
 - 1. Drug allergy (medications frequently implicated in allergic reactions)
 - 2. Anaphylactic reaction
 - 3. Delayed reaction ("serum sickness")
 - 4. Hypersensitivity
 - 5. Idiosyncrasy
 - 6. Tolerance
 - 7. Cross tolerance
 - 8. Tachyphylaxis
 - 9. Cumulative effect
 - 10. Drug dependence
 - 11. Drug interaction
 - 12. Drug antagonism
 - 13. Summation (addition or additive effect)
 - 14. Synergism
 - 15. Potentiation
 - 16. Interference

XX. Drug interactions

- A. Variables influencing drug interaction include
 - 1. Intestinal absorption
 - 2. Competition for plasma protein binding
 - 3. Drug metabolism or biotransformation
 - 4. Action at the receptor site
 - 5. Renal excretion
 - 6. Alteration of electrolyte balance
- B. Drug-drug interactions
- C. Other drug interactions
 - 1. Drug-induced malabsorption of foods and nutrients
 - 2. Food-induced malabsorption of drugs
 - 3. Alteration of enzymes
 - 4. Alcohol consumption
 - 5. Cigarette smoking
 - 6. Food-initiated alteration of drug excretion
- D. Drug incompatibilities - occur when drugs are mixed before administration

XXI. Drug storage

- A. Certain precepts should guide the manner in which drugs are secured, stored, distributed, and accounted for
- B. Refer to local protocol
- C. Drug potency can be affected by
 - 1. Temperature
 - 2. Light
 - 3. Moisture
 - 4. Shelf life
- D. Applies also to diluents
- E. Security of controlled medications
 - 1. Procedures and other measures to ensure the security of controlled medications

XXII. Components of a drug profile

- A. Drug names
- B. Classification
- C. Mechanisms of action
- D. Indications
- E. Pharmacokinetics
- F. Side/ adverse effects
- G. Routes of administration
- H. How supplied
- I. Dosages
- J. Contraindications
- K. Considerations for pediatric patients, geriatric patients, pregnant patients, and other special patient groups
- L. Other profile components

XXIII. Drugs by classifications

- A. Analgesics and antagonists
 - 1. Nonprescription analgesic-antipyretics
 - 2. Opioid analgesics-agonists
 - 3. Adjuvant medications
 - 4. Opioid antagonists
 - 5. Opioid agonist-antagonist agents
- B. Anesthetics
 - 1. Anesthesia
 - 2. Significant drug interactions
 - 3. Special anesthesia considerations
 - 4. Types of anesthetics
 - a. Inhalation anesthetics
 - b. Intravenous anesthetics
 - c. Ultra-short-acting barbiturates
 - d. Dissociative anesthetic
 - e. Neuroleptanesthesia
 - 5. Local anesthesia
 - a. Surface or topical anesthesia
 - 6. Anesthesia by injection
- C. Antianxiety, sedative, and hypnotic drugs
 - 1. Physiology of sleep
 - 2. Benzodiazepines
 - 3. Benzodiazepine antidote
 - 4. Barbiturates
 - 5. Miscellaneous sedatives and hypnotics
 - a. Antianxiety agents/ sedatives
 - b. Hypnotics
- D. Anticonvulsants
 - 1. Anticonvulsant therapy
 - 2. Hydantoins
 - 3. Barbiturates
 - 4. Succinimides
 - 5. Diones
 - 6. Benzodiazepines
 - 7. Other Anticonvulsants
- E. Central nervous system stimulants
 - 1. Anorexiant drugs
 - 2. Amphetamines
 - 3. Other central nervous system stimulants
- F. Psychotherapeutic drugs
 - 1. The central nervous system and emotions
 - 2. The role of drug therapy in psychiatry
 - 3. Antipsychotic or neuroleptic agents
 - a. Phenothiazine derivatives
 - b. Butyrophenone derivatives
 - c. Dihydroindolone derivatives
 - d. Dibenzoxapine derivatives
 - 4. Antidepressant therapy

- a. Monoamines
 - b. Tricyclic antidepressants
 - c. Monoamine oxidase inhibitor antidepressants
 - d. Antimanic drugs
- G. Drugs for specific CNS-peripheral dysfunctions
- 1. Parkinson's disease
 - 2. Drugs with central anticholinergic activity
 - a. Anticholinergic agents
 - b. Drugs affecting brain dopamine
 - (1) Drugs that increase brain levels of dopamine
 - (2) Dopamine-releasing drug
 - (3) Dopaminergic agonists
 - c. Monoamine oxidase inhibitor
- H. Drugs affecting the parasympathetic nervous system
- 1. Cholinergic drugs
 - a. Direct-acting cholinergic drugs (choline esters)
 - b. Indirect-acting cholinergic drugs
 - c. Drugs used to treat myasthenia gravis
 - 2. Cholinergic blocking drugs
 - a. Muscarinic blocking drugs
 - b. Belladonna alkaloids
 - c. Synthetic substitutes for atropine
 - 3. Ganglionic stimulating drugs
 - a. Nicotine
 - 4. Ganglionic blocking drugs
- I. Drugs affecting the sympathetic (adrenergic) nervous system
- 1. Adrenergic drugs
 - a. Direct-acting adrenergic drugs
 - (1) Catecholamines
 - b. Drugs used for hypoperfusion
 - c. Indirect- and dual-acting adrenergic drugs
 - 2. Adrenergic blocking drugs
 - a. Alpha-adrenergic blocking drugs
 - b. Noncompetitive, long-acting antagonists
 - c. Competitive, short-acting antagonists
 - d. Beta-adrenergic blocking agents
- J. Skeletal muscle relaxants
- 1. Central-acting skeletal muscle relaxants
 - 2. Direct-acting skeletal muscle relaxants
- K. Drugs affecting the cardiovascular system
- 1. Antidysrhythmics
 - a. Group I-A Drugs
 - b. Group I-B Drugs
 - c. Group I-C Drugs
 - d. Group I Drugs (A, B, C)
 - e. Group II Drugs
 - f. Group III Drugs
 - g. Group IV Drugs (miscellaneous drug group)

- 2. Antihypertensives
 - a. Diuretic drugs
 - (1) Thiazides
 - (2) Loop diuretics
 - (3) Potassium-sparing agents
 - b. Adrenergic inhibiting (sympatholytic) agents
 - (1) Beta-adrenergic blocking agents
 - (2) Centrally-acting adrenergic inhibitors
 - (3) Peripheral adrenergic inhibitors
 - (4) Rauwolfia derivatives
 - (5) Alpha-adrenergic blocking drugs
 - c. Angiotensin-converting enzyme inhibitors
 - d. Calcium channel blocking agents
 - e. Vasodilators
 - (1) Arteriolar dilator drugs
 - (2) Arterial and venous dilator drugs
 - f. Ganglionic blocking drugs
 - g. Monoamine oxidase inhibiting drugs
 - 3. Cardiac glycosides
 - a. Digitalis glycosides
 - b. Miscellaneous agents
 - 4. Calcium channel blockers
 - 5. Vasodilators
 - a. Antianginal drugs
 - b. Nitrates
 - c. Drugs for peripheral occlusive arterial disease
 - d. Other vasodilating agents
 - 6. Antihemorrhagic agents
- L. Anticoagulants, thrombolytics, and blood components
- 1. Anticoagulant drugs
 - a. Parenteral anticoagulant drugs
 - b. Parenteral anticoagulant antagonists
 - c. Oral anticoagulant therapy
 - d. Oral anticoagulant antagonist - vitamin K
 - 2. Thrombolytic therapy
 - 3. Antihemophilic agents
 - 4. Hemostatic agents
 - 5. Blood and blood components
 - a. Replacement therapies
- M. Antihyperlipidemic drugs
- N. Diuretics
- 1. Proximal tubule diuretics
 - 2. Diluting segment diuretics (thiazide and thiazide-type drugs)
 - 3. Loop diuretics
 - 4. Distal tube diuretics/ potassium-sparing diuretics
 - 5. Osmotic diuretics
 - 6. Diuretic combinations
- O. Drug therapy for renal system dysfunction

- P. Mucokinetic and bronchodilator drugs
 - 1. Mucokinetic drugs
 - a. Diluents
 - b. Aerosol therapy
 - c. Mucolytic drugs
 - d. Drugs that antagonize bronchial secretions
 - 2. Bronchodilator drugs
 - a. Sympathomimetic drugs
 - (1) Nonselective adrenergic drugs
 - (2) Nonselective beta-adrenergic drugs
 - (3) Selective beta₂ receptor drugs
 - (4) Catecholamine beta₂ receptor agents
 - (5) Noncatecholamine beta₂ receptor drugs
 - 3. Xanthine derivatives
 - 4. Prophylactic asthmatic drugs
 - a. Inhalation corticosteroid therapy
- Q. Oxygen and miscellaneous respiratory agents
 - 1. Drugs that affect the respiratory center
 - a. Oxygen therapy
 - b. Direct respiratory stimulants
 - c. Reflex respiratory stimulants
 - d. Respiratory depressants
 - 2. Cough suppressants
 - a. Opioid antitussive drugs
 - b. Nonopioid antitussive drugs
 - 3. Nasal decongestants
 - 4. Antihistamines
 - 5. Serotonin
 - 6. Antiserotonin
- R. Drugs affecting the gastrointestinal system
 - 1. Drugs that affect the stomach
 - a. Antacid combinations
 - b. Antiflatulents
 - c. Digestants
 - d. Antiemetics
 - e. Cannabinoids
 - f. Emetic agents
 - g. Cytoprotective agents
 - h. H₂ receptor antagonists
 - 2. Drugs affecting the lower gastrointestinal tract
 - a. Laxatives
 - b. Antidiarrheals
- S. Ophthalmic drugs
 - 1. Antiglaucoma agents
 - 2. Mydriatic and cycloplegic agents
 - 3. Antiinfective/ antiinflammatory agents
 - 4. Topical anesthetic agents
 - 5. Other ophthalmic preparations

- T. Drugs affecting the ear
 - 1. Antibiotic ear preparations
 - 2. Steroid and antibiotic combinations
 - 3. Miscellaneous preparations
- U. Drugs affecting the pituitary
 - 1. Anterior pituitary hormones
 - 2. Posterior pituitary hormones
- V. Drugs affecting the parathyroid and thyroid
 - 1. Thyroid preparations
 - 2. Antithyroid agents
 - 3. Iodine products
 - 4. Thiomide derivatives
- W. Drugs affecting the adrenal cortex
 - 1. Glucocorticoids
 - 2. Mineralocorticoids
 - 3. Antiadrenals (adrenal steroid inhibitors)
- X. Drugs affecting the pancreas
 - 1. Insulin preparations
 - 2. Oral hypoglycemic agents
 - 3. Hyperglycemic agents
- Y. Drugs affecting the female reproductive system
 - 1. Female sex hormones
 - a. Estrogens
 - b. Progesterone and progestins
 - 2. Oral contraceptives
 - 3. Ovulatory stimulants and drugs used for infertility
- Z. Drugs for labor and delivery
 - 1. Drugs affecting the uterus
 - a. Oxytocics
 - b. Premature labor inhibitors
- AA. Drugs affecting the male reproductive system
 - 1. Testosterone
- BB. Drugs affecting sexual behavior
 - 1. Drugs used to impair libido and sexual gratification
 - 2. Drugs used to enhance libido and sexual gratification
- CC. Antineoplastic agents
- DD. Drugs used in infectious disease and inflammation
- EE. Antibiotics
 - 1. Penicillins
 - 2. Cephalosporins and related products
 - 3. Macrolide antibiotics
 - 4. Tetracyclines
 - 5. Miscellaneous antibiotics
- FF. Antifungal and antiviral drugs
 - 1. Antifungal drugs
 - 2. Antiviral drugs
- GG. Other antimicrobial drugs and antiparasitic drugs
 - 1. Antimalarial medications

- 2. Antituberculous agents
- 3. Antiamebiasis agents
- 4. Anthelmintic agents
- 5. Leprostatic agents
- HH. Nonsteroidal antiinflammatory drugs
- II. Uricosuric drugs
- JJ. Serums, vaccines, and other immunizing agents
- KK. Drugs affecting the immunologic system
 - 1. Immunosuppressants
 - 2. Immunomodulating agents
- LL. Dermatologic drugs
 - 1. General dermatologic preparations
 - 2. Prophylactic agents
- MM. Vitamins and minerals
 - 1. Vitamins
 - a. Fat-soluble vitamins
 - b. Water-soluble vitamins
 - 2. Minerals
- NN. Fluids and electrolytes
 - 1. Parenteral solutions
 - 2. Electrolytes
- OO. Antidotes/ overdoses
 - 1. Specific to the type of poison
 - a. Elimination

UNIT TERMINAL OBJECTIVE

1-8 At the completion of this unit, the paramedic student will be able to safely and precisely access the venous circulation and administer medications.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 1-8.1 Review the specific anatomy and physiology pertinent to medication administration. (C-1)
- 1-8.2 Review mathematical principles. (C-1)
- 1-8.3 Review mathematical equivalents. (C-1)
- 1-8.4 Differentiate temperature readings between the Centigrade and Fahrenheit scales. (C-3)
- 1-8.5 Discuss formulas as a basis for performing drug calculations. (C-1)
- 1-8.6 Discuss applying basic principles of mathematics to the calculation of problems associated with medication dosages. (C-1)
- 1-8.7 Describe how to perform mathematical conversions from the household system to the metric system. (C-1)
- 1-8.8 Describe the indications, equipment needed, technique used, precautions, and general principles of peripheral venous or external jugular cannulation. (C-1)
- 1-8.9 Describe the indications, equipment needed, technique used, precautions, and general principles of intraosseous needle placement and infusion. (C-1)
- 1-8.10 Discuss legal aspects affecting medication administration. (C-1)
- 1-8.11 Discuss the "six rights" of drug administration and correlate these with the principles of medication administration. (C-1)
- 1-8.12 Discuss medical asepsis and the differences between clean and sterile techniques. (C-1)
- 1-8.13 Describe use of antiseptics and disinfectants. (C-1)
- 1-8.14 Describe the use of universal precautions and body substance isolation (BSI) procedures when administering a medication. (C-1)
- 1-8.15 Differentiate among the different dosage forms of oral medications. (C-3)
- 1-8.16 Describe the equipment needed and general principles of administering oral medications. (C-3)
- 1-8.17 Describe the indications, equipment needed, techniques used, precautions, and general principles of administering medications by the inhalation route. (C-3)
- 1-8.18 Describe the indications, equipment needed, techniques used, precautions, and general principles of administering medications by the gastric tube. (C-3)
- 1-8.19 Describe the indications, equipment needed, techniques used, precautions, and general principles of rectal medication administration. (C-3)
- 1-8.20 Differentiate among the different parenteral routes of medication administration. (C-3)
- 1-8.21 Describe the equipment needed, techniques used, complications, and general principles for the preparation and administration of parenteral medications. (C-1)
- 1-8.22 Differentiate among the different percutaneous routes of medication administration. (C-3)
- 1-8.23 Describe the purpose, equipment needed, techniques used, complications, and general principles for obtaining a blood sample. (C-1)
- 1-8.24 Describe disposal of contaminated items and sharps. (C-1)
- 1-8.25 Synthesize a pharmacologic management plan including medication administration. (C-3)
- 1-8.26 Integrate pathophysiological principles of medication administration with patient management. (C-3)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 1-8.27 Comply with paramedic standards of medication administration. (A-1)

- 1-8.28 Comply with universal precautions and body substance isolation (BSI). (A-1)
- 1-8.29 Defend a pharmacologic management plan for medication administration. (A-3)
- 1-8.30 Serve as a model for medical asepsis. (A-3)
- 1-8.31 Serve as a model for advocacy while performing medication administration. (A-3)
- 1-8.32 Serve as a model for disposing contaminated items and sharps. (A-3)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 1-8.33 Use universal precautions and body substance isolation (BSI) procedures during medication administration. (P-2)
- 1-8.34 Demonstrate cannulation of peripheral or external jugular veins. (P-2)
- 1-8.35 Demonstrate intraosseous needle placement and infusion. (P-2)
- 1-8.36 Demonstrate clean technique during medication administration. (P-3)
- 1-8.37 Demonstrate administration of oral medications. (P-2)
- 1-8.38 Demonstrate administration of medications by the inhalation route. (P-2)
- 1-8.39 Demonstrate administration of medications by the gastric tube. (P-2)
- 1-8.40 Demonstrate rectal administration of medications. (P-2)
- 1-8.41 Demonstrate preparation and administration of parenteral medications. (P-2)
- 1-8.42 Demonstrate preparation and techniques for obtaining a blood sample. (P-2)
- 1-8.43 Perfect disposal of contaminated items and sharps. (P-3)

DECLARATIVE

- I. Review of mathematical principles
 - A. Multiplication and division
 - B. Roman numerals
 - C. Fractions
 - D. Decimal fractions
 - E. Proportions
 - F. Percent

- II. Mathematical equivalents used in pharmacology
 - A. The metric system
 - B. Conversions between the household and metric system
 - C. Fahrenheit scale for temperature reading
 - D. Celsius (centigrade) scale for temperature reading
 - E. Converting between Fahrenheit and Celsius temperatures

- III. Calculating drug dosages
 - A. Calculation methods
 - 1. Fraction method
 - 2. Ratio method
 - 3. Desired dose over available concentration method
 - B. Calculating dosages
 - 1. Oral medications
 - a. Capsules and tablets
 - b. Liquids
 - 2. Parenteral medications
 - a. Quantity (typically weight)
 - b. Volume
 - c. Units (e.g., insulin)
 - 3. Intravenous infusions
 - a. Flow rates
 - b. Flow rates for infants and children
 - c. Total infusion time
 - d. Other factors influencing flow rates
 - 4. Calculating dosages for infants and children
 - a. Body weight
 - b. Body surface area (BSA)
 - c. Use of tables, charts, and other adjuncts
 - d. Length-based resuscitation tapes

- IV. Medical direction
 - A. Medication administration is bound by the paramedic's on-line or off-line medical direction
 - B. Role of the medical director
 - C. Patient management protocols
 - 1. Written standing orders
 - D. Legal considerations - policies and procedures which specify regulations of medication administration

- V. Principles of medication administration
 - A. Local drug distribution system - policies which establish stocking and supply of drugs
 - B. Paramedic's responsibility associated with the drug order
 - 1. Verification of the drug order
 - C. The "six rights" of medication administration
 - 1. "Right" patient
 - 2. "Right" drug
 - 3. "Right" dose
 - 4. "Right" route
 - 5. "Right" time
 - 6. "Right" documentation

- VI. Medical asepsis
 - A. Clean technique versus sterile technique
 - B. Sterilization
 - C. Antiseptics
 - D. Disinfectants

- VII. Universal precautions and body substance isolation (BSI) in medication administration

- VIII. Venous access
 - A. Intravenous cannulation
 - 1. General principles
 - 2. Types
 - a. Peripheral
 - (1) General principles
 - (2) Indications
 - (3) Precautions
 - (4) Equipment
 - (5) Technique
 - (a) Extremity
 - i) Indications
 - ii) Precautions
 - iii) Equipment
 - iv) Procedure
 - (b) External jugular
 - i) Indications
 - ii) Precautions
 - iii) Equipment
 - iv) Procedure
 - b. Central
 - B. Intraosseous needle placement and infusion
 - 1. General Principles
 - 2. Indications
 - 3. Precautions
 - 4. Equipment
 - 5. Technique

- IX. Medication administration by the inhalation route
 - A. Bronchodilators (beta agonist) medications
 - 1. Other medications
 - B. Equipment
 - 1. Oxygen or compressed air source
 - 2. Small volume nebulizer (SVN)
 - a. Other inhaler equipment
 - b. Other adapter equipment
 - c. Modified inhaler equipment
 - C. Administering medications by the inhalation route
 - 1. Indications
 - 2. Techniques
 - 3. Precautions
 - 4. General principles of administering medications by the inhalation route

- X. Enteral medication administration
 - A. Oral administration of medications
 - 1. Dosage forms of solid-form and liquid-form oral medications
 - a. Capsules
 - b. Time-released capsules
 - c. Lozenges
 - d. Pills
 - e. Tablets
 - f. Elixirs
 - g. Emulsions
 - h. Suspensions
 - i. Syrups
 - 2. Equipment
 - a. Souffle cup
 - b. Medicine cup
 - c. Medicine dropper
 - d. Teaspoons
 - e. Oral syringes
 - f. Nipples
 - 3. General principles for administration of solid-form and liquid-form oral medications
 - B. Administration of medications by the gastric tube
 - 1. Indications for administering medications by the gastric tube
 - a. Nasogastric tube
 - b. Orogastric tube
 - 2. Required equipment
 - 3. Techniques used
 - 4. Precautions
 - 5. General principles for administration of medications by the gastric tube
 - C. Rectal administration of medications
 - 1. Indications for rectal administration of medications
 - 2. Required equipment
 - 3. Techniques used
 - 4. Precautions

5. General principles for rectal administration of medications
- XI. Parenteral administration of medications
- A. Parenteral routes
 1. Intradermal
 2. Subcutaneous
 3. Intramuscular
 4. Intravenous
 5. Intraosseous
 6. Percutaneous
 - B. Reasons for parenteral administration of medications
 - C. Equipment used in parenteral administration of medications
 1. Syringes
 - a. Calibration of the syringe
 - b. Prefilled syringes
 2. Needles
 - a. Parts of the needle
 3. Selection of the syringe and needle
 4. Packaging of syringes and needles
 5. Packaging of parenteral medications
 - a. Ampules
 - b. Vials
 - c. Prefilled syringes
 - d. Other
 6. Intravenous (IV) administration sets
 - a. Various types
 - b. Macro drip chamber-type
 - c. Micro drip chamber-type
 - d. Variety of extensions and other pieces of equipment
 - e. Some IV administration sets are manufacturer specific
 7. Intravenous (IV) solutions
 - a. Types of containers
 - b. Variety of volumes
 8. "Piggyback" administration
 - a. Primary IV infusion
 - b. Secondary IV infusion
 - c. Related equipment to connect secondary infusion to primary infusion
 9. Volume control intravenous set
 - a. Various brands
 - D. Preparation of parenteral medication
 1. Equipment needed for preparing a parenteral medication
 2. Standard procedures for preparing all parenteral medications
 3. Guidelines for preparing medications
 - a. To prepare a medication from an ampule
 - b. Reconstitution of a sterile powder
 - c. Removal of a volume of liquid from a vial
 - d. Preparing a drug from a mix-o-vial
 - e. Preparing two medications in one syringe

- E. Administration of medication by the intradermal route
 1. Intradermal route: injections are made into the dermal layer of skin just below the epidermis
 2. Equipment needed for administration of a medication by the intradermal route
 3. Locate anatomical sites
 4. Technique for administration of medication by the intradermal route
 5. Documentation
- F. Administration of medication by the subcutaneous route
 1. Subcutaneous route: injections are made into the loose connective tissue between the dermis and muscle layer
 2. Equipment needed for administration of a medication by the subcutaneous route
 3. Locate anatomical sites
 - a. Upper arms
 - b. Anterior thighs
 - c. Abdomen
 - d. Sublingual
 4. Technique for administration of medication by the subcutaneous route
 5. Precautions
- G. Administration of medication by the intramuscular route
 1. Intramuscular route - injections are made by penetrating a needle through the dermis and subcutaneous tissue into the muscle layer
 2. Equipment needed for administration of a medication by the intramuscular route
 3. Locate anatomical sites for adults and children
 - a. Vastus lateralis muscle
 - b. Rectus femoris muscle
 - c. Gluteal area
 - d. Deltoid muscle
 4. Technique for administration of medication by the intramuscular route
 5. Precautions
- H. Administration of medication by the intravenous route
 1. Intravenous route
 - a. Places the drug directly into the bloodstream
 - b. Bypasses all barriers to drug absorption
 2. Drugs may be administered by direct injection with a needle and syringe, but more commonly drugs are given intermittently or by continuous infusion through an established peripheral or central line
 3. Purpose for a peripheral IV site
 4. Purpose for a central IV site
 5. Dosage forms for IV administration
 6. Equipment needed for administration of a medication by the peripheral or central IV route
 7. Anatomical sites for adults, children, and infants
 - a. Peripheral access
 - b. Central access
 8. General principles of IV medication administration
 9. Preparing an IV solution for infusion
 - a. Equipment
 - b. Technique
 - c. Warming or cooling an IV solution, as indicated
 10. Adding medication to an existing IV solution

11. Steps in performing venipuncture
12. Steps in performing administration of medications into an established IV line
13. Steps in performing administration of medication by a heparin lock
14. Steps in adding a medication to an IV bag, bottle, or volume control
15. Steps in adding a medication with a piggyback or secondary set
16. Steps in changing to the next container of IV solution
17. Steps in administering medication by a venous access device
 - a. Equipment
 - b. Technique
18. Steps to discontinue an intravenous infusion
 - a. Equipment
 - b. Technique
19. Steps in monitoring IV therapy
 - a. Various types of infusion pumps
20. Complications
 - a. Phlebitis or infection
 - b. Extravasation
 - c. Air in tubing
 - d. Circulatory overload and pulmonary edema
 - e. Allergic reaction
 - f. Pulmonary embolism
 - g. Failure to infuse properly
- I. Administration of percutaneous medications
 1. Percutaneous route - application of a medication for absorption through the mucous membranes or skin
 2. Factors which influence the amount of medication absorbed through the skin or mucous membranes
 3. Methods of percutaneous administration of medications
 4. Steps in preparing percutaneous medications
 5. Topical medications - applied directly to the area of skin requiring treatment
 - a. Common forms of topical medications
 - b. Steps in administering topical medications
 6. Administering medications to mucous membranes
 - a. Places where medications are commonly applied
 - (1) Under the tongue (sublingual)
 - (2) Against the cheek (buccal)
 - (3) In the eye
 - (4) In the nose
 - (5) In the ear
 - (6) Inhaled into the lungs
 - (a) Through an aerosol or nebulizer
 - (b) Through positive pressure ventilation
 - b. Dosage forms
 - (1) Tablets
 - (2) Drops
 - (3) Ointments
 - (4) Creams
 - (5) Suppositories

- (6) Metered-dose inhalers
 - c. Equipment needed for administration of each type of medication
 - d. Steps for the administration of the dosage form of medication to the place it is commonly applied
- J. Administration of medication by the intraosseous route
 - 1. Any solution or drug that can be administered intermittently or by continuous infusion can be administered by the intraosseous route
 - 2. Purpose for the intraosseous route
 - a. Shock
 - b. Status epilepticus
 - c. Other conditions
 - 3. Equipment needed
 - 4. Anatomical sites
 - 5. General principles of administering solution or medication administration via the intraosseous route
 - 6. Steps in establishing an intraosseous route for an IV solution or medication administration
 - 7. Steps in performing administration of medications by the intraosseous route
 - a. Need for injection of medication with saline flush
 - b. Need for administration of fluids
 - 8. Steps to discontinue an intraosseous infusion
 - a. Equipment
 - b. Technique
 - 9. Complications
 - a. Phlebitis or infection
 - b. Extravasation
 - c. Compartment syndrome
 - d. Fracture
 - e. Air embolism due to air in tubing
 - f. Pulmonary embolism due to marrow particles (bone and fat)
 - g. Circulatory overload and pulmonary edema
 - h. Allergic reaction
 - i. Failure to flush the intraosseous needle
 - j. Failure to infuse properly
- XII. Obtaining a blood sample
 - A. Purposes for obtaining a blood sample
 - B. Equipment needed for obtaining a blood sample
 - C. Locations from which to obtain a blood sample
 - 1. Anatomical sites
 - 2. From the established intravenous catheter
 - 3. Other locations
 - D. Steps to preparing equipment for obtaining a blood sample
 - E. Techniques for obtaining a blood sample
 - F. Complications
- XIII. Disposal of contaminated items and sharps
 - A. Follow local protocol for disposal of contaminated items and sharps

UNIT TERMINAL OBJECTIVE

- 1-9 At the completion of this unit, the paramedic student will be able to integrate the principles of therapeutic communication to effectively communicate with any patient while providing care.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 1-9.1 Define communication. (C-1)
- 1-9.2 Identify internal and external factors that affect a patient/ bystander interview conducted by a paramedic. (C-1)
- 1-9.3 Restate the strategies for developing patient rapport. (C-1)
- 1-9.4 Provide examples of open-ended and closed or direct questions. (C-1)
- 1-9.5 Discuss common errors made by paramedics when interviewing patients. (C-1)
- 1-9.6 Identify the nonverbal skills that are used in patient interviewing. (C-1)
- 1-9.7 Restate the strategies to obtain information from the patient. (C-1)
- 1-9.8 Summarize the methods to assess mental status based on interview techniques. (C-1)
- 1-9.9 Discuss the strategies for interviewing a patient who is unmotivated to talk. (C-1)
- 1-9.10 Differentiate the strategies a paramedic uses when interviewing a patient who is hostile compared to one who is cooperative. (C-3)
- 1-9.11 Summarize developmental considerations of various age groups that influence patient interviewing. (C-1)
- 1-9.12 Restate unique interviewing techniques necessary to employ with patients who have special needs. (C-1)
- 1-9.13 Discuss interviewing considerations used by paramedics in cross-cultural communications. (C-1)

AFFECTIVE OBJECTIVES

- 1-9.14 Serve as a model for an effective communication process. (A-3)
- 1-9.15 Advocate the importance of external factors of communication. (A-2)
- 1-9.16 Promote proper responses to patient communication. (A-2)
- 1-9.17 Exhibit professional non-verbal behaviors. (A-2)
- 1-9.18 Advocate development of proper patient rapport. (A-2)
- 1-9.19 Value strategies to obtain patient information. (A-2)
- 1-9.20 Exhibit professional behaviors in communicating with patients in special situations. (A-3)
- 1-9.21 Exhibit professional behaviors in communication with patient from different cultures. (A-3)

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

- I. Communication
 - A. Communication process
 - 1. Source
 - a. Common symbols
 - b. Clear format
 - c. Medium
 - (1) Written
 - (2) Verbal
 - (3) Other symbols
 - 2. Encoding
 - a. The act of placing a message in an understandable format
 - b. Procedure of translating a message into a code that is understood by sender and receiver
 - 3. Message
 - a. Code and format intended to deliver idea
 - 4. Decoding
 - a. Act of interpreting symbols and format
 - b. The decoding process can have many flaws
 - (1) Symbols or words sent in the message are not common to both parties
 - (2) Interpretation of message is based on different understandings of symbols or format
 - 5. Receiver
 - a. Person intended to understand message
 - b. In order for a message to be successful, the source must try to encode in a way the receiver understands
 - 6. Feedback
 - a. The response to a message
 - II. Internal factors for effective communication
 - A. Liking others
 - 1. Helping profession
 - 2. Genuine liking of people is necessary
 - 3. Understanding of human strengths and weaknesses
 - B. Empathy is viewing the world from another inner frame of reference while remaining yourself
 - C. Ability to listen
 - 1. Not passive role, but active
 - 2. Requires complete attention
 - 3. Requires practice
 - III. External factors for effective communication
 - A. Privacy
 - 1. Strive for privacy when interviewing
 - 2. Helps to eliminate inhibitions and distractions
 - B. Interruptions
 - 1. Attempt to avoid except when patient care information is being received from partners and is of a critical nature

- C. Physical environment
 - 1. Lighting
 - 2. Noise/ interference
 - 3. Distracting equipment
 - 4. Distance
 - a. Comfortable distance is 4 to 5 feet
 - b. Twice the patient's arms length away
 - c. "Personal space"
 - 5. Equal seating - eye level
 - D. Dress
 - 1. Appearance and clothing should be clean and meet conventional professional standards
 - 2. Easily identified as a paramedic
 - E. Note taking
 - 1. Look at the patient frequently
 - 2. Eyes should be on the patient as much as possible during an interview
- IV. Introducing the interview - the paramedic should remain calm and begin the interview with open-ended questions
- A. Open-ended questions
 - 1. Asked in a narrative form
 - 2. Encourages the patient to talk
 - 3. Doesn't restrict area of response
 - B. Closed or direct questions
 - 1. Ask for specific information
 - 2. One or two words and may be answered as "yes" or "no"
 - 3. Fill-in information left out in the narrative interview
 - 4. May provide specific facts
 - C. One question at a time
 - 1. The patient may not know which question to answer
 - 2. May leave out portions of the information or become confused
 - 3. Allow complete answers
 - D. Choose language the patient understands
- V. Responses
- A. Facilitation - encourages patient to provide more information
 - B. Silence - gives the patient more time to gather their thoughts
 - C. Reflection - echoing the patient's words back to them using slightly different words
 - D. Empathy - patient feels accepted and more open to talking
 - E. Clarification - used when the patient uses a word which is confusing to the paramedic
 - F. Confrontation - focusing patient's attention on one specific factor of interview
 - G. Interpretation
 - 1. Based upon observation or conclusion
 - 2. It links events, makes associations or implies a cause
 - H. Explanation - informing the patient and sharing factual or objective information
 - I. Summary
 - 1. Review of interview and interpretation of situation
 - 2. Open-ended to allow patient to clarify details
-

- VI. Traps of interviewing
 - A. Providing false assurance or reassurance
 - B. Giving advice
 - C. Authority
 - D. Using avoidance language
 - E. Distancing
 - F. Professional jargon
 - G. Leading or biased questions
 - H. Talking too much
 - I. Interrupting
 - J. Using "why" questions

 - VII. Non-verbal skills
 - A. Physical appearance
 - 1. Interviewer
 - a. Professional appearance, physically fit, and well groomed are important characteristics
 - b. Help gain patient's trust
 - 2. Patient
 - a. Note the patient's appearance, clothing, jewelry, and other physical signs
 - b. Will give you some indication of their condition
 - B. Posture and gestures
 - 1. Interviewer
 - a. Relaxed
 - b. Calm, slow motion
 - 2. Patient
 - a. Open position - arms extended and large muscles relaxed
 - b. Closed position - flexed arms and legs
 - 3. Gestures
 - a. Acceptance
 - (1) Nodding
 - (2) Open hands
 - b. Defensive or angry
 - (1) Shaking head
 - (2) Pointing
 - (3) Closed hands
 - 4. Facial expressions
 - a. Reflects a wide variety of relevant emotions and conditions
 - b. Indicate relaxation, relief, pain, fear, anger, sorrow, etc.
 - 5. Eye contact - lack of eye contact suggests the patient is shy, withdrawn, confused, bored, intimidated, apathetic or depressed
 - 6. Voice - intensity, rate of speech, pitch and tone of voice have meaning in communication
 - 7. Touch - the meaning of touch is influenced by the person's age, sex, cultural background, past experience and current setting

 - VIII. Developing patient rapport
 - A. Put the patient and yourself at ease - let the patient know you are on their side, that you respect their comments, and you are there to help them
-

1. Ask the patient their name and assure you can pronounce it correctly
2. Recognize signs
3. Respond to signs
4. Find the suffering and show compassion
5. Assess insight and become an ally
6. Show expertise

IX. Strategies to get information

- A. Patients generally communicate in three ways
 1. Pouring out the information (complaints)
 2. By revealing some problems but concealing embarrassing items
 3. Hiding the most embarrassing parts to both the paramedic and himself
- B. Obtaining information on complaints is accomplished based upon techniques of open-ended and closed or direct questions
 1. Resistance
 - a. Two main reasons for resistance
 - (1) The patient wishes to maintain an image
 - (2) The patient is uncertain about the paramedic's response and fear of rejection or ridicule
 - b. The paramedic must be non-judgmental if they expect to obtain information from the patient
 - c. Paramedics must be willing to talk with patients about any condition the patient may have
 2. Shifting focus
 - a. Approach a problem the patient does not want to talk about by shifting the focus away from the problem
 - b. Return focus to it from a different angle
 3. Defense mechanisms
 - a. Be aware of the patient's defense mechanisms
 - b. Anticipate them in advance
 - c. Confront them if necessary to obtain necessary medical information
 4. Distraction
 - a. When the patient is acting-out and hostile
 - b. Point out their behavior to them
 - c. Ask them if their behavior is their intention, and let them know this behavior is self-defeating

X. Methods to assess mental status during the interview

- A. Observation
 1. Appearance
 2. Consciousness
 3. Psychomotor movements
 4. Abnormal complex movements
- B. Conversation
 1. Orientation
 - a. Person
 - b. Place
 - c. Time

2. Speech
 - a. Note the speed of speech
 - b. Note the flow of speech
 3. Thinking
 4. Attention
 5. Concentration
 6. Comprehension
 7. Remote, recent and immediate memory
 - a. Memory of event
 - b. Long and short term memory
 8. Affect
 - a. Patient's emotional response to external and internal events
 9. Autonomic responses - sweating, trembling, etc.
 10. Facial movements - muscles around mouth, nose and eyes
 11. Reactive movements - made in response to novel movements such as looks at you when you are talking
 12. Grooming movements
 - a. Fixing hair
 - b. Straightening clothes
 - c. Indicate patient is uncomfortable
- C. Exploration - offers a method to review the patient's internal experiences
1. Mood
 2. Energy level
 3. Content of thinking
- XI. Special interview situations
- A. Patients unmotivated to talk
1. Most patients are more than willing to talk
 - a. Some will require more time and varying techniques to communicate with during an interview
 2. Difficult interviews stem from four sources
 - a. Patient's signs and symptoms may impact the ability to talk
 - b. The patient may fear talking with you due to psychological disorders, cultural differences or age
 - c. A cognitive impairment may be developing in the patient
 - d. The patient may intentionally want to deceive you
 3. Techniques to use - many are already known but they must be used in a special way with the patient who does not talk
 - a. Start the interview in the normal manner. When the patient does not talk, review the reason why you were called according to dispatch and take time to develop rapport with the patient.
 - b. Attempt to use open-ended questions
 - c. If unsuccessful, try direct questions
 - d. Provide some positive feedback to any responses by the patient
 - e. Make sure the patient understands the questions
 - (1) Language barriers
 - (2) Hearing difficulty
 - f. Continue to ask questions about the critical information you need to know to

- g. progress with treatment
 - h. You may not be able to obtain information about non-essential information
 - i. Ask family members or others at the scene if the patient has been non-communicative for a long time, attempt to rule out a pathology
 - j. Use summary and interpretation of events or conditions and ask the patient if your summary or interpretation is correct
 - k. See if you can get the patient to ask questions about your care, equipment, profession or any topic which will create conversation. If the patient does ask you questions make sure you answer them fully, not one word answers.
 - l. Don't be discouraged. You may not obtain all the information you are seeking. Observe affect and record information to establish a mental status baseline for later evaluations.
 - m. You may desire to ask questions that you already know the answer to establish the patient's credibility
- B. Interviewing a hostile patient
- 1. Closely monitor with overpowering force
 - 2. Be sure to stay far enough away from the patient, close to an exit
 - 3. Personal safety
 - 4. Never leave the patient alone without adequate assistance
 - 5. Use the same interviewing techniques
 - 6. Set limits and establish boundaries
 - 7. Tell the patient of the advantages of cooperation
 - 8. Be aware of local protocol for hostile patients, use of restraints, and psychological medications
- C. Developmental considerations when interviewing patients
- 1. Children - you must build rapport with two persons, the child and the parent
 - a. Begin conversations with both the child and parent
 - b. With younger children, 1 to 6 years old, focus most of your conversation with the parent
 - c. Offer the child toys or something to keep them occupied while you interview the parent
 - (1) Be aware you are collecting the child's history from a parent's point of view
 - (2) Your interview can put the parent on the defensive
 - (3) Be cautious not to be judgmental if the parents have not provided proper care or safety for the child before your arrival
 - (4) Be observant but not confrontational
 - d. Make contact with the child in a gradual approach as you are interviewing the parent
 - e. Speak to children at eye level
 - f. Use a quiet, calm voice
 - g. Be aware of your non-verbal communication
 - h. Be knowledgeable of communication with children according to their age group
 - (1) Infants
 - (a) Respond best to firm, gentle handling and a quiet calm voice
 - (b) Older infants may have stranger anxiety so keep the parent within their view
 - (2) Preschoolers

- (a) See the world only from their perspective
- (b) Use short sentences with concrete explanations
- (3) School aged children
 - (a) More objective and realistic
- (4) Adolescents
 - (a) Want to be adults
 - (b) Should not be communicated with as children
- D. The older adult- they are seeking the meaning of older age, dealing with disease and the inevitability of their death
 - 1. Address older adults always by their last name with Mr., Mrs., or Ms.
 - 2. Interviews usually take longer
 - 3. Fatigue
 - 4. Older patients may have physical disabilities that cause the interview to take longer
 - 5. Touch is a non-verbal skill that is important to older persons
- E. Hearing impaired patients
 - 1. Ask a deaf person their preferred method to communicate, either lip reading, signing, or writing
 - 2. Using writing is the best out-of-hospital method to communicate with the patient
 - 3. If they are lip reading be sure to face the patient squarely and have good lighting on your face
 - 4. Be aware that many hearing impaired patients will nod "yes" even if they do not understand what was asked
- F. Patients under the influence of street drugs or alcohol
 - 1. Ask simple or direct questions
 - 2. Do not be threatening, avoid confrontation
- G. Sexually aggressive patients
 - 1. Confront the patient so they are sure to understand your professional position and that you are a care giver
 - 2. Document any unusual occurrences with patients and have a witness to any of your actions or the incident and document their observations
 - 3. May want to consider "same sex" witness or tape recording all interaction in the back of the ambulance
- H. Transcultural considerations in communicating with patients
 - 1. Introduce yourself and the way in which you want to be called
 - a. By first name, last name, or title
 - b. Ask the patient to do the same
 - 2. Both the paramedic and the patient will bring cultural stereotypes to a professional relationship. The role of a family member in providing care must be understood and explained.
 - 3. Ethnocentrism - viewing your own life as the most desirable, acceptable or best and to act in a superior manner to another culture's way of life
 - 4. Cultural imposition - tendency to impose your beliefs, values, and patterns of behavior on individuals from another culture
 - 5. Space between the paramedic and the patient is important and varies among different cultures
 - a. Intimate zone
 - (1) 0 to 1.5 feet
 - (2) Visual distortion occurs

- (3) Best for assessing breath and other body odors
- b. Personal distance
 - (1) 1.5 to 4 feet
 - (2) Perceived as extension of self, voice is moderate, body odors are not apparent, no visual distortion
 - (3) Much of the physical assessment occurs at this distance
- c. Social distance
 - (1) 4 to 12 feet
 - (2) Used for impersonal business transactions, perceptual information much less detailed
 - (3) Much of a patient interview will occur at this distance
- d. Public distance
 - (1) 12+ feet
 - (2) Interaction with others is impersonal, speakers voice must be projected, subtle facial expressions imperceptible
- 6. Some cultures are more comfortable at a variety of spaces when communicating
- 7. Some cultures expect health care workers to have all the answers to their illness
- 8. Some cultures during illness or injury accept the sick role in different ways
- 9. Nonverbal communication such as handshaking and touching may be perceived differently in different cultures
- 10. Asian, Native Americans, Indochinese, and Arabs may consider direct eye contact impolite or aggressive and they may avert their eyes during an interview
- 11. Touch, especially between members of different culture groups may be of concern
- 12. Language - paramedics may encounter patients who do not speak the same language

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UNIT TERMINAL OBJECTIVE

- 1-10 At the completion of this unit, the paramedic student will be able to integrate the physiological, psychological, and sociological changes throughout human development with assessment and communication strategies for patients of all ages.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 1-10.1 Compare the physiological and psychosocial characteristics of an infant with those of an early adult. (C-3)
- 1-10.2 Compare the physiological and psychosocial characteristics of a toddler with those of an early adult. (C-3)
- 1-10.3 Compare the physiological and psychosocial characteristics of a pre-school child with those of an early adult. (C-3)
- 1-10.4 Compare the physiological and psychosocial characteristics of a school-aged child with those of an early adult. (C-3)
- 1-10.5 Compare the physiological and psychosocial characteristics of an adolescent with those of an early adult. (C-3)
- 1-10.6 Summarize the physiological and psychosocial characteristics of an early adult. (C-3)
- 1-10.7 Compare the physiological and psychosocial characteristics of a middle aged adult with those of an early adult. (C-3)
- 1-10.8 Compare the physiological and psychosocial characteristics of a person in late adulthood with those of an early adult. (C-3)

AFFECTIVE OBJECTIVES

- 1-10.9 Value the uniqueness of infants, toddlers, pre-school, school aged, adolescent, early adulthood, middle aged, and late adulthood physiological and psychosocial characteristics. (A-3)

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

- I. Infancy (birth to 1 year)
 - A. Physiological
 1. Vital signs
 - a) Heart rate
 - (1) 100 to 160 beats per minute during first 30 minutes
 - (2) Settling around 120 beats per minute
 - b) Respiratory
 - (1) Rate
 - (a) Initially 40 - 60
 - (b) Dropping to 30 - 40 after first few minutes of life
 - (c) Slowing to 20 - 30 by one year
 - (2) Tidal volume
 - (a) 6 - 8 ml/ kg initially
 - (b) Increasing to 10 - 15 ml/ kg by 1 year
 - c) Blood pressure
 - (1) Average systolic blood pressure increases from 70 at birth to 90 at 1 year
 - d) Temperature ranges
 - (1) 98 to 100 degrees Fahrenheit is the thermoneutral range
 2. Weight
 - a) Normally 3.0-3.5 kg. at birth
 - b) Normally drops 5-10% in the first week of life due to excretion of extracellular fluid
 - c) Exceed birth weight by second week
 - d) Grows at approximately 30 gm/day during the first month
 - e) Should double weight by 4-6 months
 - f) Should triple weight at 9-12 months
 - g) Infants head equal to 25% of the total body weight
 3. Cardiovascular system
 - a) Circulatory changes soon after birth
 - (1) Closing of the ductus arteriosus
 - (2) Closing of the ductus venosus
 - (3) Closing of the foramen ovale
 - (4) Immediate increase in systemic vascular resistance
 - (5) Decrease in pulmonary vascular resistance
 - b) Left ventricle strengthens throughout first year
 4. Pulmonary system
 - a) Airways, shorter, narrower, less stable, more easily obstructed
 - b) Infants primarily nose breathers until 4 weeks
 - c) Lung tissue is fragile and prone to barotrauma
 - d) Fewer alveoli with decreased collateral ventilation
 - e) Accessory muscles immature, susceptible to early fatigue
 - f) Chest wall less rigid
 - g) Ribs positioned horizontally, causing diaphragmatic breathing
 - h) Higher metabolic and oxygen consumption rates than adults
 - i) Rapid respiratory rates lead to rapid heat, and fluid loss
 5. Renal system
 - a) Kidneys unable to concentrate urine
 - b) Specific gravity rarely exceeds 1.020

6. Immune system
 - a) Passive immunity retained through the first 6 months of life
 - b) Based on maternal antibodies
7. Nervous system
 - a) Movements
 - (1) Strong, coordinated suck and gag
 - (2) Well flexed extremities
 - (3) Extremities move equally when infant is stimulated
 - b) Reflexes
 - (1) Moro reflex
 - (2) Palmar grasp
 - (3) Sucking reflex
 - (4) Rooting reflex
 - c) Fontanelles
 - (1) Posterior fontanelle closes at 3 months
 - (2) Anterior fontanelle closes between 9 to 18 months
 - (3) Fontanelles may provide an indirect estimate of hydration
 - d) Sleep
 - (1) Initially sleeps 16-18 hours per day with sleep and wakefulness evenly distributed over 24 hours.
 - (2) Gradually decreases to 14-16 hours per day with 9-10 hour concentration at night
 - (3) Sleeps through the night at 2-4 months
 - (4) Normal infant is easily arousable
8. Musculoskeletal system
 - a) Bone growth
 - (1) Epiphyseal plate - length
 - (2) Growth in thickness occurs by deposition of new bone on existing bone
 - (3) Is influenced by
 - (a) Growth hormone
 - (b) Genetic factors
 - (c) Thyroid hormone
 - (d) General health
 - b) Muscle weight is about 25% in infants
9. Dental system
 - a) Teeth begin to erupt at 5-7 months
10. Growth and development in infants
 - a) Rapid changes over first year
 - (1) 2 months
 - (a) Tracks objects with eyes
 - (b) Recognizes familiar faces
 - (2) 3 months
 - (a) Moves objects to mouth with hands
 - (b) Displays primary emotions with distinct facial expressions
 - (3) 4 months
 - (a) Drools without swallowing
 - (b) Reaches out to people
 - (4) 5 months
 - (a) Sleeps throughout night without food
 - (b) Discriminates between family and strangers

- (5) 6 months
 - (a) Sits upright in a highchair
 - (b) Makes one syllable sounds; e.g., ma, mu, da, di
 - (6) 7 months
 - (a) Fear of strangers
 - (b) Quickly changes from crying to laughing
 - (7) 8 months
 - (a) Responds to "no"
 - (b) Sits alone
 - (c) Plays "peek-a-boo"
 - (8) 9 months
 - (a) Respond to adult anger
 - (b) Pulls self to standing position
 - (c) Explores objects by mouthing, sucking, chewing, and biting
 - (9) 10 months
 - (a) Pays attention to own name
 - (b) Crawls well
 - (10) 11 months
 - (a) Attempts to walk without assistance
 - (b) Shows frustration to restrictions
 - (11) 12 months
 - (a) Walks with help
 - (b) Knows own name
- B. Psychosocial development
- 1. Family processes - reciprocal socialization
 - a) Scaffolding
 - b) Attachment
 - c) Trust versus mistrust
 - d) Secure attachment
 - 2. Temperament - infants may be
 - a) Easy child
 - b) Difficult child
 - c) Slow to warm-up child
 - 3. Crying
 - a) Basic cry
 - b) Anger cry
 - c) Pain cry
 - 4. Trust - based on consistent parental care
 - 5. Situational crisis - parental separation reactions
 - a) Protest
 - b) Despair
 - c) Withdrawal
 - 6. Growth charts
 - a) Good for comparing physical development to norm
- II. Toddler (12 to 36 months) and pre-school age (3 to 5 years)
- A. Physiological
- 1. Vital signs
 - a) Heart rate
 - (1) Toddlers - 80 to 130 beats per minute

- (2) Preschoolers - 80 to 120 beats per minute
- b) Respiratory rate
 - (1) Toddlers - 20 to 30
 - (2) Preschoolers- 20 to 30
- c) Systolic blood pressure
 - (1) Toddlers - 70 to 100 mmHg
 - (2) Preschools - 80 to 110 mmHg
- d) Temperature - 96.8 to 99.6 F degrees Fahrenheit
- 2. Weight
 - a) Rate of gain slows dramatically
 - b) Average child gains 2 kg per year
- 3. Cardiovascular system
 - a) Capillary beds better developed to assist in thermoregulation
 - b) Hemoglobin levels approach normal adult levels
- 4. Pulmonary system
 - a) Terminal airways continue to branch
 - b) Alveoli increase in number
- 5. Renal system
 - a) Kidneys are well developed in toddler years
 - b) Specific gravity and other urine findings similar to adults
- 6. Immune system
 - a) Passive immunity lost, more susceptible to minor respiratory and gastrointestinal infections
 - b) Develops immunity to common pathogens as exposure occurs
- 7. Nervous system
 - a) Brain 90% of adult weight
 - b) Myelination increases cognitive development
 - c) Development allows effortless walking and other basic motor skills
 - d) Fine motor skills developing
- 8. Musculoskeletal system
 - a) Muscle mass increases
 - b) Bone density increases
- 9. Dental system
 - a) All primary teeth have erupted by 36 months
- 10. Elimination patterns
 - a) Toilet training
 - (1) Physiologically capable by 12 to 15 months
 - (2) Psychologically ready between 18 and 30 months
 - (3) Average age for completion - 28 months
- 11. Sensory
 - a) Visual acuity - 20/ 30 during the toddler years
 - b) Hearing - essential maturity at 3 to 4 years
- B. Psychosocial
 - 1. Cognitive
 - a) Basics of language mastered by approximately 36 months, with continued refinement throughout childhood
 - b) Understands cause and effect between 18-24 months
 - c) Develops separation anxiety - approximately 18 months
 - d) Develops magical thinking - between 24 and 36 months
 - 2. Play

- a) Exploratory behavior accelerates
 - b) Able to play simple games and follow basic rules
 - c) Begin to display competitiveness
 - d) Observation of play may uncover frustrations otherwise unexpressed
3. Sibling relationships
- a) Sibling rivalry
 - b) First born children
 - (1) Usually maintain special relationship with parents
 - (2) Expected to exercise self-control and show responsibility in interacting with younger siblings
4. Peer group functions
- a) Children about the same age and maturity levels
 - b) Provide a source of information about the outside world and other families
 - c) Become more important to the child throughout childhood
5. Parenting styles and its effect on children
- a) Authoritarian parenting
 - b) Authoritative parenting
 - c) Permissive-indifferent parenting
 - d) Permissive-indulgent parenting
6. Divorce effects on child development
- a) Mediated by
 - (1) Age
 - (2) Cognitive and social competencies
 - (3) Amount of dependency on parents
 - (4) Type of day care
 - (5) Parents' ability to respond to the child's needs
7. Television
- a) May be a cause in aggression at this age
 - b) Careful screening of television exposure may be effective
8. Modeling
- a) Children begin to recognize the differences of sex
 - b) Begin to model themselves based on sex
- III. School age children (6 to 12 years)
- A. Physiological
1. Vital signs
 - a) Heart rate - 70 to 110 beats per minute
 - b) Respiratory rate - 20 to 30
 - c) Systolic blood pressure - 80 to 120 mmHg
 - d) Temperature - 98.6 degrees Fahrenheit
 2. Growth rate
 - a) Average child gains 3 kg per year and 6 cm per year
 3. Bodily functions
 - a) Most reach adult levels during this period
 - b) Lymph tissues proportionately larger than adult
 - c) Brain function increases in both hemispheres
 - d) Loss of primary teeth and replacement with permanent teeth begins
- B. Psychosocial
1. Families
 - a) Children allowed more self regulation

- b) Parents still provide general supervision
- c) Parents spend less time with children in this age group
- 2. Develop self-concept
 - a) More interaction with adults and children
 - (1) Begin comparing themselves with others
 - (2) Develop self-esteem
 - (a) Tends to be higher during early years of school than later years
 - (b) Often based on external characteristics
 - (c) Effected by peer popularity, rejection, emotional support, and neglect
 - (d) Negative self-esteem can be damaging to further development
- 3. Moral development
 - a) Pre-conventional reasoning
 - (1) Punishment and obedience
 - (2) Individualism and purpose
 - b) Conventional reasoning
 - (1) Interpersonal norms
 - (2) Social system morality
 - c) Post-conventional reasoning
 - (1) Community rights versus individual rights
 - (2) Universal ethical principles
 - d) Individuals move through development throughout school age and young adulthood at different paces

IV. Adolescence - (13 to 18 years)

A. Physiological

- 1. Vital signs
 - a) Heart rate - 55 to 105 beats per minute
 - b) Respiratory rate - 12 to 20 breaths per minute
 - c) Blood pressure - 100 to 120
 - d) Temperature- 98.6 degrees Fahrenheit
- 2. Growth rate
 - a) Most experience a rapid 2-3 year growth spurt
 - (1) Begins distally with enlargement of feet and hands
 - (2) Enlargement of the arms and legs follows
 - (3) Chest and trunk enlarge in final stage
 - b) Girls are mostly done growing by age 16, boys are mostly done growing by age 18
 - c) Secondary sexual development occurs
 - (1) Noticeable development of the external sexual organs
 - (2) Pubic and axillary hair develops
 - (3) Vocal quality changes occur (mostly in males)
 - (4) Menstruation initiates (in females)
 - d) Endocrine changes
 - (1) Female
 - (a) FSH and LH release
 - (b) Gonadotropin promote estrogen and progesterone production
 - (c) Other biologic changes
 - (2) Male
 - (a) Gonadotropin promote testosterone production

- e) Reproductive maturity
 - f) Muscle mass and bone growth nearly complete
 - g) Body fat decreases early in adolescence, and begins to increase later
(1) Females require 18-20% body fat percentage for menarche to occur
 - h) Blood chemistry nearly equal to adult levels
 - i) Skin toughens through sebaceous gland activity
- B. Psychosocial
- 1. Family
 - a) Conflicts arise
 - (1) Adolescents strive for autonomy
 - (2) Biological changes associated with puberty
 - (3) Increased idealism
 - (4) Independence and identity changes
 - 2. Develop identity
 - a) Self-consciousness increases
 - b) Peer pressure increases
 - c) Interest in the opposite sex increases
 - d) Want to be treated like adults
 - e) Progress through various stages based on how they handle crisis, etc.
 - f) Anti-social behavior peaks around eighth or ninth grade
 - g) Minority adolescents tend to have more identity crisis than non-minority
 - h) Body image of great concern
 - (1) Continual comparison amongst peers
 - (2) Eating disorders are common
 - i) Self-destructive behaviors begin
 - (1) Tobacco
 - (2) Alcohol
 - (3) Illicit drugs
 - j) Depression and suicide more common than any other age group
 - 3. Ethical development
 - a) Develop capability for logical, analytical, and abstract thinking
 - b) Develop a personal code of ethics
- V. Early adulthood (20 to 40 years)
- A. Physiological
 - 1. Vital signs
 - a) Heart rate - average 70 beats per minute
 - b) Respiratory rate - average 16 to 20
 - c) Blood pressure - average 120/ 80 mmHg
 - d) Temperature - 98.6 degrees Fahrenheit
 - 2. Peak physical conditioning between 19 and 26 years of age
 - 3. Adults develop lifelong habits and routines during this time
 - 4. All body systems at optimal performance
 - 5. Accidents are a leading cause of death in this age group
 - B. Psychosocial
 - 1. Experience highest levels of job stress during this time
 - 2. Love develops
 - a) Romantic love
 - b) Affectionate love
 - 3. Childbirth most common in this age group

- 4. a) New families provide new challenges and stress
 - 4. This period is less associated with psychological problems related to well-being
- VI. Middle adulthood (41 to 60 years)
- A. Physiological
 - 1. Vital signs
 - a) Heart rate - average 70 beats per minute
 - b) Respiratory rate - average 16 - 20
 - c) Blood pressure - average 120/ 80 mmHg
 - d) Temperature - 98.6 degrees Fahrenheit
 - 2. Body still functioning at high level with varying degrees of degradation
 - 3. Vision changes
 - 4. Hearing less effective
 - 5. Cardiovascular health becomes a concern
 - a) Cardiac output decreases throughout this period
 - b) Cholesterol levels increased
 - 6. Cancer strikes in this age group often
 - 7. Weight control more difficult
 - 8. Menopause in women in late 40s early 50s
 - B. Psychosocial
 - 1. Adults in this group more concerned with "social clock"
 - a) Task oriented
 - b) Pressed for time to accomplish lifelong goals
 - 2. Approach problems more as challenges than threats
 - 3. Empty-nest syndrome
 - 4. Often burdened by financial commitments for elderly parents as well as young adult children
- VII. Late adulthood (61 years and older)
- A. Physiological
 - 1. Vital signs
 - a) Heart rate - depends on patient's physical and health status
 - b) Respiratory rate - depends on patient's physical and health status
 - c) Blood pressure - depends on patient's physical and health status
 - d) Temperature - 98.6 degrees Fahrenheit
 - 2. Life span - maximum approximately 120 years.
 - 3. Life expectancy - average length based on year of birth
 - 4. Cardiovascular function changes
 - a) Blood vessels
 - (1) Thickening
 - (2) Increased peripheral vascular resistance
 - (3) Reduced blood flow to organs
 - (4) Decreased baroreceptor sensitivity
 - (5) By 80 years of age, there is approximately 50% decrease in vessel elasticity
 - b) Heart
 - (1) Increased workload causes
 - (a) Cardiomegaly
 - (b) Mitral and aortic valve changes
 - (c) Decreased myocardial elasticity

- (2) Myocardium is less able to respond to exercise
- (3) Fibrous tissues in SA node
- (4) Pacemaker cells diminish resulting in arrhythmia
- (5) Tachycardia not well tolerated
- c) Blood cells
 - (1) Functional blood volume decreased
 - (2) Decrease in platelet count
 - (3) RBCs diminished
 - (4) Poor iron levels
- 5. Respiratory system
 - a) Changes in mouth, nose, and lungs
 - b) Metabolic changes lead to decreased lung function
 - c) Muscular changes
 - (a) Diaphragm elasticity diminished
 - (b) Chest wall weakens
 - d) Diffusion through alveoli diminished
 - (a) Life long exposure to pollutants, etc.
 - e) Lung capacity diminished
 - f) Coughing ineffective
 - (1) Weakened chest wall
 - (2) Weakened bone structure
- 6. Endocrine system changes
 - a) Decreased glucose metabolism
 - b) Decreased insulin production
 - c) Thyroid shows some diminished T3 production
 - d) Cortisol diminished by 25 %
 - e) Pituitary gland 20% less effective
 - f) Reproductive organs atrophy in women
- 7. Gastrointestinal system
 - a) Mouth, teeth, and saliva changes
 - b) Peristalsis decreased
 - c) Esophageal sphincter less effective
 - d) GI secretions decreased
 - e) Vitamin and mineral deficiencies
 - f) Internal intestinal sphincters lose tone
- 8. Renal system
 - a) 50% nephrons lost
 - b) Abnormal glomeruli more common
 - c) Decreased elimination
- 9. Sensory changes
 - a) Loss of taste buds
 - b) Olfactory diminished
 - c) Diminished pain perception
 - d) Diminished kinesthetic sense
 - e) Visual acuity diminished
 - f) Reaction time diminished
 - g) Presbycusis problems with hearing
- 10. Nervous system
 - a) Neuron loss
 - b) Neurotransmitters diminish

- c) Sleep - wake cycle disrupted
- B. Psychosocial
 - 1. Terminal drop hypothesis
 - a) Death preceded by a decrease in cognitive functioning over a five year period prior to death
 - 2. Wisdom attributed to age in some cultures
 - 3. 95% of older adults live in communities
 - 4. Challenges
 - a) Self worth
 - b) Declining well being
 - c) Financial burdens
 - d) Death or dying of companions

UNIT TERMINAL OBJECTIVE

- 2-1 At the completion of this unit, the paramedic student will be able to establish and/ or maintain a patent airway, oxygenate, and ventilate a patient.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 2-1.1 Explain the primary objective of airway maintenance. (C-1)
- 2-1.2 Identify commonly neglected prehospital skills related to airway. (C-1)
- 2-1.3 Identify the anatomy of the upper and lower airway. (C-1)
- 2-1.4 Describe the functions of the upper and lower airway. (C-1)
- 2-1.5 Explain the differences between adult and pediatric airway anatomy. (C-1)
- 2-1.6 Define gag reflex. (C-1)
- 2-1.7 Explain the relationship between pulmonary circulation and respiration. (C-3)
- 2-1.8 List the concentration of gases that comprise atmospheric air. (C-1)
- 2-1.9 Describe the measurement of oxygen in the blood. (C-1)
- 2-1.10 Describe the measurement of carbon dioxide in the blood. (C-1)
- 2-1.11 Describe peak expiratory flow. (C-1)
- 2-1.12 List factors that cause decreased oxygen concentrations in the blood. (C-1)
- 2-1.13 List the factors that increase and decrease carbon dioxide production in the body. (C-1)
- 2-1.14 Define atelectasis. (C-1)
- 2-1.15 Define FiO₂. (C-1)
- 2-1.16 Define and differentiate between hypoxia and hypoxemia. (C-1)
- 2-1.17 Describe the voluntary and involuntary regulation of respiration. (C-1)
- 2-1.18 Describe the modified forms of respiration. (C-1)
- 2-1.19 Define normal respiratory rates and tidal volumes for the adult, child, and infant. (C-1)
- 2-1.20 List the factors that affect respiratory rate and depth. (C-1)
- 2-1.21 Explain the risk of infection to EMS providers associated with ventilation. (C-3)
- 2-1.22 Define pulsus paradoxes. (C-1)
- 2-1.23 Define and explain the implications of partial airway obstruction with good and poor air exchange. (C-1)
- 2-1.24 Define complete airway obstruction. (C-1)
- 2-1.25 Describe causes of upper airway obstruction. (C-1)
- 2-1.26 Describe causes of respiratory distress. (C-1)
- 2-1.27 Describe manual airway maneuvers. (C-1)
- 2-1.28 Describe the Sellick (cricoid pressure) maneuver. (C-1)
- 2-1.29 Describe complete airway obstruction maneuvers. (C-1)
- 2-1.30 Explain the purpose for suctioning the upper airway. (C-1)
- 2-1.31 Identify types of suction equipment. (C-1)
- 2-1.32 Describe the indications for suctioning the upper airway. (C-3)
- 2-1.33 Identify types of suction catheters, including hard or rigid catheters and soft catheters. (C-1)
- 2-1.34 Identify techniques of suctioning the upper airway. (C-1)
- 2-1.35 Identify special considerations of suctioning the upper airway. (C-1)
- 2-1.36 Describe the indications, contraindications, advantages, disadvantages, complications, equipment and technique of tracheobronchial suctioning in the intubated patient. (C-3)
- 2-1.37 Describe the use of an oral and nasal airway. (C-1)
- 2-1.38 Identify special considerations of tracheobronchial suctioning in the intubated patient. (C-1)
- 2-1.39 Define gastric distention. (C-1)
- 2-1.40 Describe the indications, contraindications, advantages, disadvantages, complications, equipment and

- technique for inserting a nasogastric tube and orogastric tube. (C-1)
- 2-1.41 Identify special considerations of gastric decompression. (C-1)
- 2-1.42 Describe the indications, contraindications, advantages, disadvantages, complications, and technique for inserting an oropharyngeal and nasopharyngeal airway (C-1)
- 2-1.43 Describe the indications, contraindications, advantages, disadvantages, complications, and technique for ventilating a patient by: (C-1)
1. Mouth-to-mouth
 2. Mouth-to-nose
 3. Mouth-to-mask
 4. One person bag-valve-mask
 5. Two person bag-valve-mask
 6. Three person bag-valve-mask
 7. Flow-restricted, oxygen-powered ventilation device
- 2-1.44 Explain the advantage of the two person method when ventilating with the bag-valve-mask. (C-1)
- 2-1.45 Compare the ventilation techniques used for an adult patient to those used for pediatric patients. (C-3)
- 2-1.46 Describe indications, contraindications, advantages, disadvantages, complications, and technique for ventilating a patient with an automatic transport ventilator (ATV). (C-1)
- 2-1.47 Explain safety considerations of oxygen storage and delivery. (C-1)
- 2-1.48 Identify types of oxygen cylinders and pressure regulators (including a high-pressure regulator and a therapy regulator). (C-1)
- 2-1.49 List the steps for delivering oxygen from a cylinder and regulator. (C-1)
- 2-1.50 Describe the use, advantages and disadvantages of an oxygen humidifier. (C-1)
- 2-1.51 Describe the indications, contraindications, advantages, disadvantages, complications, liter flow range, and concentration of delivered oxygen for supplemental oxygen delivery devices. (C-3)
- 2-1.52 Define, identify and describe a tracheostomy, stoma, and tracheostomy tube. (C-1)
- 2-1.53 Define, identify, and describe a laryngectomy. (C-1)
- 2-1.54 Define how to ventilate with a patient with a stoma, including mouth-to-stoma and bag-valve-mask-to-stoma ventilation. (C-1)
- 2-1.55 Describe the special considerations in airway management and ventilation for patients with facial injuries. (C-1)
- 2-1.56 Describe the special considerations in airway management and ventilation for the pediatric patient. (C-1)
- 2-1.57 Differentiate endotracheal intubation from other methods of advanced airway management. (C-3)
- 2-1.58 Describe the indications, contraindications, advantages, disadvantages and complications of endotracheal intubation. (C-1)
- 2-1.59 Describe laryngoscopy for the removal of a foreign body airway obstruction. (C-1)
- 2-1.60 Describe the indications, contraindications, advantages, disadvantages, complications, equipment, and technique for direct laryngoscopy. (C-1)
- 2-1.61 Describe visual landmarks for direct laryngoscopy. (C-1)
- 2-1.62 Describe use of cricoid pressure during intubation. (C-1)
- 2-1.63 Describe indications, contraindications, advantages, disadvantages, complications, equipment and technique for digital endotracheal intubation. (C-1)
- 2-1.64 Describe the indications, contraindications, advantages, disadvantages, complications, equipment and technique for using a dual lumen airway. (C-3)
- 2-1.65 Describe the indications, contraindications, advantages, disadvantages, complications and equipment for

- rapid sequence intubation with neuromuscular blockade. (C-1)
- 2-1.66 Identify neuromuscular blocking drugs and other agents used in rapid sequence intubation. (C-1)
- 2-1.67 Describe the indications, contraindications, advantages, disadvantages, complications and equipment for sedation during intubation. (C-1)
- 2-1.68 Identify sedative agents used in airway management. (C-1)
- 2-1.69 Describe the indications, contraindications, advantages, disadvantages, complications, equipment and technique for nasotracheal intubation. (C-1)
- 2-1.70 Describe the indications, contraindications, advantages, disadvantages and complications for performing an open cricothyrotomy. (C-3)
- 2-1.71 Describe the equipment and technique for performing an open cricothyrotomy. (C-1)
- 2-1.72 Describe the indications, contraindications, advantages, disadvantages, complications, equipment and technique for transtaryngeal catheter ventilation (needle cricothyrotomy). (C-3)
- 2-1.73 Describe methods of assessment for confirming correct placement of an endotracheal tube. (C-1)
- 2-1.74 Describe methods for securing an endotracheal tube. (C-1)
- 2-1.75 Describe the indications, contraindications, advantages, disadvantages, complications, equipment and technique for extubation. (C-1)
- 2-1.76 Describe methods of endotracheal intubation in the pediatric patient. (C-1)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 2-1.77 Defend the need to oxygenate and ventilate a patient. (A-1)
- 2-1.78 Defend the necessity of establishing and/ or maintaining patency of a patient's airway. (A-1)
- 2-1.79 Comply with standard precautions to defend against infectious and communicable diseases. (A-1)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 2-1.80 Perform body substance isolation (BSI) procedures during basic airway management, advanced airway management, and ventilation. (P-2)
- 2-1.81 Perform pulse oximetry. (P-2)
- 2-1.82 Perform end-tidal CO₂ detection. (P-2)
- 2-1.83 Perform peak expiratory flow testing. (P-2)
- 2-1.84 Perform manual airway maneuvers, including: (P-2)
- a. Opening the mouth
 - b. Head-tilt/ chin-lift maneuver
 - c. Jaw-thrust without head-tilt maneuver
 - d. Modified jaw-thrust maneuver
- 2-1.85 Perform manual airway maneuvers for pediatric patients, including: (P-2)
- a. Opening the mouth
 - b. Head-tilt/ chin-lift maneuver
 - c. Jaw-thrust without head-tilt maneuver
 - d. Modified jaw-thrust maneuver
- 2-1.86 Perform the Sellick maneuver (cricoid pressure). (P-2)
- 2-1.87 Perform complete airway obstruction maneuvers, including: (P-2)
- a. Heimlich maneuver
 2. Finger sweep
 3. Chest thrusts

4. Removal with Magill forceps
- 2-1.88 Demonstrate suctioning the upper airway by selecting a suction device, catheter and technique. (P-2)
 - 2-1.89 Perform tracheobronchial suctioning in the intubated patient by selecting a suction device, catheter and technique. (P-2)
 - 2-1.90 Demonstrate insertion of a nasogastric tube. (P-2)
 - 2-1.91 Demonstrate insertion of an orogastric tube. (P-2)
 - 2-1.92 Perform gastric decompression by selecting a suction device, catheter and technique. (P-2)
 - 2-1.93 Demonstrate insertion of an oropharyngeal airway. (P-2)
 - 2-1.94 Demonstrate insertion of a nasopharyngeal airway. (P-2)
 - 2-1.95 Demonstrate ventilating a patient by the following techniques: (P-2)
 - a. Mouth-to-mask ventilation
 2. One person bag-valve-mask
 3. Two person bag-valve-mask
 4. Three person bag-valve-mask
 5. Flow-restricted, oxygen-powered ventilation device
 6. Automatic transport ventilator
 7. Mouth-to-stoma
 8. Bag-valve-mask-to-stoma ventilation
 - 2-1.96 Ventilate a pediatric patient using the one and two person techniques. (P-2)
 - 2-1.97 Perform ventilation with a bag-valve-mask with an in-line small-volume nebulizer. (P-2)
 - 2-1.98 Perform oxygen delivery from a cylinder and regulator with an oxygen delivery device. (P-2)
 - 2-1.99 Perform oxygen delivery with an oxygen humidifier. (P-2)
 - 2-1.100 Deliver supplemental oxygen to a breathing patient using the following devices: nasal cannula, simple face mask, partial rebreather mask, non-rebreather mask, and venturi mask (P-2)
 - 2-1.101 Perform stoma suctioning. (P-2)
 - 2-1.102 Perform retrieval of foreign bodies from the upper airway. (P-2)
 - 2-1.103 Perform assessment to confirm correct placement of the endotracheal tube. (P-2)
 - 2-1.104 Intubate the trachea by the following methods: (P-2)
 - a. Orotracheal intubation
 - b. Nasotracheal intubation
 - c. Multi-lumen airways
 9. Digital intubation
 - d. Transillumination
 - e. Open cricothyrotomy
 - 2-1.105 Adequately secure an endotracheal tube. (P-1)
 - 2-1.106 Perform endotracheal intubation in the pediatric patient. (P-2)
 - 2-1.107 Perform transtracheal catheter ventilation (needle cricothyrotomy). (P-2)
 - 2-1.108 Perform extubation. (P-2)
 - 2-1.109 Perform replacement of a tracheostomy tube through a stoma. (P-2)

DECLARATIVE

- I. Introduction
 1. The body's need for oxygen
 2. Primary objective of emergency care
 - a. Ensure optimal ventilation
 - (1) Delivery of oxygen
 - (2) Elimination of CO₂
 3. Brain death occurs within 6 to 10 minutes
 4. Major prehospital causes of preventable death
 - a. Early detection
 - b. Early intervention
 - c. Lay-person BLS education
 5. Most often neglected of prehospital skills
 - a. Basics taken for granted
 - b. Poor techniques
 - (1) BVM seal
 - (2) Improper positioning
 - (3) Failure to reassess

- II. Anatomy of upper airway
 1. Function of the upper airway
 - a. Warm
 - b. Filter
 - c. Humidify
 2. Pharynx
 - a. Nasopharynx
 - (1) Formed by the union of facial bones
 - (2) Orientation of nasal floor is towards the ear not the eye
 - (3) Separated by septum
 - (4) Lined with
 - (a) Mucous membranes
 - (b) Cilia
 - (5) Turbinate
 - (a) Parallel to nasal floor
 - (b) Provide increased surface area for air
 - i) Filtration
 - ii) Humidifying
 - iii) Warming
 - (6) Sinuses
 - (a) Cavities formed by cranial bones
 - (b) Appear to further trap bacteria and act as tributaries for fluid to and from Eustachian tubes and tear ducts
 - i) Commonly become infected
 - ii) Fracture of certain sinus bones may cause cerebrospinal fluid (CSF) leak
 - (7) Tissues extremely delicate and vascular
 - (a) Improper or overly aggressive placement of tubes or airways will cause significant bleeding which may not be controlled by direct pressure

- b. Oropharynx
 - (1) Teeth
 - (a) 32 adult
 - (b) Requires significant force to dislodge
 - (c) May fracture or avulse causing obstruction
 - (2) Tongue
 - (a) Large muscle attached at the mandible and hyoid bones
 - (b) Most common airway obstruction
 - (3) Palate
 - (a) Roof of mouth separates oro/ nasopharynx
 - i) Anterior is hard palate
 - ii) Posterior (beyond the teeth) is soft palate
 - (4) Adenoids
 - (a) Lymph tissue located in the mouth and nose that filters bacteria
 - (b) Frequently infected and swollen
 - (5) Posterior tongue
 - (6) Epiglottis
 - (7) Vallecula
 - (a) "Pocket" formed by the base of the tongue and epiglottis
 - (b) Important landmark for endotracheal intubation
- 3. Larynx
 - a. Attached to hyoid bone
 - (1) "Horseshoe-shaped" bone between the chin and mandibular angle
 - (2) Supports trachea
 - (3) Made of cartilage
 - b. Thyroid cartilage
 - (1) First tracheal cartilage
 - (2) "Shield-shaped"
 - (a) Cartilage anterior
 - (b) Smooth muscle posterior
 - (3) Laryngeal prominence
 - (a) "Adam's Apple" anterior prominence of thyroid cartilage
 - (b) Glottic opening directly behind
 - c. Glottic opening
 - (1) Narrowest part of adult trachea
 - (2) Patency heavily dependent on muscle tone
 - (3) Contain vocal bands
 - (a) White bands of cartilage
 - (b) Produce voice
 - d. Arytenoid cartilage
 - (1) "Pyramid-like" posterior attachment of vocal bands
 - (2) Important landmark for endotracheal intubation
 - e. Pyriform fossae
 - (1) "Hollow pockets" along the lateral borders of the larynx
 - f. Cricoid ring
 - (1) First tracheal ring
 - (2) Completely cartilaginous
 - (3) Compression occludes esophagus (Sellick maneuver)
 - g. Cricothyroid membrane

- (1) Fibrous membrane between cricoid and thyroid cartilage
 - (2) Site for surgical and alternative airway placement
 - h. Associated structures
 - (1) Thyroid gland
 - (a) Located below cricoid cartilage
 - (b) Lies across trachea and up both sides
 - (2) Carotid arteries
 - (a) Branches cross and lie closely alongside trachea
 - (3) Jugular veins
 - (a) Branch across and lie close to trachea
- III. Anatomy of lower airway
- 1. Function of the lower airway
 - a. Exchange of O₂ and CO₂
 - 2. Location of the lower airway
 - a. From fourth cervical vertebrae to xiphoid process
 - b. From glottic opening to pulmonary capillary membrane
 - 3. Structures of the lower airway
 - a. Trachea
 - (1) Trachea bifurcates at carina into
 - (a) Right and left mainstem bronchi
 - (b) Right mainstem has lesser angle
 - i) Foreign bodies, ET tubes commonly displace here
 - (2) Lined with
 - (a) Mucous cells
 - (b) Beta 2 receptors - dilate bronchioles
 - b. Bronchi
 - (1) Mainstem bronchi enter lungs at hilum
 - (2) Branch into narrowing secondary and tertiary bronchi that branch into bronchioles
 - c. Bronchioles
 - (1) Branch into alveolar ducts that end at alveolar sacs
 - d. Alveoli
 - (1) "Balloon-like" clusters
 - (2) Site of gas exchange
 - (3) Lined with surfactant
 - (a) Decreases surface tension of alveoli which facilitates ease of expansion
 - (b) Alveoli become thinner as they expand which makes diffusion of O₂/ CO₂ easier
 - (c) If surfactant is decreased or alveoli are not inflated, alveoli collapse (atelectasis)
 - e. Lungs
 - (1) Right lung
 - (a) 3 lobes
 - (2) Left lung
 - (a) 2 lobes
 - (3) Lobes made of parenchymal tissue
 - (4) Membranous outer lining called pleura
 - (5) Lung capacity
- IV. Differences in pediatric airway
- 1. Pharynx
-
-

- a. A proportionately smaller jaw causes the tongue to encroach upon the airway
 - b. Omega shaped, floppy epiglottis
 - c. Absent or very delicate dentition
2. Trachea
- a. Airway is smaller and narrower at all levels
 - b. Larynx lies more superior
 - c. Larynx is "funnel-shaped" due to narrow, undeveloped cricoid cartilage
 - d. Narrowest point is at cricoid ring before 10 years of age
 - e. Further narrowing of the airway by tissue swelling of foreign body results in major increase in airway resistance
3. Chest wall
- a. Ribs and cartilage are softer
 - b. Cannot optimally contribute to lung expansion
 - c. Infants and children tend to depend more heavily on the diaphragm for breathing
- V. Lung/ respiratory volumes
1. Total lung volume
- a. Adult male, 6 liters
 - b. Not all inspired air enters alveoli
 - c. Minor diffusion of O₂ takes place in alveolar ducts and terminal bronchioles
2. Tidal volume
- a. Volume of gas inhaled or exhaled during a single respiratory cycle
 - b. 5-7cc/ kg (500 cc normally)
3. Dead space air
- a. Air remaining in air passageways, unavailable for gas exchange (approximately 150cc)
 - b. Anatomic dead space
 - (1) Trachea
 - (2) Bronchi
 - c. Physiologic dead space
 - (1) Dead space formed by factors like disease or obstruction
 - (a) COPD
 - (b) Atelectasis
4. Minute volume
- a. Amount of gas moved in and out of the respiratory tract per minute
 - b. Determined by
 - (1) Tidal volume - dead space volume times respiratory rate
5. Functional reserve capacity
- a. After optimal inspiration: optimum amount of air that can be forced from the lungs in a single exhalation
6. Residual volume
- a. Volume of air remaining in lungs at the end of maximal expiration
7. Alveolar air
- a. Air reaching the alveoli for gas exchange (alveolar volume)
 - b. Approximately 350 cc
8. Inspiratory reserve
- a. Amount of gas that can be inspired in addition to tidal volume
9. Expiratory reserve
- a. Amount of gas that can be expired after a passive (relaxed) expiration
10. FiO₂
-

- a. Percentage of oxygen in inspired air (increases with supplemental oxygen)
 - (1) Commonly documented as a decimal (e.g., $FiO_2 = .85$)
- VI. Ventilation
- 1. Definition - movement of air into and out of the lungs
 - 2. Phases
 - a. Inspiration
 - (1) Stimulus to breathe from respiratory center
 - (2) Impulse transmitted to diaphragm via phrenic nerve
 - (a) Diaphragm - "muscle of respiration"
 - (b) Separates thoracic from abdominal cavity
 - (3) Diaphragm contracts - "flattens"
 - (a) Causes intrapulmonic pressure to fall slightly below atmospheric pressure
 - (4) Intercostal muscles contract
 - (5) Ribs elevate and expand
 - (6) Air is drawn into lungs like a vacuum
 - (7) Alveoli Inflate
 - (8) O_2/CO_2 are able to diffuse across membrane
 - b. Expiration
 - (1) Stretch receptors in lungs signal respiratory center via vagus nerve to inhibit inspiration (Hering-Breuer Reflex)
 - (2) Natural elasticity (recoil) of the lungs passively expires air
- VII. Respiration
- 1. Definition
 - a. Exchange of gases between a living organism and its environment
 - b. The major gases of respiration are oxygen and carbon dioxide
 - 2. Types
 - a. External respiration - exchange of gasses between the lungs and the blood cells
 - b. Internal respiration - exchange of gases between the blood cells and tissues
 - 3. The transportation of oxygen and carbon dioxide in the human body
 - a. Diffusion - passage of solution from area of higher concentration to lower concentration
 - (1) O_2/CO_2 dissolve in water and pass through alveolar membrane by diffusion
 - b. Oxygen content of blood
 - (1) Dissolved O_2 crosses pulmonary capillary membrane and binds to hemoglobin (Hgb) of red blood cell
 - (2) Oxygen is carried
 - (a) Bound to hemoglobin
 - (b) Dissolved in plasma
 - (3) Approximately 97% of total O_2 is bound to hemoglobin
 - (4) O_2 saturation
 - (a) % of hemoglobin saturated
 - (b) Normally greater than 98%
 - c. Oxygen in the blood
 - (1) Bound to hemoglobin
 - (a) SaO_2
 - (2) Dissolved in plasma
 - (a) PaO_2
 - d. Carbon dioxide content of the blood

- (1) CO₂ is a byproduct of cellular work (cellular respiration)
 - (2) CO₂ is transported in blood as bicarbonate ion
 - (3) About 33% is bound to hemoglobin
 - (4) As O₂ crosses into blood, CO₂ diffuses into alveoli
 - (5) Carbon dioxide in the blood
 - (a) PaCO₂
 - e. Diagnostic testing
 - (1) Pulse oximetry
 - (2) Peak expiratory flow testing
 - (3) End-tidal CO₂ monitoring
 - (4) Other equipment
- VIII. Causes of decreased oxygen concentrations in the blood
- 1. Lower partial pressure of atmospheric O₂
 - 2. Lower hemoglobin levels in blood
 - 3. Trauma
 - a. Less surface area for gas exchange
 - (1) Pneumothorax
 - (2) Hemothorax
 - (3) Combination of pneumothorax and hemothorax
 - b. Decreased mechanical effort
 - (1) Pain
 - (2) Traumatic suffocation
 - (3) Hypoventilation
 - 4. Medical
 - a. Physiological barriers
 - (1) Pneumonia
 - (2) Pulmonary edema
 - (3) COPD
- IX. Carbon dioxide in blood
- 1. Increases
 - a. Hypoventilation
 - 2. Decreases
 - a. Hyperventilation
- X. The measurement of gases
- 1. Total pressure
 - a. The combined pressure of all atmospheric gases
 - b. 100% or 760 torr at sea level
 - 2. Partial pressure
 - a. The pressure exerted by a specific atmospheric gas
 - 3. Concentration of gases in the atmosphere
 - a. Nitrogen 597.0 torr (78.62%)
 - b. Oxygen 159.0 torr (20.84%)
 - c. CO₂ 0.3 torr (0.04%)
 - d. Water 3.7 torr (0.5%)
 - 4. Water vapor pressure
 - 5. Alveolar gas concentration

- a. Nitrogen 569.0 torr (74.9%)
 - b. Oxygen 104.0 torr (13.7%)
 - c. CO₂ 40.0 torr (5.2%)
 - d. Water 47.0 torr (6.2%)
- XI. Respiratory rate
- 1. Definition - the number of times a person breathes in one minute
 - 2. Neural control
 - a. Primary control from the medulla and pons
 - b. Medulla
 - (1) Primary involuntary respiratory center
 - (2) Connected to respiratory muscles by vagus nerve
 - c. Pons
 - (1) Apneustic center - secondary control center if medulla fails to initiate respiration
 - (2) Pneumotaxic center - controls expiration
 - 3. Chemical stimuli
 - a. Receptors for O₂/ CO₂ balance
 - (1) Cerebrospinal fluid pH
 - (2) Carotid bodies (sinus)
 - (3) Aortic arch
 - b. Hypoxic drive - respiratory stimulus dependent on O₂ rather than CO₂ in the blood
 - 4. Control of respiration by other factors
 - a. Body temperature - respirations increase with fever
 - b. Drug and medications - may increase or decrease respirations depending on their physiologic action
 - c. Pain - increases respirations
 - d. Emotion - increases respirations
 - e. Hypoxia - increases respirations
 - f. Acidosis - respirations increase as compensatory response to increased CO₂ production
 - g. Sleep - respirations decrease
- XII. Pathophysiology
- 1. Obstruction
 - a. Tongue
 - (1) Most common airway obstruction
 - (2) Snoring respirations
 - (3) Corrected with positioning
 - b. Foreign body
 - (1) May cause partial or full obstruction
 - (2) Symptoms include
 - (a) Choking
 - (b) Gagging
 - (c) Stridor
 - (d) Dyspnea
 - (e) Aphonia (unable to speak)
 - (f) Dysphonia (difficulty speaking)
 - c. Laryngeal spasm and edema
 - (1) Spasm
 - (a) Spasmodic closure of vocal cords
-

- (b) Most frequently caused by
 - i) Trauma from over aggressive technique during intubation
 - ii) Immediately upon extubation especially when patient is semiconscious
- (2) Edema
 - (a) Glottic opening becomes extremely narrow or totally obstructed
 - (b) Most frequently caused by
 - i) Epiglottitis (a bacterial infection of the epiglottis)
 - ii) Anaphylaxis (severe allergic reaction)
 - iii) Relieved by
 - (c) Aggressive ventilation
 - (d) Forceful upward pull of the jaw
 - (e) Muscle relaxants
- d. Fractured larynx
 - (1) Airway patency dependent upon muscle tone
 - (2) Fractured laryngeal tissue
 - (a) Increases airway resistance by decreasing airway size through
 - i) Decreasing muscle tone
 - ii) Laryngeal edema
 - iii) Ventilatory effort
- e. Aspiration
 - (1) Significantly increases mortality
 - (a) Obstructs airway
 - (b) Destroys delicate bronchiolar tissue
 - (c) Introduces pathogens
 - (d) Decreases ability to ventilate

XIII. Airway evaluation

1. Essential parameters

- a. Rate
 - (1) Normal resting rate in adults - 12-24
- b. Regularity
 - (1) Steady pattern
 - (2) Irregular respiratory patterns are significant until proven otherwise
- c. Effort
 - (1) Breathing at rest should be effortless
 - (2) Effort changes may be subtle in rate or regularity
 - (3) Patients often compensate by preferential positioning
 - i) Upright sniffing
 - ii) Semifowlers
 - iii) Frequently avoid supine

2. Recognition of airway problems

- a. Respiratory distress
 - (1) Upper and lower airway obstruction
 - (2) Inadequate ventilation
 - (3) Impairment of the respiratory muscles
 - (4) Impairment of the nervous system
- b. Difficulty in rate, regularity, or effort is defined as dyspnea
- c. Dyspnea may be result of or result in hypoxia
 - (1) Hypoxia - lack of oxygen

- (2) Hypoxia - lack of oxygen to tissues
- (3) Anoxia - total absence of oxygen
- d. Recognition and treatment of dyspnea is crucial to patient survival
 - (1) Expert assessment and management is essential
 - (a) The brain can survive only a few minutes of anoxia
 - (b) All therapies fail if airway is inadequate
- e. Visual techniques
 - (1) Position
 - (a) Tripod positioning
 - (b) Orthopnea
 - (2) Rise and fall of chest
 - (3) Gaspings
 - (4) Color of skin
 - (5) Flaring of nares
 - (6) Pursed lips
 - (7) Retraction
 - (a) Intercostal
 - (b) Suprasternal notch
 - (c) Supraclavicular fossa
 - (d) Subcostal
- f. Auscultation techniques
 - (1) Air movement at mouth and nose
 - (2) Bilateral lung fields equal
- g. Palpation Techniques
 - (1) Air movement at mouth and nose
 - (2) Chest wall
 - (a) Paradoxical motion
 - (b) Retractions
- h. Bag-valve-mask
 - (1) Resistance or changing compliance with bag-valve-mask ventilations
- i. Pulsus paradoxus
 - (1) Systolic blood pressure drops greater than 10mm Hg with inspiration
 - (a) Change in pulse quality maybe detected
 - (b) Seen in COPD, pericardial tamponade
 - (c) Possible increase in intrathoracic pressure
- j. History
 - (1) Evolution
 - (a) Sudden
 - (b) Gradual over time
 - (c) Known cause or "trigger"
 - (2) Duration
 - (a) Constant
 - (b) Recurrent
 - (3) Ease - what makes it better?
 - (4) Exacerbate - what makes it worse?
 - (5) Associate
 - (a) Other symptoms (productive cough, chest pain, fever, etc...)
 - (6) Interventions
 - (a) Evaluations/ admissions to hospital

- (b) Medications (include compliance)
 - (c) Ever intubated
- k. Modified forms of respiration
 - (1) Protective reflexes
 - (a) Cough
 - i) Forceful, spastic exhalation
 - ii) Aids in clearing bronchi and bronchioles
 - (b) Sneeze - clears nasopharynx
 - (c) Gag reflex - spastic pharyngeal and esophageal reflex from stimulus of the posterior pharynx
 - (2) Sighing
 - (a) Involuntary deep breath that increases opening of alveoli
 - (b) Normally sigh about once per minute
 - (3) Hiccough - intermittent spastic closure of glottis
- l. Respiratory pattern changes
 - (1) Cheyne-Stokes
 - (a) Gradually increasing rate and tidal volume followed by gradual decrease
 - (b) Associated with brain stem insult
 - (2) Kussmaul's breathing
 - (a) Deep, gasping respirations
 - (b) Common in diabetic coma
 - (3) Biot's respirations
 - (a) Irregular pattern, rate, and volume with intermittent periods of apnea
 - (b) Increased intracranial pressure
 - (4) Central neurogenic hyperventilation
 - (a) Deep rapid respirations similar to Kussmaul's
 - (b) Increased intracranial pressure
 - (5) Agonal
 - (a) Slow, shallow, irregular respirations
 - (b) Resulting from brain anoxia
- m. Inadequate ventilation
 - (1) Occurs when body cannot compensate for increased O₂ demand or maintain O₂/ CO₂ balance
 - (2) Many causes
 - (a) Infection
 - (b) Trauma
 - (c) Brainstem insult
 - (d) Noxious or hypoxic atmosphere
 - (e) Renal failure
 - (3) Multiple symptoms
 - (a) Altered response
 - (b) Respiratory rate changes (up or down)

XIV. Supplemental oxygen therapy

1. Rationale

- a. Enriched O₂ atmosphere increases oxygen to cells
- b. Increasing available O₂ increases patient's ability to compensate
- c. O₂ delivery method must be reassessed to determine adequacy and efficiency

2. Oxygen source

- a. Compressed gas
 - (1) Oxygen compressed in gas form in an aluminum or steel tank
 - (2) Common sizes and volumes
 - (a) D 400L
 - (b) E 660L
 - (c) M 3450L
 - (3) O₂ delivery measured in liters/ min (LPM)
 - (4) Calculating tank life
 - (a) Tank pressure (psi) x 0.28 = volume
 - (b) Volume/ LPM = tank life in minutes
 - b. Liquid oxygen
 - (1) O₂ cooled to its aqueous state
 - (a) Converts to gaseous state when warmed
 - (2) Advantage
 - (a) Much larger volume of gaseous O₂ can be stored in aqueous state
 - (3) Disadvantage
 - (a) Units generally require upright storage
 - (b) Special requirements for large volume storage and cylinder transfer
3. Regulators
- a. High-pressure
 - (1) Attached to cylinder stem delivers cylinder gas under high pressure
 - (2) Used to transfer cylinder gas from tank to tank
 - b. Therapy regulators
 - (1) Attached to cylinder stem
 - (2) 50psi escape pressure is "stepped down" through regulator mechanism
 - (3) Subsequent delivery to patient is adjustable low pressure
4. Delivery devices
- a. Nasal cannula
 - (1) Nasally placed O₂ catheter for oxygen enrichment
 - (2) Optimal delivery: 40% at 6 L/ min
 - (3) Indications
 - (a) Low to moderate O₂ enrichment
 - (b) Long term O₂ maintenance therapy
 - (4) Contraindications
 - (a) Poor respiratory effort
 - (b) Severe hypoxia
 - (c) Apnea
 - (d) Mouth breathing
 - (5) Advantages
 - (a) Well tolerated
 - (6) Disadvantages
 - (a) Does not deliver high volume/ high concentration
 - b. Simple face mask
 - (1) Full airway enclosure with open side ports
 - (a) Room air is drawn through side ports on inspiration
 - (b) Diluting O₂ concentration
 - (2) Indications
 - (a) Delivery of moderate to high O₂ concentrations
 - (b) Range - 40-60% at 10 L/ min

- (3) Advantages
 - (a) Higher O₂ concentrations
- (4) Disadvantages
 - (a) Delivery of volumes beyond 10 L/ min does not enhance O₂ concentration
- (5) Special considerations
 - (a) Mask leak around face decreases O₂ concentration
- c. Partial rebreather
 - (1) Mask vent ports covered by one-way disc
 - (a) Residual expired air mixed in mask and rebreathed
 - (b) Room air not entrained with inspiration
 - (2) Indications
 - (3) Contraindications
 - (a) Apnea
 - (b) Poor respiratory effort
 - (4) Advantages
 - (a) Inspired gas not mixed with room air
 - i) Higher O₂ concentrations attainable
 - (b) Disadvantages
 - i) Delivery of volumes beyond 10 L/ min does not enhance O₂ concentration
 - (c) Special considerations
 - i) Mask leak around face decreases O₂ concentration
- d. Non-rebreather mask
 - (1) Mask side ports covered by one-way disc
 - (2) Reservoir bag attached
 - (3) Range: 80-95+% at 15 L/ min
 - (4) Indications
 - (a) Delivery of highest O₂ concentration
 - (5) Contraindications
 - (a) Apnea
 - (b) Poor respiratory effort
 - (6) Advantages
 - (a) Highest O₂ concentration
 - (b) Delivers high volume/ high O₂ enrichment
 - (c) Patient inhales enriched O₂ from reservoir bag rather than residual air
 - (7) Disadvantages
- e. Venturi mask
 - (1) Mask with interchangeable adapters
 - (a) Adapters have port holes that entrain room air as O₂ passes
 - (b) Patient receives a highly specific concentration of O₂
 - (c) Air is entrained by venturi principle
- f. Small volume nebulizer
 - (1) Delivers aerosolized medication
 - (2) O₂ enters an aerosol chamber containing 3-5 ccs of fluid
 - (3) Pressurized O₂ mists fluid
- 5. Oxygen humidifiers
 - a. Sterile water reservoir for humidifying O₂
 - b. Good for long term O₂ administration
 - c. Desirable for croup/ Epiglottitis/ bronchiolitis

6. Tracheostomy, stoma, and tracheostomy tubes
 - a. Tracheostomy
 - (1) Surgical opening into trachea
 - (a) Done in operating room under controlled conditions
 - (b) A stoma located just superior to the suprasternal notch
 - b. Stoma
 - (1) Resultant orifice connecting trachea to outside air
 - (2) Patient now breathes through this surgical opening
 - c. Tracheostomy tube
 - (1) Plastic tube placed within tracheostomy site
 - (2) 15 mm connector for ventilator acceptance
- XV. Ventilation
1. Mouth-to-mouth
 - a. Most basic form of ventilation
 - b. Indications
 - (1) Apnea from any mechanism when other ventilation devices are not available
 - c. Contraindications
 - (1) Awake patients
 - (2) Communicable disease risk limitations
 - d. Advantages
 - (1) No special equipment required
 - (2) Delivers excellent tidal volume
 - (3) Delivers adequate oxygen
 - e. Disadvantages
 - (1) Psychological barriers from
 - (a) Sanitary issues
 - (b) Communicable disease issues
 - i) Direct blood/ body fluid contact
 - ii) Unknown communicable disease risks at time of event
 - f. Complications
 - (1) Hyperinflation of patient's lungs
 - (2) Gastric distension
 - (3) Blood/ body fluid contact manifestation
 - (4) Hyperventilation of rescuer
 2. Mouth-to-nose
 - a. Ventilating through nose rather than mouth
 - b. Indications
 - (1) Apnea from any mechanism
 - c. Contraindications
 - (1) Awake patients
 - d. Advantages
 - (1) No special equipment required
 - e. Disadvantages
 - (1) Direct blood/ body fluid contact
 - (2) Psychological limitations of rescuer
 - f. Complications
 - (1) Hyperinflation of patient's lungs
 - (2) Gastric distension

- (3) Blood/ body fluid manifestation
- (4) Hyperventilation of rescuer
- 3. Mouth-to-mask
 - a. Adjunct to mouth-to-mouth ventilation
 - b. Indications
 - (1) Apnea from any mechanism
 - c. Contraindications
 - (1) Awake patients
 - d. Advantages
 - (1) Physical barrier between rescuer and patient blood/ body fluids
 - (2) One-way valve to prevent blood/ body fluid splash to rescuer
 - (3) May be easier to obtain face seal
 - e. Disadvantages
 - (1) Useful only if readily available
 - f. Complications
 - (1) Hyperinflation of patient's lungs
 - (2) Hyperventilation of rescuer
 - (3) Gastric distention
 - g. Method for use
 - (1) Position head by appropriate method
 - (2) Position and seal mask over mouth and nose
 - (3) Ventilate as appropriate
- 4. One person bag-valve-mask
 - a. Fixed volume self inflating bag can deliver adequate tidal volumes and O₂ enrichment
 - b. Indications
 - (1) Apnea from any mechanism
 - (2) Unsatisfactory respiratory effort
 - c. Contraindications
 - (1) Awake, intolerant patients
 - d. Advantages
 - (1) Excellent blood/ body fluid barrier
 - (2) Good tidal volumes
 - (3) Oxygen enrichment
 - (4) Rescuer can ventilate for extended periods without fatigue
 - e. Disadvantages
 - (1) Difficult skill to master
 - (2) Mask seal may be difficult to obtain and maintain
 - (3) Tidal volume delivered is dependent on mask seal integrity
 - f. Complications
 - (1) Inadequate tidal volume delivery with
 - (a) Poor technique
 - (b) Poor mask seal
 - (c) Gastric distention
 - g. Method for use
 - (1) Position appropriately
 - (2) Choose proper mask size - seats from bridge of nose to chin
 - (3) Position, spread/ mold/ seal mask
 - (4) Hold mask in place
 - (5) Squeeze bag completely over 1.5 to 2 seconds for adults

- (6) Avoid overinflation
 - (7) Reinflate completely over several seconds
 - h. Special considerations
 - (1) Medical
 - (a) Observe for
 - i) Gastric distension
 - ii) Changes in compliance of bag with ventilation
 - iii) Improvement or deterioration of ventilation status (i.e., color change, responsiveness, air leak around mask)
 - (2) Trauma
 - (a) Very difficult to perform with cervical spine immobilization in place
5. Two person bag-valve-mask ventilation method
- a. Most efficient method
 - b. Indications
 - (1) Bag-valve-mask ventilation on any patient
 - (a) Especially useful for cervical spine immobilized patients
 - (b) Difficulty obtaining or maintaining adequate mask seal
 - c. Contraindications
 - (1) Awake, intolerant patients
 - d. Advantages
 - (1) Superior mask seal
 - (2) Superior volume delivery
 - e. Disadvantages
 - (1) Requires extra personnel
 - f. Complications
 - (1) Hyperinflation of patient's lungs
 - (2) Gastric distension
 - g. Method for use
 - (1) First rescuer maintains mask seal by appropriate method
 - (2) Second rescuer squeezes bag
 - h. Special considerations
 - (1) Observe chest movement
 - (2) Avoid overinflation
 - (3) Monitor lung compliance with ventilations
6. Three person bag-valve-mask ventilation
- a. Indications
 - (1) Bag-valve-mask ventilation on any patient
 - (a) Especially useful for cervical spine immobilized patients
 - (b) Difficulty obtaining or maintaining adequate mask seal
 - b. Contraindications
 - (1) Awake, intolerant patients
 - c. Advantages
 - (1) Superior mask seal
 - (2) Superior volume density
 - d. Disadvantages
 - (1) Requires extra personnel
 - (2) "Crowded" around airway
 - e. Complications
 - (1) Hyperinflation of patient's lungs

- (2) Gastric distension
 - f. Method for use
 - (1) First rescuer maintains mask seal by appropriate method
 - (2) Second rescuer holds mask in place
 - (3) Third rescuer squeezes bag and monitors compliance
 - g. Special considerations
 - (1) Avoid overinflation
 - (2) Monitor lung compliance with ventilations
7. Flow-restricted, oxygen-powered ventilation devices
- a. The valve opening pressure at the cardiac sphincter is approx 30 cm H₂O
 - b. These devices operate at or below 30 cm H₂O to prevent gastric distension
 - c. Indications
 - (1) Delivery of high volume/ high concentration of O₂ (1 L/ sec)
 - (2) Awake compliant patients
 - (3) Unconscious patient with caution
 - d. Contraindications
 - (1) Noncompliant patients
 - (2) Poor tidal volume
 - (3) Small children
 - e. Advantages
 - (1) Self administered
 - (2) Delivers high volume/ high concentration O₂
 - (3) O₂ delivered in response to inspiratory effort (no O₂ wasting)
 - (4) O₂ volume delivery is regulated by inspiratory effort minimizing overinflation risk
 - (5) O₂ volume delivery is also restricted to less than 30 cm H₂O
 - f. Disadvantages
 - (1) Cannot monitor lung compliance
 - (2) Requires O₂ source
 - g. Complications
 - (1) Gastric distension
 - (2) Barotrauma
 - h. Method
 - (1) Mask is held manually in place
 - (2) Negative pressure upon inspiration triggers O₂ delivery or medic triggers release button
 - (3) Patient is monitored for adequate tidal volume and oxygenation
8. Automatic transport ventilators
- a. Volume/ rate controlled
 - b. Indications
 - (1) Extended ventilation of intubated patients
 - (2) In situations in which a BVM is used
 - (3) Can be used during CPR
 - c. Contraindications
 - (1) Awake patients
 - (2) Obstructed airway
 - (3) Increased airway resistance
 - (a) Pneumothorax (after needle decompression)
 - (b) Asthma
 - (c) Pulmonary edema
 - d. Advantages
-

- (1) Frees personnel to perform other tasks
- (2) Lightweight
- (3) Portable
- (4) Durable
- (5) Mechanically simple
- (6) Adjustable tidal volume
- (7) Adjustable rate
- (8) Adapts to portable O₂ tank
- e. Disadvantages
 - (1) Cannot detect tube displacement
 - (2) Does not detect increasing airway resistance
 - (3) Difficult to secure
 - (4) Dependent on O₂ tank pressure
- 9. Cricoid pressure - Sellick's maneuver
 - a. Pressure on cricoid Ring
 - b. Occludes esophagus
 - c. Facilitates intubation by moving the larynx posteriorly
 - d. Helps to prevent passive emesis
 - e. Can help minimize gastric distension during bag-valve-mask ventilation
 - f. Indications
 - (1) Vomiting is imminent or occurring
 - (2) Patient cannot protect own airway
 - g. Contraindications
 - (1) Use with caution in cervical spine injury
 - h. Advantages
 - (1) Noninvasive
 - (2) Protects from aspiration as long as pressure is maintained
 - i. Disadvantages
 - (1) May have extreme emesis if pressure is removed
 - (2) Second rescuer required for bag-valve-mask ventilation
 - (3) May further compromise injured cervical spine
 - j. Complications
 - (1) Laryngeal trauma with excessive force
 - (2) Esophageal rupture from unrelieved high gastric pressures
 - (3) Excessive pressure may obstruct the trachea in small children
 - k. Method
 - (1) Locate the anterior aspect of the cricoid ring
 - (2) Apply firm, posterior pressure
 - (3) Maintain pressure until the airway is secured with an endotracheal tube
- 10. Artificial ventilation of the pediatric patient
 - a. Flat nasal bridge makes achieving mask seal more difficult
 - b. Compressing mask against face to improve mask seal results in obstruction
 - c. Mask seal best achieved with jaw displacement (two person bag-valve-mask)
 - d. Bag-valve-mask ventilation
 - (1) Bag size
 - (a) Full-term neonates and infants - minimum of 450 ml tidal volume (pediatric BVM)
 - (b) Children up to eight years of age - pediatric BVM preferred but adult-sized BVM (1500 ml) may be used
 - (c) Children over eight years of age require adult-sized BVM for adequate ventilation

- (d) Proper mask fit
 - (e) Length based resuscitation tape
 - (f) Bridge of nose to cleft of chin
 - (2) Proper mask position and seal (EC-clamp)
 - (a) Place mask over mouth and nose; avoid compressing the eyes
 - (b) Using one hand, place thumb on mask at apex and index finger on mask at chin (C-grip)
 - (c) With gentle pressure, push down on mask to establish adequate seal
 - (d) Maintain airway by lifting bony prominence of chin with remaining fingers forming an "E"; avoid placing pressure on the soft area under chin
 - (e) May use one or two rescuer technique
 - (3) Ventilate according to current standards
 - (4) Obtain chest rise with each breath
 - (a) Begin ventilation and say "squeeze"; provide just enough volume to initiate chest rise; **DO NOT OVERVENTILATE**
 - (5) Allow adequate time for exhalation
 - (a) Begin releasing the bag and say "release, release"
 - (6) Continue ventilations using "squeeze, release, release" method
 - (7) Assess BVM ventilation
 - (a) Look for adequate chest rise
 - (b) Listen for lung sounds at third intercostal space, midaxillary line
 - (c) Assess for improvement in color and/ or heart rate
 - (8) Apply cricoid pressure to minimize gastric inflation and passive regurgitation
 - (a) Locate cricoid ring by palpating the trachea for a prominent horizontal band inferior to the thyroid cartilage and cricothyroid membrane
 - (b) Apply gentle downward pressure using one fingertip in infants and the thumb and index finger in children
 - (c) Avoid excessive pressure as it may produce tracheal compression and obstruction in infants
11. Ventilation of stoma patients
- a. Mouth-to-stoma
 - (1) Locate stoma site and expose
 - (2) Pocket mask to stoma preferred
 - (a) Seal around stoma site, check for adequate ventilation
 - (b) Seal mouth and nose if air leak evident
 - b. Bag-valve-mask to stoma
 - (1) Locate stoma site and expose
 - (2) Seal around stoma site, check for adequate ventilation
 - (3) Seal mouth and nose if air leak evident
- XVI. Airway obstructions
- 1. Causes
 - a. Tongue
 - b. Foreign body
 - c. Laryngeal spasm
 - d. Laryngeal edema
 - e. Trauma
 - 2. Classifications/ assessment
 - a. Complete obstruction
-

- b. Partial obstruction
 - (1) With good air exchange
 - (2) With poor air exchange
 - 3. Management
 - a. Heimlich maneuver
 - b. Finger sweep
 - c. Chest thrusts
 - d. Suctioning
 - e. Direct laryngoscopy for the removal of foreign body in airway obstruction
 - (1) If patient is unconscious and you are unable to ventilate and BLS methods fail
 - (a) Insert laryngoscope blade into patient's mouth
 - (b) If foreign body is visualized carefully and deliberately remove foreign body with Magill forceps
 - f. Intubation
- XVII. Suctioning
- 1. Suction devices
 - a. Hand-powered suction devices
 - (1) Advantages
 - (a) Lightweight
 - (b) Portable
 - (c) Mechanically simple
 - (d) Inexpensive
 - (2) Disadvantages
 - (a) Limited volume
 - (b) Manually powered
 - (c) Fluid contact components not disposable
 - b. Oxygen-powered portable suction devices
 - (1) Advantages
 - (a) Lightweight
 - (b) Small in size
 - (2) Disadvantages
 - (a) Limited suctioning power
 - (b) Uses a lot of oxygen for limited suctioning power
 - c. Battery-operated portable suction devices
 - (1) Advantages
 - (a) Lightweight
 - (b) Portable
 - (c) Excellent suction power
 - (d) May "field" troubleshoot most problems
 - (2) Disadvantages
 - (a) More complicated mechanics
 - (b) May lose battery integrity over time
 - (c) Some fluid contact components not disposable
 - d. Mounted vacuum-powered suction devices
 - (1) Advantages
 - (a) Extremely strong vacuum
 - (b) Adjustable vacuum power
 - (c) Fluid contact components disposable

- (2) Disadvantages
 - (a) Non-portable
 - (b) Cannot "field service" or substitute power source
- 2. Suctioning catheters
 - a. Hard or rigid catheters
 - (1) "Yankauer" or "tonsil tip"
 - (2) Suction large volumes of fluid rapidly
 - (3) Standard size
 - (4) Various sizes
 - b. Soft catheters
 - (1) Can be placed in oropharynx, nasopharynx, or down endotracheal tube
 - (2) Various sizes
 - (3) Smaller inside diameter than hard tip catheters
 - (4) Suction tubing without catheter (facilitates suctioning of large debris)
- 3. Suctioning the upper airway
 - a. Prevention of aspiration critical
 - (1) Mortality increases significantly if aspiration occurs
 - (2) Preoxygenate if possible
 - (3) Hyperoxygenate after suctioning
 - b. Description
 - (1) Soft tip catheters must be prelubricated
 - (2) Place catheter
 - (3) Suction during extraction of catheter
 - (4) Suction to clear the airway
 - (5) Reevaluate patency of the airway
 - (6) Ventilate and oxygenate
- 4. Tracheobronchial suctioning
 - a. Use sterile technique, if possible
 - b. Preoxygenation essential
 - c. Description
 - (1) Pre-lubricate soft tip catheter
 - (2) Hyperoxygenate
 - (a) May be necessary to inject 3 to 5 ccs of sterile water down endotracheal tube to loosen secretions
 - (3) Gently insert catheter until resistance is felt
 - (4) Suction upon extraction of catheter
 - (5) Do not exceed 15 seconds
 - (6) Ventilate and oxygenate
- 5. Gastric distention
 - a. Air becomes trapped in the stomach
 - b. Very common when ventilating non-intubated patients
 - c. Stomach diameter increases
 - d. Pushes against diaphragm
 - e. Interferes with lung expansion
 - f. Abdomen becomes increasingly distended
 - g. Resistance to bag-valve-mask ventilation
 - h. Management
 - (1) Non-invasive
 - (a) May be reduced by increasing bag-valve-mask ventilation time

- i) Adults - 1.5 to 2 seconds
- ii) Pediatrics - 1 to 1.5 seconds
- (b) Prepare for large volume suction
- (c) Position patient left lateral
- (d) Slowly apply pressure to epigastric region
- (e) Suction as necessary
- (2) Gastric tubes
 - (a) Tube placed in the stomach for gastric decompression and/ or emesis control
 - (b) Nasogastric decompression
 - i) Indications
 - a) Threat of aspiration
 - b) Need for lavage
 - ii) Contraindications
 - a) Extreme caution in esophageal disease or esophageal trauma
 - b) Facial trauma (caution)
 - c) Esophageal obstruction
 - iii) Advantages
 - a) Tolerated by awake patients
 - b) Does not interfere with intubation
 - c) Mitigates recurrent gastric distension
 - d) Mitigates nausea
 - e) Patient can still talk
 - iv) Disadvantages
 - a) Uncomfortable for patient
 - b) May cause patient to vomit during placement even if gag is suppressed
 - c) Interferes with BVM seal
 - v) Complications
 - a) Nasal, esophageal or gastric trauma from poor technique
 - b) Endotracheal placement
 - c) Supragastric placement
 - d) Tube obstruction
 - vi) Method
 - a) Prepare patient
 - b) Head neutral
 - c) Oxygenate
 - d) Suppress gag with topical anaesthetic or IV lidocaine
 - e) Anesthetize and dilate nares
 - f) Lubricate tube
 - g) Advance gently along nasal floor
 - h) Encourage patient to swallow or drink to facilitate passage
 - i) Advance into stomach
 - j) Confirm placement
 - k) Auscultate while injecting 30-50 ccs of air
 - l) Note gastric contents through tube
 - m) No reflux around tube
 - n) Secure in place
 - (c) Orogastric decompression

- i) Indications
 - a) Same parameters as NG
 - b) Generally preferred for unconscious patients
- ii) Contraindications
 - a) Same parameters as NG
- iii) Advantages
 - a) May use larger tubes
 - b) May lavage more aggressively
 - c) Safe to pass in facial fracture
 - d) Avoids nasopharynx
- iv) Disadvantages
 - a) May interfere with visualization during Intubation
- v) Method
 - a) Neutral or flexed head position
 - b) Introduce tube down midline
 - c) Procedure same as NG
- vi) Complications
 - a) Same as NG
 - b) Patient may bite tube

XVIII. Airway management

1. Manual maneuvers

- a. Head-tilt/ chin-lift maneuver
 - (1) Technique
 - (a) Tilt head back
 - (b) Lift chin forward
 - (c) Open mouth
 - (2) Indications
 - (a) Unresponsive patients who
 - i) Do not have mechanism for c-spine injury
 - ii) Unable to protect their own airway
 - (3) Contraindications
 - i) Awake patients
 - ii) Possible c-spine injury
 - (4) Advantages
 - (a) No equipment required
 - (b) Simple
 - (c) Safe
 - (d) Non-invasive
 - (5) Disadvantages
 - (a) Head tilt hazardous to c-spine injured patients
 - (b) Does not protect from aspiration
- b. Jaw-thrust without head-tilt maneuver
 - (1) Technique
 - (a) Head is maintained neutral
 - (b) Jaw is displaced forward
 - (c) Lift by grasping under chin and behind teeth
 - (d) Mouth opened
 - (2) Indications

- (a) Patients who are
 - i) Unresponsive
 - ii) Unable to protect their own airway
 - iii) May have c-spine injury
- (3) Contraindications
 - (a) Responsive patients
 - (b) Resistance to opening mouth
- (4) Advantages
 - (a) May be used in c-spine injury
 - (b) May be performed with cervical collar in place
 - (c) Does not require special equipment
- (5) Disadvantages
 - (a) Cannot maintain if patient becomes responsive or combative
 - (b) Difficult to maintain for extended period
 - (c) Very difficult to use in conjunction with bag-valve-mask ventilation
 - (d) Thumb must remain in patient's mouth in order to maintain displacement
 - (e) Separate rescuer required to perform bag-valve-mask ventilation
 - (f) Does not protect against aspiration
- c. Modified jaw-thrust maneuver
 - (1) Technique
 - (a) Head maintained neutral
 - (b) Jaw is displaced forward at mandibular angle
 - (2) Indications
 - (a) Unresponsive
 - (b) Cervical spine Injury
 - (c) Unable to protect own airway
 - (d) Resistance to opening mouth
 - (3) Contraindications
 - (a) Awake patients
 - (4) Advantages
 - (a) Non-invasive
 - (b) Requires no special equipment
 - (c) May be used with cervical collar in place
 - (5) Disadvantages
 - (a) Difficult to maintain
 - (b) Requires second rescuer for bag-valve-mask ventilation
 - (c) Does not protect against aspiration
- 2. Nasal airway
 - a. Soft rubber with beveled tip
 - (1) Distal tip rests in hypopharynx
 - (2) For adults, length measured from nostril to earlobe
 - (3) Diameter roughly equal to patient's little finger
 - b. Indications
 - (1) Unconscious patients
 - (2) Altered response patients with suppressed gag reflex
 - c. Contraindications
 - (1) Patient intolerance
 - (2) Caution in presence of facial fracture or skull fracture
 - d. Advantages

- (1) Can be suctioned through
 - (2) Provides patent airway
 - (3) Can be tolerated by awake patients
 - (4) Can be safely placed "blindly"
 - (5) Does not require mouth to be open
 - e. Disadvantages
 - (1) Poor technique may result in severe bleeding
 - (a) Resulting epistaxis may be extremely difficult to control
 - (2) Does not protect from aspiration
 - f. Placement
 - (1) Determine correct length and diameter
 - (2) Lubricate nasal airway
 - (3) With bevel towards septum, insert gently along the nasal floor parallel to the mouth
 - (4) Do not force
 - (5) Measurement from corner of the mouth to the jaw angle rather than tip of the ear
 - (6) Too long airway causes airway obstruction
3. Oral airway
- a. Hard plastic airway designed to prevent the tongue from obstructing glottis
 - b. Indications
 - (1) Unconscious patients
 - (2) Absent gag reflex
 - c. Contraindications
 - (1) Conscious patients
 - d. Advantages
 - (1) Non-invasive
 - (2) Easily placed
 - (3) Prevents blockage of glottis by tongue
 - e. Disadvantages
 - (1) Does not prevent aspiration
 - (2) Unexpected gag may produce vomiting
 - f. Complications
 - (1) Unexpected gag may produce vomiting
 - (2) Pharyngeal or dental trauma with poor technique
 - g. Placement
 - (1) Open mouth
 - (2) Remove visible obstructions
 - (3) Place with distal tip toward glottis using tongue depressor as adjunct
 - (4) Alternate method - place airway with distal tip toward palate and rotate into place
 - h. Pediatrics
 - (1) Place with tongue depressor
 - (2) Place with tip toward tongue, not palate
4. Endotracheal tube
- a. Tube passed into the trachea in order to provide externally controlled breathing through a BVM or ventilator
 - (1) Sizes
 - (a) 2.5-9.0 mm inside diameter (id)
 - (b) Length 12-32 cm
 - (2) Types
 - (a) Cuffed 5.0-9.0
-

- i) Proximal end 15 mm adapter
 - ii) Proximal end inflation port with pilot balloon
 - iii) Cm markings along length
 - iv) Distal end beveled tip
 - v) Distal end balloon cuff
 - (b) Uncuffed 2.5-4.5
 - i) Proximal end 15 mm adapter
 - ii) Distal end bevel tip
 - iii) Distal end depth markings
 - iv) No balloon cuff or pilot balloon
- b. Indications
 - (1) Present or impending respiratory failure
 - (2) Apnea
 - (3) Failure to protect own airway
- c. Contraindications
- d. Advantages
 - (1) Provides a secure airway
 - (2) Protects against aspiration
 - (3) Route for medication
- e. Disadvantages
 - (1) Special equipment needed
 - (2) Bypasses physiologic function of upper airway
 - (a) Warming
 - (b) Filtering
 - (c) Humidifying
- f. Complications
 - (1) Bleeding
 - (2) Laryngeal swelling
 - (3) Laryngospasm
 - (4) Vocal cord damage
 - (5) Mucosal necrosis
 - (6) Barotrauma
- g. Techniques of insertion
 - (1) Orotracheal intubation by direct laryngoscopy
 - (a) Directly visualizing the passage of an ET tube into the trachea
 - (b) Indications
 - i) Apnea
 - ii) Hypoxia
 - iii) Poor respiratory effort
 - iv) Suppression or absence of gag reflex
 - (c) Contraindications
 - i) Caution in unsuppressed gag reflex
 - (d) Advantages
 - i) Direct visualization of anatomy and tube placement
 - ii) Ideal method for confirming placement
 - iii) May be performed in breathing and apneic patients
 - (e) Disadvantages
 - i) Requires special equipment
 - (f) Complications

- i) Dental trauma
- ii) Laryngeal trauma
- iii) Misplacement
 - a) Right mainstem
 - b) Esophageal
- (g) Equipment
 - i) Laryngoscope
 - a) Device used to visualize glottis during endotracheal intubation
 - b) Battery pack/ handle with interchangeable blades
 - c) Blade types
 - d) Straight (Miller) lifts epiglottis
 - e) Curved (MacIntosh) lifts epiglottis by fitting into vallecula
 - ii) 10 cc syringe to inflate/ deflate balloon cuff
 - iii) Water soluble lubricant to lubricate endotracheal tube, promote ease of passage, and decrease trauma
 - iv) Stylet - semi-rigid wire for molding and maintaining tube shape
 - v) Securing device
 - a) Tape
 - b) Commercially available endotracheal tube holder
 - vi) Suction
 - vii) Body substance precautions
 - a) Gloves
 - b) Mask
 - c) Eyewear or faceshield
- h. Endotracheal intubation technique
 - (1) Medical patient
 - (a) Orotracheal intubation by direct laryngoscopy
 - (b) Place patient supine in sniffing position to facilitate visualization
 - (c) Method
 - i) Position used when the potential for c-spine injury does not exist
 - a) Sniffing position
 - b) Optimal hyperextension of head with elevation of occiput
 - c) Brings the axes of the mouth, the pharynx, and the trachea into alignment
 - ii) When potential for c-spine injury exists head is held firmly in neutral position during intubation
 - iii) Ensure optimal oxygenation and ventilation with 100% O₂
 - iv) Ensure all equipment is prepared
 - a) Lubricated tube with stylet in place
 - b) Best position is "hockey stick"
 - c) Bend directly behind balloon cuff
 - d) Working laryngoscope
 - e) Blade locks securely in place
 - f) Light is bright and steady (unpleasant to look at)
 - g) Test cuff by inflating and then deflating
 - v) Ideally, hyperoxygenate patient for 30 seconds to 1 minute
 - vi) Insert laryngoscope blade
 - a) Gently insert to hypopharynx
 - b) Lift tongue and jaw with firm, steady pressure

- ii) Confined space
- iii) Inability to directly visualize
- (c) Contraindications
 - i) Breathing patient
 - ii) Present gag reflex
- (d) Advantages
 - i) Does not require laryngoscope
 - ii) Does not require sniffing position
 - iii) May be passed through fluid obstructions
- (e) Disadvantages
 - i) Semi-blind technique
 - ii) May only be done on apneic patients
- (f) Method
 - i) Pre-intubation precautions
 - ii) Open mouth
 - a) Extending tongue with gauze will facilitate palpation of glottis
 - iii) Palpate and lift epiglottis
 - iv) Palpate arytenoid cartilage
 - v) Pass tube between epiglottis and arytenoids
 - vi) Inflate balloon cuff
 - vii) Confirm placement
 - viii) Secure tube
- (4) Transillumination techniques (lighted stylet)
 - (a) Use of a lighted stylet to transilluminate the glottis and facilitate intubation
 - (b) Indications
 - i) Inability to directly visualize glottis
 - ii) Cervical spine injury
 - (c) Contraindications
 - i) Present gag reflex
 - ii) Airway obstruction
 - (d) Advantages
 - i) Minimal manipulation of cervical spine
 - ii) Adds visual parameter to blind technique
 - (e) Disadvantages
 - i) Difficult in bright light
 - (f) Method
 - i) Pre-intubation precautions
 - ii) Place patient in neutral position
 - iii) Bend tube into "J"
 - iv) Turn on stylet
 - a) Insert midline into pharynx
 - v) Observe for focused midline glow
 - vi) Advance additional 1-2 cm
 - vii) Remove stylet
 - viii) Inflate balloon cuff
 - ix) Confirm placement
 - x) Secure tube
- i. Confirming placement
 - (1) Methods

- (a) Direct re-visualization
 - i) Re-visualize glottis
 - ii) Note tube depth
 - a) Average tube depth in males is 22 cm at the teeth
 - b) Average tube depth in women is 21 cm
- (b) Note condensation in the tube
- (c) Auscultation
 - i) Epigastric area
 - a) Air entry into stomach indicates esophageal placement
 - ii) Bilateral bases
 - a) Equal volume and expansion
 - iii) Apices
 - a) Equal volume
 - iv) Unequal or absent breath sounds indicate
 - a) Esophageal placement
 - b) Right mainstem placement
 - c) Pneumothorax
 - d) Bronchial obstruction
- (d) Palpation of balloon cuff at sternal notch by compressing pilot balloon
- (e) Pulse oximetry
- (f) Expired CO₂
 - i) Measures presence of CO₂ in expired air
 - a) Colormetric
 - b) Digital
 - c) Digital/ waveform
- (g) Bag-valve-mask ventilation compliance
 - i) Increased resistance to BVM compliance may indicate
 - a) Gastric distension
 - b) Esophageal placement
 - c) Tension pneumothorax
- (2) Evidence of a misplaced tube regardless when it was last checked must be reconfirmed
- (3) Confirmation must be performed
 - (a) By multiple methods
 - (b) Immediately after tube placement
 - (c) After any major move
 - (d) After manipulation of neck (manipulation of neck may displace tube up to 5 cm)
- j. Corrective measures
 - (1) Esophageal placement
 - (a) Ready to vigorously suction as needed
 - (b) Likelihood of emesis is increased especially if gastric distension is present
 - (c) Ideally preoxygenate prior to reintubation
 - (d) Misplaced tube may be removed after proper tracheal placement is confirmed or it may be removed beforehand provided diligent and vigorous airway suctioning is ready
 - (2) Right mainstem placement
 - (a) Loosen or remove securing device
 - (b) Deflate balloon cuff
 - (c) While ventilation continues, SLOWLY retract tube while simultaneously listening for breath sounds over left chest

- (d) STOP as soon as breath sounds are heard in left chest
 - (e) Note tube depth
 - (f) Reinflate balloon cuff
 - (g) Secure tube
- k. Securing the tube
- (1) As critical as the intubation itself
 - (2) Multiple methods and products available
 - (3) Adjuncts include
 - (a) Securing to maxilla rather than mandible
 - (b) Tincture of benzoin to facilitate tape adhesion
- l. Field extubation
- (1) Generally, the only reason to field extubate is the patient is unreasonably intolerant of the tube
 - (2) Awake patients are at high risk of laryngospasm immediately following extubation
 - (3) There may be a problem re-inducing and re-intubating a laryngospastic patient
 - (4) Indications
 - (a) Able to protect and maintain airway
 - (b) Risks for need to reintubate significantly reduce
 - (c) Must not be sedated
 - (5) Contraindications
 - (a) Any risk of recurrence of respiratory failure
 - (6) Complications
 - (a) Highest risk of recurrence of laryngospasm is immediately post extubation
 - (b) Respiratory distress or failure may return necessitating re-intubation
 - (7) Method
 - (a) Ensure oxygenation
 - (b) Intubation equipment and suction immediately available
 - (c) Confirm patient responsiveness
 - (d) Suction oropharynx
 - (e) Deflate cuff
 - (f) Remove upon cough or expiration
 - (8) Special considerations
 - (a) Need for field extubation is extremely rare
 - (b) Intolerance of ET tube evidenced by gag reflex should be addressed by increasing sedation rather than removing tube
- m. Pediatric endotracheal intubation
- (1) Laryngoscope and size appropriate blades
 - (a) Straight blades are preferred
 - (b) General guidelines
 - i) Premature infant - 0 straight
 - ii) Full-term infant to one year of age - 1 straight
 - iii) Two years of age to adolescent - 2 straight
 - iv) Adolescent and above - 3 straight or curved
 - (2) Appropriate size endotracheal tube
 - (a) Formula = $(16 + \text{age in years}) \div 4$
 - (b) Anatomical clues
 - (c) General guidelines
 - i) Premature infant - 2.5 to 3.0 uncuffed
 - ii) Full-term infant - 3.0 to 3.5 uncuffed

- iii) Infant to one year of age - 3.5 to 4.0 uncuffed
- iv) Toddler - 4.0 to 5.0 uncuffed
- v) Preschool - 5.0 to 5.5 uncuffed
- vi) School age - 5.5 to 6.5 uncuffed
- vii) Adolescent - 7.0 to 8.0 cuffed
- (d) Depth of insertion
 - i) 2-3 cm below the vocal cords
 - a) Uncuffed - place the black glottic marker of the tube at the level of the vocal cords
 - b) Cuffed - insert until the cuff is just below the vocal cords
 - ii) 3 x inside diameter - 1
 - iii) General guidelines
 - a) Premature infant - 8 cm
 - b) Full-term infant - 8 to 9.5 cm
 - c) Infant to one year of age - 9.5 to 11 cm
 - d) Toddler - 11 to 12.5 cm
 - e) Preschool - 12.5 to 14 cm
 - f) School age - 14 to 20 cm
 - g) Adolescent - 20 to 23 cm
- (e) Appropriate sized endotracheal tube stylet
- (3) Endotracheal tube securing device
 - (a) Tape
 - (b) Commercial device
- (4) Technique
 - (a) Separate parent/ guardian and patient
 - (b) Manually open airway
 - (c) Insert appropriate airway adjunct if needed
 - (d) Ventilate patient with 100% oxygen via age appropriate sized bag
 - (e) Place the patient's head in the sniffing position
 - (f) Pre-oxygenate the patient with 100% oxygen a minimum of 30 seconds
 - (g) Prepare all equipment
 - i) Lubricate endotracheal tube with sterile water/ saline or water-soluble gel
 - ii) Lubricate stylet if utilized
 - (h) Insert the laryngoscope to the right side of the mouth and sweep the tongue to the left side
 - (i) Lift tongue with firm, steady pressure
 - i) Avoid fulcrum against teeth or gums
 - (j) Use the tip of the blade to lift epiglottitis
 - (k) Identify the vocal cords
 - (l) Introduce the endotracheal tube to the right side of the mouth
 - (m) Pass the tube through the vocal cords to about 2-3 cm below the vocal cords
 - (n) Confirm proper tube placement
 - i) Observe for symmetrical chest expansion
 - ii) Auscultate for equal breath sounds over each lateral chest wall high in the axillae
 - iii) Absence of breath sounds over the abdomen
 - iv) Improved heart rate and color
 - v) If available, end-tidal carbon dioxide detector
 - (o) Secure tube noting placement of distance marker at teeth/ gums

- (p) Reconfirm tube placement
- 5. Multi-lumen airways
 - a. Pharyngo-tracheal lumen airway (PTL)
 - (1) An endotracheal tube encased in a large pharyngeal tube
 - (2) Designed to be passed blindly
 - (3) Dual ventilation ports provide means to ventilate regardless of whether the ET tube is placed in the esophagus or the trachea
 - (4) Indications
 - (a) Alternative airway control when conventional intubation procedures are not available or successful
 - (5) Advantages
 - (a) Can ventilate with tracheal or esophageal placement
 - (b) No facemask to seal
 - (c) No special equipment
 - (d) Does not require sniffing position
 - (6) Disadvantages
 - (a) Cannot be used in awake patients
 - (b) Adults only
 - (c) Pharyngeal balloon mitigates but does not eliminate aspiration risk
 - (d) Can only be passed orally
 - (e) Extremely difficult to intubate around
 - (7) Method
 - (a) Head neutral
 - (b) Pre-intubation precautions
 - (c) Insert at the midline using jaw-lift
 - (d) Ventilate through pharyngeal tube (green) first
 - i) Chest rise indicates ET tube is in esophagus
 - a) Inflate pharyngeal balloon and ventilate
 - ii) No chest rise indicates ET tube in trachea
 - a) Inflate ET tube balloon cuff
 - b) Ventilate through ET tube
 - (8) Complications
 - (a) Pharyngeal or esophageal trauma from poor technique
 - (b) Unrecognized displacement of ET tube into esophagus
 - (c) Displacement of pharyngeal balloon
 - (9) Special considerations
 - (a) Good assessment skills are essential to properly confirm placement
 - (b) Mis-identification of placement has been reported
 - (c) Reinforce multiple confirmation of placement techniques
 - b. Combitube
 - (1) Pharyngeal and endotracheal tube molded into a single unit
 - (2) Indications
 - (a) Alternative airway control when conventional intubation measures are unsuccessful or unavailable
 - (3) Contraindications
 - (a) Children too small for the tube
 - (b) Esophageal trauma or disease
 - (c) Caustic ingestion
 - (4) Advantages

- (a) Rapid insertion
- (b) No special equipment
- (c) Does not require sniffing position
- (5) Disadvantages
 - (a) Impossible to suction trachea when tube is in esophagus
 - (b) Adults only
 - (c) Unconscious only
 - (d) Very difficult to intubate around
- (6) Method
 - (a) Head - neutral position
 - (b) Pre-intubation precautions
 - (c) Insert with jaw-lift at midline
 - (d) Inflate pharyngeal cuff with 100 ccs of air
 - (e) Inflate distal cuff with 10-15 ccs of air
 - (f) Ventilate through longest tube first (pharyngeal)
 - i) Chest rise indicates esophageal placement of distal tip
 - ii) No chest rise indicates tracheal placement, switch ports and ventilate
- (7) Special considerations
 - (a) Good assessment skills are essential to confirm proper placement
 - (b) Mis-identification of placement has been reported
 - (c) Reinforce multiple confirmation techniques

XIX. Pharmacological adjuncts to airway management and ventilation

1. Sedation in emergency intubation

- a. Sedatives are used in airway management to
 - (1) Reduce anxiety
 - (2) Induce amnesia
 - (3) Decrease the gag reflex
- b. Indications
 - (1) Combative patients
 - (2) Patients who require aggressive airway management but who are too conscious to tolerate intubation
 - (3) Agitated patients
- c. Contraindications
 - (1) Known sensitivity to the medications
- d. Advantages
 - (1) Decreases anxiety
 - (2) Induces amnesia
- e. Disadvantages
 - (1) Respiratory depression
 - (2) Vomiting/ aspiration
- f. Pharmacology
 - (1) Decreases anxiety
 - (2) Increases patient compliance
 - (3) Often produces amnesia to procedure
 - (4) Enhances ease of intubation
 - (5) Types of medications used
 - (a) Haloperidol
 - (b) Barbiturates

- (c) Benzodiazepines
 - (d) Etomidate
 - (e) Narcotics
 - (f) Ketamine
 - g. Complications
 - (1) Airway compromise
 - (2) Regurgitation/ aspiration
 - (3) Loss of protective reflexes
 - (4) Sedating patient with tenuous airway may completely collapse what airway they have
 - h. Method
- 2. Neuromuscular blockade in emergency intubation
 - a. The use of neuromuscular blocking agents to induce skeletal muscle paralysis
 - b. The patient is much easier to intubate once paralyzed
 - c. Indications
 - (1) Combative patients who need to be intubated
 - d. Contraindications
 - (1) Absolute
 - (a) Inability to ventilate once paralyzed
 - (2) Relative
 - (a) Patients who will be difficult to ventilate (i.e. facial hair, etc)
 - (b) Patients who will be difficult to intubate (short necks, etc.)
 - e. Advantages
 - (1) Enables the paramedic to intubate some patients who need aggressive airway management (i.e. head injury, etc.) but may be otherwise uncooperative
 - f. Disadvantages
 - (1) Paralysis of the diaphragm/ apnea
 - (2) Inability of the patient to protect their own airway
 - g. Pharmacology
 - (1) Skeletal muscles contract in response to nerve stimulus
 - (2) Junction of muscle and nerve fiber is neuromuscular junction
 - (3) Acetylcholine (ACH) allows nerve impulse to cross neuromuscular junction
 - (4) Neuromuscular blockade relaxes muscle by impeding the action of ACH
 - (5) Does not provide sedation
 - (6) Types
 - (a) Depolarizing agents
 - i) Substitute themselves into neuromuscular junction
 - ii) May cause fasciculations (uncontrollable muscle twitching)
 - iii) Examples
 - a) Succinylcholine
 - b) Rapid onset/ short duration (90 seconds/ 5-10 minutes)
 - c) Use with caution in burns, crush, blunt trauma (hyperkalemia)
 - (b) Non-depolarizing agents
 - i) Block uptake of ACH into junction
 - ii) Do not cause fasciculations
 - iii) Examples
 - a) Vecuronium
 - b) Rapid onset - 2 minutes
 - c) Short duration - 45 minutes

- d) Pancuronium
 - e) Rapid onset - 3-5 minutes
 - f) Longer duration - 1 hour
 - h. Complications
 - (1) Inability to intubate
 - (2) Inability to ventilate
 - (3) Vomiting
 - (4) Airway compromise
 - i. Method for rapid sequence intubation
- XX. Translaryngeal cannula ventilation
1. High volume/ high pressure ventilation of lungs through cannulation of trachea below the glottis
 - a. Oxygen delivery differs from other methods
 - b. Delivers a large volume of O₂ through a small port
 - c. Delivers a very high pressure to the lungs compared to other methods (50 psi versus less than 1 psi through a regulator)
 2. Indications
 - a. Apnea
 - b. Delayed or inability to ventilate the patient by other means
 3. Contraindications
 - a. Total airway obstruction (both inspiratory and expiratory)
 - b. Equipment not immediately available
 4. Advantages
 - a. Rapidly performed
 - b. Provides adequate ventilation when performed properly
 - c. Does not manipulate the cervical spine
 - d. Does not interfere with subsequent attempts to intubate
 5. Disadvantages
 - a. Requires jet ventilator
 - b. Expends high volumes of oxygen more rapidly
 - c. May not protect against aspiration
 6. Equipment
 - a. Large bore IV catheter (14-16 gauge)
 - b. 10 cc syringe
 - c. 3 ccs of water or saline (optional)
 - d. Oxygen source (50 psi)
 - e. Jet ventilator
 7. Method
 - a. Prepare equipment
 - b. Identify cricothyroid membrane
 - c. Insert needle with syringe midline through cricothyroid membrane at a slight angle towards sternum
 - d. Withdraw on syringe plunger until air is freely withdrawn (bubbles if fluid is in syringe)
 - e. Advance additional 1 cm
 - f. Hold needle steady, advance catheter to hub
 - g. Attach jet ventilator
 - h. Ventilate once per five seconds
 - (1) Exhalation is passive through the glottis
 8. Complications
-

- a. Bleeding
 - (1) From improper catheter placement
 - b. Subcutaneous emphysema
 - (1) From excessive air leak around catheter site or undetected laryngeal trauma
 - c. Airway obstruction
 - (1) Result of excessive bleeding or subcutaneous air which compresses trachea
 - d. Barotrauma
 - (1) Resulting from overinflation
 - e. Hypoventilation
- XXI. Cricothyrotomy
- 1. Surgical access to the airway through the cricothyroid membrane
 - 2. Indications
 - a. Total upper airway obstruction (epiglottitis, acute anaphylaxis, respiratory tract burns, etc.)
 - b. Massive facial trauma
 - c. Delayed or inability to intubate or ventilate the patient by other means
 - d. Contraindication to intubation
 - e. Posterior laceration of the tongue
 - f. Inability to open the mouth
 - 3. Contraindications
 - a. Inability to identify anatomical landmarks
 - b. Crush injury to the larynx
 - c. Tracheal transection
 - d. Underlying anatomical abnormality (trauma, tumor, subglottic stenosis, etc.)
 - 4. Advantages
 - a. Rapidly performed
 - b. Much faster and technically easier than tracheostomy
 - c. Does not manipulate the cervical spine
 - 5. Disadvantages
 - a. Difficult to perform in children
 - b. Difficult to perform on patients with short, muscular, or fat necks
 - 6. Equipment
 - a. Endotracheal or tracheostomy tube
 - b. Scalpel
 - c. Curved hemostats
 - d. Suction apparatus
 - 7. Method
 - 8. Complications
 - a. Incorrect tube placement/ false passage
 - b. Thyroid gland damage
 - c. Severe bleeding
 - d. Subcutaneous emphysema
 - e. Laryngeal nerve damage
- XXII. Special patient considerations
- 1. Patients with laryngectomies (stomas)
 - a. Mucous plug
 - (1) Laryngectomies possess less efficient cough
 - (2) Mucous commonly obstructs tubes

- (3) Tube may be removed/ cleaned and replaced
 - b. Stenosis
 - (1) Stoma spontaneously narrows
 - (a) Potentially life-threatening
 - (b) Soft tissue swelling decreases stoma diameter
 - (2) Trach tube is difficult or impossible to replace
 - (3) ET tube must be placed before total obstruction
 - c. Suctioning
 - (1) Must be done with extreme caution if laryngeal edema is suspected
 - (2) Procedure
 - (a) Preoxygenate
 - (b) Inject 3 cc sterile saline down trachea
 - (c) Instruct patient to exhale
 - (d) Insert suction catheter until resistance detected
 - (e) Instruct patient to cough or exhale
 - (f) Suction during withdrawal
 - d. Tube replacement
 - (1) Lubricate appropriately sized tracheostomy tube or ET tube (5.0 or larger)
 - (2) Instruct patient to exhale
 - (3) Gently insert tube about 1-2 cm beyond balloon cuff
 - (4) Inflate balloon cuff
 - (5) Confirm comfort, patency and proper placement
 - (6) Ensure false lumen was not created
2. Dental appliances
- a. Dentures, partial plates, etc.
 - b. Best removed before intubation
3. Airway management considerations for patients with facial injuries
- a. Facial injuries suggest the possibility of cervical spine injury
 - (1) In-line stabilization
 - (a) Trauma technique endotracheal intubation
 - b. Foreign body/ blood in oropharynx
 - (1) Suction airway
 - c. Inability to ventilate/ intubate orally
 - (1) Requires surgical intervention

UNIT TERMINAL OBJECTIVE

- 3-1 At the completion of this unit, the paramedic student will be able to use the appropriate techniques to obtain a medical history from a patient.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 3-1.1 Describe the techniques of history taking. (C-1)
- 3-1.2 Discuss the importance of using open ended questions. (C-1)
- 3-1.3 Describe the use of facilitation, reflection, clarification, empathetic responses, confrontation, and interpretation. (C-1)
- 3-1.4 Differentiate between facilitation, reflection, clarification, sympathetic responses, confrontation, and interpretation. (C-3)
- 3-1.5 Describe the structure and purpose of a health history. (C-1)
- 3-1.6 Describe how to obtain a comprehensive health history. (C-1)
- 3-1.7 List the components of a comprehensive history of an adult patient. (C-1)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 3-1.8 Demonstrate the importance of empathy when obtaining a health history. (A-1)
- 3-1.9 Demonstrate the importance of confidentiality when obtaining a health history. (A-1)

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

- I. Overview
 - A. Purpose
 - 1. This information is gathered on a patient by patient, case by case basis
 - B. Several parts
 - 1. Specific purpose
 - 2. Together they give structure
 - C. Does not dictate sequence
- II. Content of the patient history
 - A. Date
 - 1. Always important
 - 2. Time may also be a consideration
 - B. Identifying data
 - 1. Age
 - 2. Sex
 - 3. Race
 - 4. Birthplace
 - 5. Occupation
 - C. Source of referral
 - 1. Patient referral
 - 2. Referral by others
 - D. Source of history
 - 1. Patient
 - 2. Family
 - 3. Friends
 - 4. Police
 - 5. Others
 - E. Reliability
 - 1. Variable
 - a. Memory
 - b. Trust
 - c. Motivation
 - 2. Made at the end of the evaluation, not the beginning
 - F. Chief complaint
 - 1. Main part of the health history
 - 2. The one or more symptoms for which the patient is seeking medical care for
 - G. Present illness
 - 1. Identifies chief complaint
 - 2. Provides a full, clear, chronological account of the symptoms
 - H. Past history
 - 1. General state of health
 - 2. Childhood illnesses
 - 3. Adult illnesses
 - 4. Psychiatric illnesses
 - 5. Accidents and injuries

- 6. Operations
 - 7. Hospitalizations
 - I. Current health status
 - 1. Focuses on present state of health
 - 2. Environmental conditions
 - 3. Personal habits
 - a. Current medications
 - b. Allergies
 - c. Tobacco use
 - d. Alcohol, drugs and related substances
 - e. Diet
 - f. Screening tests
 - g. Immunizations
 - h. Sleep patterns
 - i. Exercise and leisure activities
 - j. Environmental hazards
 - k. Use of safety measures
 - l. Family history
 - m. Home situation and significant other
 - n. Daily life
 - o. Important experiences
 - p. Religious beliefs
 - q. Patients outlook
 - J. Review of body systems
- III. Techniques of history taking
- A. Setting the stage
 - 1. Reviewing the medical history
 - a. Briefly review any previous medical records available
 - b. Important insight
 - (1) Referral
 - (2) Life experience
 - (3) Past diagnosis and treatment
 - 2. The environment
 - a. Proper environment enhances communication
 - b. Place for you and the patient to sit
 - c. Be cautious of power relationship
 - d. Personal space
 - 3. Your demeanor and appearance
 - a. Just as you are watching the patient, the patient will be watching you
 - b. Messages of body language
 - c. Clean, neat, professional appearance
 - 4. Note taking
 - a. Difficult to remember all details
 - b. Most patients are comfortable with note taking
 - (1) If concerns arise, explain your purpose
 - (2) Do not divert your attention from the patient to take notes

- B. Learning about the present illness
 - 1. Greeting the patient
 - a. Greet by name
 - b. Shake hands
 - c. Avoid the use of unfamiliar or demeaning terms such as Granny or Hon, etc.
 - 2. The patient's comfort
 - a. Be alert to patient comfort levels
 - b. Inquire about the patient's feelings
 - c. Watch for signs of uneasiness
 - 3. Opening questions
 - a. Find out why the patient is seeking medical care or advice
 - b. Use a general, open-ended question
 - c. Follow the patient's leads
 - (1) Facilitation
 - (a) Your posture, actions or words should encourage the patient to say more
 - (b) Making eye contact or saying phrases such as "Go-on" or "I'm listening" may help the patient to continue
 - (2) Reflection
 - (a) Repetition of the patient's words that encourage additional responses
 - (b) Typically does not bias the story or interrupt the patient's train of thought
 - (3) Clarification
 - (a) Used to clarify ambiguous statements or words
 - (4) Empathetic responses
 - (a) Use techniques of therapeutic communication to interpret feelings and your response
 - (5) Confrontation
 - (a) Some issues or response may require you to confront patients about their feelings
 - (6) Interpretation
 - (a) Goes beyond confrontation, requires you to make an inference
 - (7) Asking about feelings
 - 4. Getting more information
 - a. Attributes of a symptom
 - (1) Location
 - (a) Where is it
 - (b) Does it radiate
 - (2) Quality
 - (a) What is it like
 - (3) Quantity or severity
 - (a) How bad is it
 - (b) Attempt to quantify the pain
 - i) 1 - 10 scale
 - ii) Other scales
 - (4) Timing

- (a) When did it start
 - (b) How long does it last
 - (5) The setting in which it occurs
 - (a) Emotional response
 - (b) Environmental factors
 - (6) Factors that make it better or worse
 - (7) Associated manifestations
- C. Clinical reasoning
- 1. Results of questioning may allow you to think about associated problems and body systems
- D. Direct questions
- 1. To gather additional information, direct questions may be required
 - 2. Should not be leading questions
 - 3. Ask one question at a time
 - 4. Use language that is appropriate
- E. Taking a history on sensitive topics
- 1. Alcohol and drugs
 - 2. Physical abuse or violence
 - 3. Sexual history
- IV. Special challenges
- A. Silence
- 1. Silence is often uncomfortable
 - 2. Silence has meaning and many uses
 - a. Patients may use this to collect their thoughts, remember details or decide whether or not they trust you
 - b. Be alert for nonverbal clues of distress
 - 3. Silence may be a result of the interviewer's lack of sensitivity
- B. Overly talkative patients
- 1. Faced with a limited amount of time interviewers may become impatient
 - 2. Although there are no perfect solutions, several techniques may be helpful
 - a. Lower your goals, accept a less comprehensive history
 - b. Give the patient free reign for the first several minutes
 - c. Summarize frequently
- C. Patients with multiple symptoms
- D. Anxious patients
- 1. Anxiety is natural
 - 2. Be sensitive to nonverbal clues
- E. Reassurance
- 1. It is tempting to be overly reassuring
 - 2. Premature reassurance blocks communication
- F. Anger and hostility
- 1. Understand that anger and hostility are natural
 - 2. Often the anger is displaced toward the clinician
 - 3. Do not get angry in return
- G. Intoxication
- 1. Be accepting not challenging

2. Do not attempt to have the patient lower their voice or stop cursing; this may aggravate them
 3. Avoid trapping them in small areas
- H. Crying
1. Crying, like anger and hostility may provide valuable insight
 2. Be sympathetic
- I. Depression
1. Be alert for signs of depression
 2. Be sure you know how bad it is
- J. Sexually attractive or seductive patients
1. Clinicians and patients may be sexually attracted to each other
 2. Accept these as normal feelings, but prevent them from affecting your behavior
 3. If a patient becomes seductive or makes sexual advances, frankly but firmly make clear that your relationship is professional not personal
- K. Confusing behaviors or histories
1. Be prepared for the confusion and frustration of varying behaviors and histories
 2. Be alert for mental illness, delirium or dementia
- L. Limited intelligence
1. Do not overlook the ability of these patients to provide you with adequate information
 2. Be alert for omissions
 3. Severe mental retardation may require you to get information from family or friends
- M. Language barriers
1. Take every possible step to find a translator
 2. A few broken words are not an acceptable substitute
- N. Hearing problems
1. Very similar to patients with a language barrier
 2. If the patient can sign, make every effort to find a translator
- O. Blind patients
1. Be careful to announce yourself and to explain who you are and why you are there
- P. Talking with family and friends
1. Some patients may not be able to provide you with all information
 2. Try to find a third party who can help you get the whole story

UNIT TERMINAL OBJECTIVE

- 3-2 At the completion end of this unit, the paramedic student will be able to explain the pathophysiological significance of physical exam findings.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 3-2.1 Define the terms inspection, palpation, percussion, auscultation. (C-1)
- 3-2.2 Describe the techniques of inspection, palpation, percussion, and auscultation. (C-1)
- 3-2.3 Describe the evaluation of mental status. (C-1)
- 3-2.4 Evaluate the importance of a general survey. (C-3)
- 3-2.5 Describe the examination of skin, hair and nails. (C-1)
- 3-2.6 Differentiate normal and abnormal findings of the assessment of the skin. (C-3)
- 3-2.7 Distinguish the importance of abnormal findings of the assessment of the skin. (C-3)
- 3-2.8 Describe the examination of the head and neck. (C-1)
- 3-2.9 Differentiate normal and abnormal findings of the scalp examination. (C-3)
- 3-2.10 Describe the normal and abnormal assessment findings of the skull. (C-1)
- 3-2.11 Describe the assessment of visual acuity. (C-1)
- 3-2.12 Explain the rationale for the use of an ophthalmoscope. (C-1)
- 3-2.13 Describe the examination of the eyes. (C-1)
- 3-2.14 Distinguish between normal and abnormal assessment findings of the eyes. (C-3)
- 3-2.15 Explain the rationale for the use of an otoscope. (C-1)
- 3-2.16 Describe the examination of the ears. (C-1)
- 3-2.17 Differentiate normal and abnormal assessment findings of the ears. (C-3)
- 3-2.18 Describe the examination of the nose. (C-1)
- 3-2.19 Differentiate normal and abnormal assessment findings of the nose. (C-3)
- 3-2.20 Describe the examination of the mouth and pharynx. (C-1)
- 3-2.21 Differentiate normal and abnormal assessment findings of the mouth and pharynx. (C-3)
- 3-2.22 Describe the examination of the neck. (C-1)
- 3-2.23 Differentiate normal and abnormal assessment findings the neck. (C-3)
- 3-2.24 Describe the survey of the thorax and respiration. (C-1)
- 3-2.25 Describe the examination of the posterior chest. (C-1)
- 3-2.26 Describe percussion of the chest. (C-1)
- 3-2.27 Differentiate the percussion notes and their characteristics. (C-3)
- 3-2.28 Differentiate the characteristics of breath sounds. (C-3)
- 3-2.29 Describe the examination of the anterior chest. (C-1)
- 3-2.30 Differentiate normal and abnormal assessment findings of the chest examination. (C-3)
- 3-2.31 Describe special examination techniques related to the assessment of the chest. (C-1)
- 3-2.32 Describe the examination of the arterial pulse including rate, rhythm, and amplitude. (C-1)
- 3-2.33 Distinguish normal and abnormal findings of arterial pulse. (C-3)
- 3-2.34 Describe the assessment of jugular venous pressure and pulsations. (C-1)
- 3-2.35 Distinguish normal and abnormal examination findings of jugular venous pressure and pulsations. (C-3)
- 3-2.36 Describe the examination of the heart and blood vessels. (C-1)
- 3-2.37 Differentiate normal and abnormal assessment findings of the heart and blood vessels. (C-3)
- 3-2.38 Describe the auscultation of the heart. (C-1)
- 3-2.39 Differentiate the characteristics of normal and abnormal findings associated with the auscultation of the heart. (C-3)
- 3-2.40 Describe special examination techniques of the cardiovascular examination. (C-1)

- 3-2.41 Describe the examination of the abdomen. (C-1)
- 3-2.42 Differentiate normal and abnormal assessment findings of the abdomen. (C-3)
- 3-2.43 Describe auscultation of the abdomen. (C-1)
- 3-2.44 Distinguish normal and abnormal findings of the auscultation of the abdomen. (C-3)
- 3-2.45 Describe the examination of the female genitalia. (C-1)
- 3-2.46 Differentiate normal and abnormal assessment findings of the female genitalia. (C-3)
- 3-2.47 Describe the examination of the male genitalia. (C-1)
- 3-2.48 Differentiate normal and abnormal findings of the male genitalia. (C-3)
- 3-2.49 Describe the examination of the anus and rectum. (C-3)
- 3-2.50 Distinguish between normal and abnormal findings of the anus and rectum. (C-3)
- 3-2.51 Describe the examination of the peripheral vascular system. (C-1)
- 3-2.52 Differentiate normal and abnormal findings of the peripheral vascular system. (C-3)
- 3-2.53 Describe the examination of the musculoskeletal system. (C-1)
- 3-2.54 Differentiate normal and abnormal findings of the musculoskeletal system. (C-3)
- 3-2.55 Describe the examination of the nervous system. (C-1)
- 3-2.56 Differentiate normal and abnormal findings of the nervous system. (C-3)
- 3-2.57 Describe the assessment of the cranial nerves. (C-1)
- 3-2.58 Differentiate normal and abnormal findings of the cranial nerves. (C-3)
- 3-2.59 Describe the general guidelines of recording examination information. (C-1)
- 3-2.60 Discuss the considerations of examination of an infant or child. (C-1)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 3-2.61 Demonstrate a caring attitude when performing physical examination skills. (A-3)
- 3-2.62 Discuss the importance of a professional appearance and demeanor when performing physical examination skills. (A-1)
- 3-2.63 Appreciate the limitations of conducting a physical exam in the out-of-hospital environment. (A-2)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 3-2.64 Demonstrate the examination of skin, hair and nails. (P-2)
- 3-2.65 Demonstrate the examination of the head and neck. (P-2)
- 3-2.66 Demonstrate the examination of the eyes. (P-2)
- 3-2.67 Demonstrate the examination of the ears. (P-2)
- 3-2.68 Demonstrate the assessment of visual acuity. (P-2)
- 3-2.69 Demonstrate the examination of the nose. (P-2)
- 3-2.70 Demonstrate the examination of the mouth and pharynx. (P-2)
- 3-2.71 Demonstrate the examination of the neck. (P-2)
- 3-2.72 Demonstrate the examination of the thorax and ventilation. (P-2)
- 3-2.73 Demonstrate the examination of the posterior chest. (P-2)
- 3-2.74 Demonstrate auscultation of the chest. (P-2)
- 3-2.75 Demonstrate percussion of the chest. (P-2)
- 3-2.76 Demonstrate the examination of the anterior chest. (P-2)
- 3-2.77 Demonstrate special examination techniques related to the assessment of the chest. (P-2)
- 3-2.78 Demonstrate the examination of the arterial pulse including location, rate, rhythm, and amplitude. (P-2)
- 3-2.79 Demonstrate the assessment of jugular venous pressure and pulsations. (P-2)

- 3-2.80 Demonstrate the examination of the heart and blood vessels. (P-2)
- 3-2.81 Demonstrate special examination techniques of the cardiovascular examination. (P-2)
- 3-2.82 Demonstrate the examination of the abdomen. (P-2)
- 3-2.83 Demonstrate auscultation of the abdomen. (P-2)
- 3-2.84 Demonstrate the external visual examination of the female genitalia. (P-2)
- 3-2.85 Demonstrate the examination of the male genitalia. (P-2)
- 3-2.86 Demonstrate the examination of the peripheral vascular system. (P-2)
- 3-2.87 Demonstrate the examination of the musculoskeletal system. (P-2)
- 3-2.88 Demonstrate the examination of the nervous system. (P-2)

DECLARATIVE

- I. Physical examination - approach and overview
 - A. Examination techniques and equipment
 1. Examination techniques
 - a. Inspection
 - b. Palpation
 - c. Percussion
 - d. Auscultation
 2. Measurement of vitals
 - a. Pulse
 - b. Respirations
 - c. Blood pressure
 3. Height and weight
 4. Equipment
 - a. Stethoscope
 - b. Ophthalmoscope
 - c. Otoscope
 - d. Blood pressure cuff
 - B. General approach
 1. Examine the patient systematically
 2. Place special emphasis on areas suggested by the present illness and chief complaint
 3. Keep in mind that most patients view a physical exam with apprehension and anxiety - they feel vulnerable and exposed
 - C. Overview of a comprehensive examination
 1. The categories of a physical exam should include
 - a. Mental status
 - b. General survey
 - c. Vital signs
 - d. Skin
 - e. HEENT
 - (1) Head
 - (2) Eyes
 - (3) Ears
 - (4) Nose
 - (5) Throat
 - f. Neck
 - g. Chest
 - h. Abdomen
 - i. Posterior body
 - j. Extremities
 - (1) Peripheral vascular
 - (2) Musculoskeletal
 - k. Neurologic exam
- II. Mental status
 - A. Appearance and behavior
 1. Assess for level of consciousness

- a. Alertness
 - b. Response to verbal stimuli
 - c. Response to touch or shake of shoulder (tactile)
 - d. Response to painful stimuli
 - e. Unresponsive
 - f. Possible findings
 - (1) Normal
 - (2) Drowsiness
 - (3) Obtundation
 - (a) Insensitive to unpleasant or painful stimuli by reducing level of consciousness by an anesthetic or analgesic
 - (4) Stupor
 - (a) State of lethargy and unresponsiveness
 - (b) Person seems unaware of surroundings
 - g. Coma
 - (1) State of profound unconsciousness
 - (2) Absence of spontaneous eye movements
 - (3) No response to verbal or painful stimuli
 - (4) Patient can not be aroused by any stimuli
 - h. Posture and motor behavior
2. Observe posture and motor behavior
- a. Pace
 - b. Range
 - c. Character
 - d. Appropriateness of movement
 - e. Possible findings
 - (1) Normal
 - (2) Restlessness
 - (3) Agitation
 - (4) Bizarre postures
 - (5) Immobility
 - (6) Involuntary movements
3. Dress, grooming, and personal hygiene
- a. Fastidiousness
 - b. Neglect
4. Facial expression
- a. Anxiety
 - b. Depression
 - c. Elation
 - d. Anger
 - e. Response to imaginary people or objects
 - f. Withdrawal
5. Manner, affect, and relation to person and things
- B. Speech and language
- 1. Assess
 - a. Quantity
 - b. Rate
 - c. Loudness

- d. Fluency
 - e. Possible findings
 - (1) Aphasia
 - (2) Dysphonia
 - (3) Dysarthria
 - (4) Changes with mood disorders
- C. Mood
- 1. Assess
 - a. Nature
 - b. Intensity
 - c. Duration
 - d. Stability of abnormal mood
 - e. Risk of suicide
 - f. Possible findings
 - (1) Happiness
 - (2) Elation
 - (3) Depression
 - (4) Anxiety
 - (5) Anger
 - (6) Indifference
- D. Thought and perceptions
- 1. Assess thought processes
 - a. Logic
 - b. Relevance
 - c. Organization
 - d. Coherence of thought
 - e. Possible findings
 - (1) Loosening of associations
 - (2) Flight of ideas
 - (3) Incoherence
 - (4) Confabulation
 - (5) Blocking
 - 2. Assess thought content
 - a. Unusual thoughts
 - b. Unpleasant thoughts
 - c. Possible findings
 - (1) Obsessions
 - (2) Compulsions
 - (3) Delusions
 - (4) Feelings of unreality
 - 3. Assess perceptions
 - a. Unusual
 - b. Hearing things
 - c. Seeing things
 - d. Possible findings
 - e. Illusions
 - f. Hallucinations
- E. Assess insight and judgement

1. Insight into illness
 2. Level of judgement in making decisions or plans
 3. Possible findings
 - a. Recognition or denial of mental cause of symptoms
 - b. Bizarre, impulsive, or unrealistic judgement
- F. Memory and attention
1. Assess orientation
 - a. Time
 - b. Place
 - c. Person
 - d. Possible findings
 - (1) Disorientation
 2. Assess attention
 - a. Digit span
 - b. Serial sevens
 - c. Spelling backwards
 3. Assess remote memory (i.e. birthdays)
 4. Assess recent memory (i.e. events of the day)
 5. Assess new learning ability
- III. General survey
- A. Level of consciousness
1. Awake
 2. Alert
 3. Responsive
- B. Signs of distress
1. Assess for signs of distress
 2. Examples (not inclusive)
 - a. Cardiorespiratory insufficiency
 - (1) Labored breathing
 - (2) Wheezing
 - (3) Cough
 - b. Pain
 - (1) Wincing
 - (2) Sweating
 - (3) Protectiveness of a painful part
 - c. Anxiety
 - (1) Anxious face
 - (2) Fidgety movement
 - (3) Cold moist palms
- C. Apparent state of health
1. Acutely or chronically ill
 2. Frail
 3. Feeble
 4. Robust
 5. Vigorous
- D. Skin color and obvious lesions
1. Pallor

2. Cyanosis
3. Jaundice
4. Rashes
5. Bruises - ecchymosis
6. Scars
7. Discoloration
- E. Height and build
 1. Unusually tall or short
 2. Slender, lanky, muscular or stocky build
- F. Sexual development
 1. Are the following appropriate for the patient's age and gender
 - a. Voice
 - b. Hair
 - (1) Facial
 - (2) Axillary
 - (3) Groin
 - c. Breast size
- G. Weight
 1. Emaciated
 2. Slender
 3. Plump
 4. Obese
 - a. Concentrated
 - b. Distributed evenly
 5. Recent history of weight gain or loss
- H. Posture, gait and motor activity
 1. Preferred posture
 - a. Tripodal
 - b. Paralysis
 - c. Limpness
 - d. Ataxia
 - e. Restless or quiet
 - f. Involuntary motor activity
 - g. Ease of walking
 - (1) Balance
 - (2) Limp
 - (3) Discomfort
 - (4) Fear of falling
 - (5) Abnormal motor pattern
- I. Dress, grooming and personal hygiene
 1. How is the patient dressed
 - a. Appropriate for temperature and weather
 - b. Clean
 - c. Properly buttoned and zipped
 - d. Compare with clothing worn by people of similar age and social group
 - e. Shoes
 - (1) Clean
 - (2) Holes cut in them

- (3) Laces tied
 - (4) Slippers
 - f. Unusual jewelry
 - (1) Copper bracelet for arthritis
 - (2) Medical identification insignia
 - g. Hair, fingernails and use of cosmetics
 - (1) Reflect lifestyle, mood, and personality
 - (2) Grown out hair or nail polish may indicate decreased interest in appearance or help to estimate length of illness
 - h. Is grooming and hygiene appropriate for the patients age, lifestyle, occupation and socioeconomic group?
 - J. Odors of breath or body
 - 1. Breath odors may indicate underlying conditions
 - a. Alcohol/ alcoholic beverage
 - b. Acetone
 - c. Infections
 - d. Liver failure
 - K. Facial expression
 - 1. Observe expression
 - 2. At rest, during conversation and during the examination
 - L. Vital signs
 - 1. Blood pressure
 - 2. Respirations
 - 3. Pulse
 - 4. Temperature
 - M. Additional assessment techniques
 - 1. Pulse oximetry
 - 2. Others
- IV. Anatomical regions
 - A. The skin
 - 1. Anatomy and physiology review
 - 2. Changes with age
 - 3. Techniques of exam
 - a. Inspect and palpate the skin
 - (1) Note the following characteristics
 - (a) Color
 - i) The red color of oxyhemoglobin and pallor due to lack of oxygen are best seen where the epidermis is thinnest
 - ii) The fingernails and lips and the mucous membranes of the mouth and palpebral conjunctiva
 - iii) In dark skinned persons, the palms and the soles may also be useful
 - (b) Moisture
 - (c) Temperature
 - (d) Texture
 - (e) Mobility and turgor
 - (f) Lesions

- b. Inspect and palpate the fingernails and toenails
 - (1) Note their color and shape
 - (2) Note if there are any lesions present
- c. Inspect and palpate the hair
 - (1) Note its quantity, distribution and texture
- 4. Abnormalities
 - a. Basic types of skin lesions
 - b. Skin colors
 - c. Skin tumors
 - d. Findings in or near the nails
 - (1) Clubbing
 - (2) Paronychia
 - (3) Onycholysis
 - (4) Terry's nails
 - (5) White spots
 - (6) Transverse white lines
 - (7) Psoriasis
 - (8) Beau's lines
- B. Head, ears, eyes, nose, and throat
 - 1. Anatomy and physiology review
 - a. The head
 - b. The neck
 - c. The ears
 - d. The nose
 - e. The mouth and pharynx
 - f. The neck
 - g. Changes with age
 - 2. Techniques of examination
 - a. The head
 - (1) The scalp
 - (a) Part the hair in several places
 - (b) Look for scaliness, lumps or other lesions
 - (2) The skull
 - (a) Observe the general size and contour of the skull
 - (b) Palpate and inspect note any tenderness, deformities or lumps
 - (3) The face
 - (a) Note the facial expression and contours
 - (b) Observe for asymmetry, involuntary movements, masses and edema
 - (4) The skin
 - (a) Observe the skin
 - (b) Note color, pigmentation, texture, thickness, hair distribution and any lesions
 - b. The eyes
 - (1) Methods to assess visual acuity
 - (a) Print
 - (b) Finger count at a distance
 - (c) Distinguish light and dark

- (d) Snellen chart
- (2) Visual fields by confrontation
 - (a) Ask the patient to look at your nose
 - (b) With both arms extended and elbows at right angles, the examiner wiggles both index fingers at the same time
 - (c) The patient is asked which finger moved
 - (d) If patient states both, the visual fields are grossly normal
 - (e) Should be performed in all four quadrants
 - i) Left - right
 - ii) Up - down
- (3) Position and alignment of the eyes
 - (a) Stand in front of the patient and survey the eyes
 - (b) Assess for position and alignment
- (4) Eyebrows
 - (a) Inspect the eyebrows
 - (b) Note the quantity and distribution and scaliness of the underlying skin
- (5) Eyelids
 - (a) Note the position of the eyelids in relation to the eyeballs
 - (b) Inspect for the following
 - i) Width of palpebral fissures
 - ii) Edema of the lids
 - iii) Color of the lids
 - iv) Lesions
 - v) Condition and direction of the eyelashes
 - vi) Adequacy with which the eyelids close
 - vii) Drainage
- (6) Lacrimal apparatus
 - (a) Briefly inspect the regions of the lacrimal gland and lacrimal sac for swelling
 - (b) Look for excessive tearing or dryness of the eyes
- (7) Conjunctiva and sclera
 - (a) Ask the patient to look up as you depress both lower lids with your thumbs, exposing the sclera and conjunctiva
 - (b) Inspect the sclera and palpebral conjunctiva for color, note the vascular pattern
 - (c) Look for nodules, swelling, or discharge
- (8) Cornea and lens
 - (a) With oblique lighting, inspect the cornea of each eye for opacities
- (9) Iris
 - (a) As you inspect the cornea and lens, inspect the iris
 - i) The markings should be clearly defined
- (10) Pupils
 - (a) Inspect the size, shape and symmetry of the pupils
 - (b) Test the pupillary reactions to light
 - i) Look for
 - a) Direct reaction
 - b) Consensual reaction

- (11) Extraocular muscles
 - (a) From about 2 feet in front of the patient, shine a light into the patient's eyes and ask the patient to look at it
- (12) Accommodation
 - (a) Ask the patient to focus on a distant object
 - (b) Then have the person shift the gaze to a near object
 - i) Normal response
 - a) Pupil constriction
 - b) Convergence of the axes of the light

c. Ophthalmoscope

- (1) Tool used by allied health personnel to perform a detailed exam of the eye that requires skill and practice
- (2) Used to evaluate the following
 - (a) Cornea
 - i) Foreign bodies
 - ii) Lacerations
 - iii) Abrasions
 - iv) Infection
 - (b) Anterior chamber
 - i) Cells
 - ii) Hyphema - blood
 - iii) Hypopyon - pus
 - (c) Fundus
 - i) Retinal vessels
 - ii) Optic nerve
 - iii) Retina
 - (d) Vitreous
 - (e) Foreign bodies under eyelid

d. The ears

- (1) The auricle
 - (a) Inspect each auricle and surrounding tissue for deformities, lumps and skin lesions, drainage, tenderness, erythema
- (2) Mastoid
 - (a) Discoloration
 - (b) Tenderness
- (3) Otoscope
 - (a) Tool used by allied health personnel to perform a detailed exam of the ear
 - (b) Used to evaluate the following
 - i) Any discharges
 - ii) Foreign bodies
 - iii) Redness or swelling
 - iv) Eardrum
 - a) Color
 - b) Contour
 - c) Fluid or infection behind the drum
 - d) Perforation
- (4) Assess gross auditory acuity

- e. The nose
 - (1) Inspect the anterior and inferior surface of the nose
 - (a) Asymmetry
 - (b) Deformity
 - (c) Foreign bodies
 - (2) Palpate for tenderness
 - f. The mouth and pharynx
 - (1) Inspect the lips, observe color, moisture, note any lumps, ulcers, cracking or scaliness
 - (2) Look into the patient's mouth with a good light and a tongue blade, inspect the oral mucosa
 - (3) Note the color of the gums and teeth
 - (4) Inspect the teeth
 - (5) Inspect the color and architecture of the hard palate
 - (6) Inspect the tongue
 - (7) Inspect the tonsils
 - g. The neck
 - (1) Inspect the neck, noting its symmetry and any masses or scars
 - (2) Palpate the lymph nodes
 - (3) Inspect and palpate the trachea for any deviation
 - (4) Inspect for jugular venous distention
 - (5) Inspect the neck for the thyroid gland
 - (6) Palpate the thyroid gland from behind
 - h. Head and cervical spine
 - (a) The temporomandibular joint
 - (b) The cervical spine
 - i) Inspection
 - ii) Palpation
 - a) Tenderness
 - b) Deformities
 - iii) Range of motion
 - a) Flexion - touch the chin to the chest
 - b) Rotation - touch chin to each shoulder
 - c) Lateral bending - touch each ear to each shoulder
 - d) Extension - put the head back
- C. Chest
- 1. Anatomy and physiology
 - 2. Techniques of examination
 - a. General approach
 - (1) Have the patient expose their chest so that you can see the entire chest
 - (2) Proceed in an orderly fashion
 - (a) Inspect
 - (b) Palpate
 - (c) Percuss
 - (d) Auscultate
 - (e) Compare side to side
 - (3) Try to visualize the underlying lobes of the lungs

- b. Examination of the thorax and ventilation
 - (1) Observe rate, rhythm, depth and effort of breathing
 - (2) Check the patient for cyanosis
 - (3) Listen to the patient's breathing
 - (4) Observe the shape of the chest
- c. Examination of the posterior chest
 - (1) Inspect noting
 - (a) Any deformities or asymmetry
 - i) Barrel chest
 - ii) Traumatic flail chest
 - iii) Funnel chest
 - iv) Pigeon chest
 - v) Thoracic kyphoscoliosis
 - (b) Abnormal retractions
 - (c) Impairment of respiratory movement
 - (2) Palpate noting
 - (a) Any tender areas
 - (b) Assessment of observed abnormalities
 - (c) Further assessment of respiratory expansion
 - (3) Percuss in symmetrical locations noting
 - (a) Any area of abnormal percussion note
 - i) Percussion notes
 - a) Dullness
 - b) Resonance
 - c) Hyperresonance
 - (b) The level of the diaphragm
 - (c) Estimate of diaphragmatic excursion
 - (4) Auscultate breath sounds
 - (a) Normal
 - i) Vesicular
 - ii) Bronchiovesicular
 - iii) Bronchial
 - iv) Tracheal
 - (b) Added sounds (adventitious lung sounds)
 - i) Discontinuous sounds (crackles)
 - a) Fine crackles
 - b) Course crackles
 - ii) Continuous sounds
 - a) Wheezes
 - b) Rhonchi
 - iii) Pleural friction rub
 - (c) Diminished or absent
 - i) Effusion
 - ii) Consolidation
 - d. Examination of the anterior chest
 - (1) Inspect noting
 - (a) Any deformities or asymmetry
 - (b) Abnormal retractions

- (c) Impairment of respiratory movement
 - (2) Palpate noting
 - (a) Any tender areas
 - (b) Assessment of observed abnormalities
 - (c) Further assessment of respiratory expansion
 - (3) Percuss in symmetrical locations noting
 - (a) Any area of abnormal percussion note
 - (b) The level of the diaphragm
 - (4) Auscultate
 - (a) Breath sounds
 - (b) Added sounds
- D. The cardiovascular system
 - 1. Anatomy and physiology
 - a. Surface projections of the heart great vessels
 - b. Events in the cardiac cycle
 - c. Heart murmurs
 - d. Relation of auscultatory findings to the chest wall
 - e. The heart as a pump
 - f. Arterial pulses and blood pressure
 - g. Jugular vein pressure and pulses
 - h. Changes with age
 - 2. Techniques of examination
 - a. The arterial pulse
 - (1) Heart rate
 - (2) Rhythm
 - (3) Amplitude
 - (4) Bruits and thrills
 - b. Blood pressure
 - c. Jugular venous pressure and pulsation
 - d. The heart
 - (1) Inspection and palpation of the chest
 - (2) Auscultation
 - (a) Listen for the heart tones
 - i) Locate the point of maximum impulse (PMI)
 - ii) Listen in the following locations
 - a) Aortic - second intercostal space to the right of the sternum
 - b) Pulmonic - second intercostal space to the left of the sternum
 - c) Third intercostal space
 - d) Fourth intercostal space
 - e) Tricuspid - lower left sternal border
 - f) Mitral - apex of the heart
 - iii) Listen for the heart tones - note their intensity
 - a) Listen for the first tone - S₁
 - b) Listen for the second tone - S₂
 - c) Listen for extra sounds - murmurs
- E. Abdomen

1. Anatomy and physiology review
2. Changes with age
3. Techniques of examination
 - a. General approach
 - (1) Ideally, the patient should not have a full bladder
 - (2) Make the patient comfortable in a supine position
 - (3) Before palpation ask the patient to point out any areas of pain - examine these areas last
 - (4) Have warm hands, a warm stethoscope and short nails
 - (5) Approach slowly and avoid quick, unexpected movements
 - (6) Distract the patient as needed with conversation
 - (7) Visualize each organ as in the region as you are examining
 - (8) Proceed in an orderly manner
 - (a) Inspection
 - (b) Auscultation
 - (c) Percussion
 - (d) Palpation
 - b. Inspection of the abdomen, including the flanks, noting
 - (1) Skin
 - (a) Scars
 - (b) Striae
 - (c) Dilated veins
 - (d) Rashes and lesions
 - (e) Discoloration
 - (f) Ascites
 - (g) Herniation
 - (2) The umbilicus
 - (a) Contour
 - (b) Location
 - (c) Signs of inflammation or hernia
 - (3) The contour of the abdomen
 - (a) Bulges
 - i) Flat
 - ii) Rounded
 - iii) Protuberant
 - iv) Scaphoid
 - v) Bulges at the flanks
 - vi) Hernias
 - (b) Symmetry
 - (4) Peristalsis
 - (5) Pulsations
 - (6) Ascites
 - c. Auscultate
 - (1) Listen for bowel sounds
 - (a) Note frequency and character
 - i) Increased
 - ii) Decreased
 - iii) Absent

- (2) Bruits
 - d. Palpation
 - (1) Muscle guarding
 - (2) Rigidity
 - (3) Large masses
 - (4) Tenderness
- F. The female genitalia
 - 1. Anatomy and physiology review
 - 2. Changes with age
 - 3. Techniques of examination
 - a. General approach
 - (1) This may be awkward or uncomfortable for the patient and the provider
 - (2) Male examiners are customarily attended by female assistants
 - (3) Female examiners may choose to work alone
 - b. Examination
 - (1) Inspect the external genitalia
 - (2) Note any
 - (a) Inflammation
 - (b) Discharge
 - (c) Swelling
 - (d) Lesions
 - 4. Abnormal findings
- G. The male genitalia
 - 1. Anatomy and physiology
 - 2. Changes with age
 - 3. Techniques of examination
 - a. General approach
 - (1) This may be awkward or uncomfortable for the patient and the provider
 - (2) Female examiners are customarily attended by male assistants
 - (3) Male examiners may choose to work alone
 - b. Examination
 - (1) Inspect the external genitalia
 - (2) Note any
 - (a) Inflammation
 - (b) Discharge
 - (c) Swelling
 - (d) Lesions
 - 4. Abnormal findings
- H. Anus
 - 1. Anatomy and physiology
 - a. Changes with age
 - 2. Techniques of examination
 - a. General techniques
 - b. Can be accomplished with the patient in one of several positions
 - (1) For most patients, the side-lying position is satisfactory
 - (2) Drape the patient appropriately
 - (3) Inspect the sacrococcygeal and perineal areas
 - (a) Look for and note

- i) Lumps
 - ii) Ulcers
 - iii) Inflammations
 - iv) Rashes
 - v) Excoriations
 - vi) Tenderness
 - (4) Methods for testing for occult blood
- I. Extremities
 - 1. Anatomy and physiology
 - a. Structure and function of joints
 - b. Specific joints
 - c. Changes with age
 - 2. Techniques of examination
 - a. General approach
 - (1) Direct your attention to function as well as structure
 - (2) Assess general appearance, bodily proportions and ease of movement
 - (3) Note particularly
 - (a) Limitation in the range of motion
 - (b) Unusual Increase in the mobility of a joint
 - (4) In general note
 - (a) Signs of inflammation
 - i) Swelling
 - ii) Tenderness
 - iii) Increased heat
 - iv) Redness
 - v) Decreased function
 - (b) Crepitus
 - (c) Deformities
 - (d) Muscular strength
 - (e) Symmetry
 - (f) Atrophy
 - b. Patient sitting up
 - (1) Hands and wrist
 - (a) Range of motion
 - i) Make a fist with each hand
 - ii) Extend and spread the fingers
 - iii) Flex and extend the wrists
 - iv) With palms down move the hands lateral and medially
 - (b) Inspection
 - i) Swelling
 - ii) Redness
 - iii) Nodules
 - iv) Deformities
 - v) Muscular atrophy
 - (c) Palpation
 - i) Feel
 - a) Medial and lateral aspect of each distal interphalangeal joint (DIP)

- b) Proximal interphalangeal joint (PIP)
 - c) Squeeze the hand from each side between your thumb and fingers compressing the metacarpophalangeal joints (MAPS)
 - d) Each wrist joint
 - e) Any area of abnormality
 - ii) Note
 - a) Swelling
 - b) Tenderness
 - c) Bogginess
- (2) Elbows
 - (a) Range of motion
 - i) Ask the patient to bend and straighten the elbows
 - ii) Keep the arms at the sides with elbows flexed
 - iii) Supination - turn palms up
 - iv) Pronation - turn palms down
 - (b) Inspection
 - i) Support the patient's forearms with your opposite hand so that the elbow is flexed to about 70 degrees
 - ii) Examine the elbow
 - (c) Palpation
 - i) Palpate the grooves between the epicondyle and the olecranon
 - ii) Press on the lateral and medial epicondyle
 - iii) Note
 - a) Tenderness
 - b) Swelling
 - c) Thickening
- (3) Shoulders and related structures
 - (a) Range of motion
 - i) Ask the patient to
 - a) Raise both arms to a vertical position at the sides of the head
 - b) External rotation and abduction - place both hands behind the neck with elbows to the side
 - c) Internal rotation - place both hands behind the small of the back
 - ii) Cup your hands over the shoulders and note any crepitus
 - (b) Palpation
 - i) Palpate the following regions
 - a) The sternoclavicular joint
 - b) The acromioclavicular joint
 - c) The subacromial area
 - d) The bicipital groove
 - ii) Note
 - a) Tenderness
 - b) Swelling

- c. Ankles and feet
 - (a) Inspection
 - i) Observe all surfaces of the ankle and feet
 - ii) Note
 - a) Deformities
 - b) Nodules
 - c) Swelling
 - d) Calluses
 - e) Corns
 - (b) Palpation
 - i) The anterior aspects of each ankle joint
 - ii) The Achilles tendon
 - iii) Metatarsophalangeal joints
 - iv) Note
 - a) Tenderness
 - b) Bogginess
 - c) Swelling
 - (c) Range of motion
 - i) The ankle joint
 - a) Dorsiflex
 - b) Plantar flex
 - ii) The traverse tarsal joint
 - a) Inversion
 - b) Eversion
 - iii) The metatarsophalangeal joints
 - iv) Flexion of the toes
 - (1) Knees and hips
 - (a) Inspection of the knees
 - i) Note alignment and deformity
 - ii) Observe atrophy of the quadriceps
 - (b) Palpation of the knees
 - i) Palpate note
 - a) Thickening
 - b) Swelling
 - (c) Range of motion
 - i) Ask the patient to bend each knee in turn up to the chest
 - ii) Note the flexion of the hip and knee
 - iii) Assess for rotation of the hips
 - iv) Assess abduction of the hips
 - (d) Palpation of the hips
 - i) Palpate the hip joint
- J. Peripheral vascular system
- 1. Anatomy and physiology
 - a. Arteries
 - b. Veins
 - c. The lymphatic system and lymph nodes
 - d. Fluid exchange and the capillary bed
 - e. Changes with age

2. Techniques of examination
 - a. The arms
 - (1) Inspection from fingertips to shoulders noting
 - (a) Size
 - (b) Symmetry
 - (c) Swelling
 - (d) Venous pattern
 - (e) The color of the skin and nail beds
 - (f) Texture of the skin
 - (2) Palpation
 - (a) The radial pulse
 - (b) If you suspect arterial insufficiency, feel for the brachial pulse
 - (c) Feel for epitrochlear nodes
 - b. Legs
 - (1) Patient should be lying down, appropriately draped
 - (2) Successful examination cannot be completed with socks or stockings on
 - (3) Inspect from the groin and buttocks to the feet, noting
 - (a) Size
 - (b) Symmetry
 - (c) Swelling
 - (d) The venous pattern and any venous enlargement
 - (e) Pigmentation
 - (f) Rashes
 - (g) Scars
 - (h) Ulcers
 - (i) Color and texture of the skin
 - (4) Palpate the superficial inguinal nodes
 - (5) Palpate the pulses in order to assess arterial circulation
 - (a) The femoral pulse
 - (b) The popliteal pulse
 - (c) The dorsalis pedis pulse
 - (d) The posterior tibial pulse
 - (e) Note the temperature of the feet and legs
 - (f) Look for edema
 - (g) Check for pitting edema
 - i) Press firmly but gently with your thumb for at least 5 seconds
 - a) Over the dorsum of each foot
 - b) Behind each medial malleolus
 - c) Over the shins
 - c. Special techniques
 3. Abnormal finding
 - K. The spine
 1. Inspection
 - a. From the side note the cervical, thoracic and lumbar curves
 - b. Note curvatures
 - (1) Lordosis
 - (2) Kyphosis

- (3) Scoliosis
 - c. Look for differences in the height of the shoulders
 - d. Look for differences in the height of the iliac crest
 - 2. Range of motion
 - a. Flexion - ask the patient to bend forward and touch the toes
 - (1) Note
 - (a) Smoothness of movement
 - (b) Symmetry of movement
 - (c) Range of motion
 - (d) Curve in the lumbar area
 - b. Lateral bending - bend sideways
 - c. Extension - back backwards toward you
 - d. Rotation - twist the shoulders one way and then the other
 - 3. Palpation
 - a. Palpate the spinous process with your thumb
 - (1) Identify tenderness
 - b. Palpate in the area of the costovertebral angle
 - (1) Identify tenderness
 - 4. Abnormal findings
- L. The nervous system
 - 1. Anatomy and physiology
 - a. Central nervous system
 - b. Peripheral nervous system
 - c. Spinal reflexes - deep tendon response
 - d. Motor pathways
 - e. Sensory pathways
 - f. Changes with age
 - 2. Techniques of examination
 - a. General approach
 - (1) Are right and left sided findings symmetrical
 - (2) Is this a peripheral or central nervous system problem
 - (3) Detail of an appropriate neurological exam varies greatly
 - (4) Components of the neurological exam may be completed during other assessments
 - (5) It may be best to organize your findings into five categories
 - (a) Mental status and speech
 - (b) Cranial nerves
 - (c) Motor system
 - (d) Sensory system
 - (e) Reflexes
 - b. The cranial nerves
 - (1) Cranial nerve I - olfactory (sense of smell)
 - (2) Cranial nerve II - optic
 - (a) Test visual acuity
 - (3) Cranial nerves II and III - optic and oculomotor
 - (a) Inspect the size and shape of the pupils
 - (b) Test the pupil response to light
 - (4) Cranial nerves III, IV, and VI

- (a) Test the extra-ocular movements in the six cardinal directions of gaze
- (5) Cranial nerve V - trigeminal
 - (a) Motor
 - i) Ask the patient to clench their teeth while palpating the temporal and masseter muscles
 - ii) Note the strength of muscle contraction
 - (b) Sensory
 - i) Explain to the patient what you will do
 - ii) Touch the forehead, cheeks and jaw on each side for pain sensation
- (6) Cranial nerve VII - facial
 - (a) Inspect the face at rest and during conversation
 - i) Note symmetry and observe for tics or abnormal movement
 - (b) Ask the patient to
 - i) Raise the eyebrows
 - ii) Frown
 - iii) Close both eyes tightly so that you cannot open them; test muscular strength by trying to open them
 - iv) Show both upper and lower teeth
 - v) Smile
 - vi) Puff out both cheeks
 - vii) Note any weakness or asymmetry
- (7) Cranial nerve VIII - acoustic
 - (a) Assess hearing
- (8) Cranial nerves IX and X - glossopharyngeal and vagus
- (9) Cranial nerve XI - spinal accessory
- (10) Cranial nerve XII - hypoglossal
- c. The motor system
 - (1) Body position
 - (a) Observe the position during movement and at rest
 - (2) Involuntary movements
 - (a) Watch for involuntary movements
 - (b) Note
 - i) Quality
 - ii) Rate
 - iii) Rhythm
 - iv) Amplitude
 - (c) Note relation to
 - i) Posture
 - ii) Activity
 - iii) Fatigue
 - iv) Emotion
 - (3) Muscle bulk
 - (a) Compare the size and contour of the muscles
 - (4) Muscle tone
 - (a) Feel the resistance to passive stretch

- (5) Muscle strength
 - (a) Ask the patient to move actively against your resistance
 - i) No muscular contraction detected
 - ii) A barely detectable flicker or trace of contraction
 - iii) Active movement of the body part with gravity eliminated
 - iv) Active movement against gravity
 - v) Active movement against gravity and some resistance
 - vi) Active movement against full resistance without evident fatigue - this is normal muscle tone
 - (b) Test flexion
 - (c) Test extension
 - (d) Test extension at the wrist
 - (e) Test the grip
 - (f) Test finger abduction
 - (g) Test the opposition of the thumb
 - (h) Test flexion at the hip
 - (i) Test adduction at the hips
 - (j) Test abduction at the hips
 - (k) Test extension at the hips
 - (l) Test extension at the knee
 - (m) Test flexion at the knee
 - (n) Test dorsi-flexion
 - (6) Coordination
 - (a) Rapid alternating movements
 - (b) Point to point movements
 - i) Finger-to-nose
 - ii) Heel-to-shin
 - (c) Gait
 - i) Walk heel to toe
 - ii) Walk on the toes
 - iii) Walk on the heels
 - iv) Hop in place
 - v) Do a shallow knee bend
 - vi) Rise from a sitting position
 - (d) Stance
 - i) The Romberg test
 - ii) Test for pronator drift
- d. The sensory system
- (1) General approach
 - (a) Compare symmetrical areas on the two sides of the body
 - (b) When testing pain, temperature and touch, compare distal and proximal areas
 - (c) Assess sensation in relation to dermatomes
 - (2) Pain
 - (3) Light touch
3. Abnormal findings

V. The physical examination of infants and children

- A. Approach to the patient
 - B. Techniques of examination
- VI. Recording examination findings

UNIT TERMINAL OBJECTIVE

- 3-3 At the end of this unit, the paramedic student will be able to integrate the principles of history taking and techniques of physical exam to perform a patient assessment.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 3-3.1 Recognize hazards/ potential hazards. (C-1)
- 3-3.2 Describe common hazards found at the scene of a trauma and a medical patient. (C-1)
- 3-3.3 Determine hazards found at the scene of a medical or trauma patient. (C-2)
- 3-3.4 Differentiate safe from unsafe scenes. (C-3)
- 3-3.5 Describe methods to making an unsafe scene safe. (C-1)
- 3-3.6 Discuss common mechanisms of injury/ nature of illness. (C-1)
- 3-3.7 Predict patterns of injury based on mechanism of injury. (C-2)
- 3-3.8 Discuss the reason for identifying the total number of patients at the scene. (C-1)
- 3-3.9 Organize the management of a scene following size-up. (C-3)
- 3-3.10 Explain the reasons for identifying the need for additional help or assistance. (C-1)
- 3-3.11 Summarize the reasons for forming a general impression of the patient. (C-1)
- 3-3.12 Discuss methods of assessing mental status. (C-1)
- 3-3.13 Categorize levels of consciousness in the adult, infant and child. (C-3)
- 3-3.14 Differentiate between assessing the altered mental status in the adult, child and infant patient. (C-3)
- 3-3.15 Discuss methods of assessing the airway in the adult, child and infant patient. (C-1)
- 3-3.16 State reasons for management of the cervical spine once the patient has been determined to be a trauma patient. (C-1)
- 3-3.17 Analyze a scene to determine if spinal precautions are required. (C-3)
- 3-3.18 Describe methods used for assessing if a patient is breathing. (C-1)
- 3-3.19 Differentiate between a patient with adequate and inadequate minute ventilation. (C-3)
- 3-3.20 Distinguish between methods of assessing breathing in the adult, child and infant patient. (C-3)
- 3-3.21 Compare the methods of providing airway care to the adult, child and infant patient. (C-3)
- 3-3.22 Describe the methods used to locate and assess a pulse. (C-1)
- 3-3.23 Differentiate between locating and assessing a pulse in an adult, child and infant patient. (C-3)
- 3-3.24 Discuss the need for assessing the patient for external bleeding. (C-1)
- 3-3.25 Describe normal and abnormal findings when assessing skin color. (C-1)
- 3-3.26 Describe normal and abnormal findings when assessing skin temperature. (C-1)
- 3-3.27 Describe normal and abnormal findings when assessing skin condition. (C-1)
- 3-3.28 Explain the reason for prioritizing a patient for care and transport. (C-1)
- 3-3.29 Identify patients who require expeditious transport. (C-3)
- 3-3.30 Describe the evaluation of patient's perfusion status based on findings in the initial assessment. (C-1)
- 3-3.31 Describe orthostatic vital signs and evaluate their usefulness in assessing a patient in shock. (C-1)
- 3-3.32 Apply the techniques of physical examination to the medical patient. (C-1)
- 3-3.33 Differentiate between the assessment that is performed for a patient who is unresponsive or has an altered mental status and other medical patients requiring assessment. (C-3)
- 3-3.34 Discuss the reasons for reconsidering the mechanism of injury. (C-1)
- 3-3.35 State the reasons for performing a rapid trauma assessment. (C-1)
- 3-3.36 Recite examples and explain why patients should receive a rapid trauma assessment. (C-1)
- 3-3.37 Apply the techniques of physical examination to the trauma patient. (C-1)
- 3-3.38 Describe the areas included in the rapid trauma assessment and discuss what should be evaluated. (C-1)
- 3-3.39 Differentiate cases when the rapid assessment may be altered in order to provide patient care. (C-3)
- 3-3.40 Discuss the reason for performing a focused history and physical exam. (C-1)
- 3-3.41 Describe when and why a detailed physical examination is necessary. (C-1)
- 3-3.42 Discuss the components of the detailed physical exam in relation to the techniques of examination. (C-1)

- 3-3.43 State the areas of the body that are evaluated during the detailed physical exam. (C-1)
- 3-3.44 Explain what additional care should be provided while performing the detailed physical exam. (C-1)
- 3-3.45 Distinguish between the detailed physical exam that is performed on a trauma patient and that of the medical patient. (C-3)
- 3-3.46 Differentiate patients requiring a detailed physical exam from those who do not. (C-3)
- 3-3.47 Discuss the reasons for repeating the initial assessment as part of the on-going assessment. (C-1)
- 3-3.48 Describe the components of the on-going assessment. (C-1)
- 3-3.49 Describe trending of assessment components. (C-1)
- 3-3.50 Discuss medical identification devices/ systems. (C-1)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 3-3.51 Explain the rationale for crew members to evaluate scene safety prior to entering. (A-2)
- 3-3.52 Serve as a model for others explaining how patient situations affect your evaluation of mechanism of injury or illness. (A-3)
- 3-3.53 Explain the importance of forming a general impression of the patient. (A-1)
- 3-3.54 Explain the value of performing an initial assessment. (A-2)
- 3-3.55 Demonstrate a caring attitude when performing an initial assessment. (A-3)
- 3-3.56 Attend to the feelings that patients with medical conditions might be experiencing. (A-1)
- 3-3.57 Value the need for maintaining a professional caring attitude when performing a focused history and physical examination. (A-3)
- 3-3.58 Explain the rationale for the feelings that these patients might be experiencing. (A-3)
- 3-3.59 Demonstrate a caring attitude when performing a detailed physical examination. (A-3)
- 3-3.60 Explain the value of performing an on-going assessment. (A-2)
- 3-3.61 Recognize and respect the feelings that patients might experience during assessment. (A-1)
- 3-3.62 Explain the value of trending assessment components to other health professionals who assume care of the patient. (A-2)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 3-3.63 Observe various scenarios and identify potential hazards. (P-1)
- 3-3.64 Demonstrate the scene-size-up. (P-2)
- 3-3.65 Demonstrate the techniques for assessing mental status. (P-2)
- 3-3.66 Demonstrate the techniques for assessing the airway. (P-2)
- 3-3.67 Demonstrate the techniques for assessing if the patient is breathing. (P-2)
- 3-3.68 Demonstrate the techniques for assessing if the patient has a pulse. (P-2)
- 3-3.69 Demonstrate the techniques for assessing the patient for external bleeding. (P-2)
- 3-3.70 Demonstrate the techniques for assessing the patient's skin color, temperature, and condition. (P-2)
- 3-3.71 Demonstrate the ability to prioritize patients. (P-2)
- 3-3.72 Using the techniques of examination, demonstrate the assessment of a medical patient. (P-2)
- 3-3.73 Demonstrate the patient care skills that should be used to assist with a patient who is responsive with no known history. (P-2)
- 3-3.74 Demonstrate the patient care skills that should be used to assist with a patient who is unresponsive or has an altered mental status. (P-2)
- 3-3.75 Perform a rapid medical assessment. (P-2)
- 3-3.76 Perform a focused history and physical exam of the medical patient. (P-2)
- 3-3.77 Using the techniques of physical examination, demonstrate the assessment of a trauma patient. (P-2)
- 3-3.78 Demonstrate the rapid trauma assessment used to assess a patient based on mechanism of injury. (P-2)
- 3-3.79 Perform a focused history and physical exam on a non-critically injured patient. (P-2)

- 3-3.80 Perform a focused history and physical exam on a patient with life-threatening injuries. (P-2)
- 3-3.81 Perform a detailed physical examination. (P-2)
- 3-3.82 Demonstrate the skills involved in performing the on-going assessment. (P-2)

DECLARATIVE

- I. Scene size-up/ assessment
 - A. Body substance isolation review
 - 1. Eye protection if necessary
 - 2. Gloves if necessary
 - 3. Gown if necessary
 - 4. Mask if necessary
 - B. Scene safety
 - 1. Definition - an assessment to assure the well-being of the paramedic
 - 2. Personal protection - Is it safe to approach the patient?
 - a. Crash/ rescue scenes
 - b. Toxic substances - low oxygen areas
 - c. Crime scenes - potential for violence
 - d. Unstable surfaces - slope, ice, water
 - 3. Protection of the patient - environmental considerations
 - 4. Protection of bystanders - if necessary, help the bystander avoid becoming a patient
 - 5. Do not enter unsafe scenes
 - 6. Scenes may be dangerous even if they appear to be safe
 - C. Definition - an assessment of the scene and surroundings that will provide valuable information to the paramedic
 - D. Mechanism of injury/ nature of illness
 - 1. Medical
 - a. Nature of illness - determine from the patient, family or bystanders why EMS was activated
 - b. Determine the total number of patients
 - c. If there are more patients than the responding unit can effectively handle, initiate a mass casualty plan
 - (1) Obtain additional help prior to contact with patients: law enforcement, fire, rescue, ALS, utilities
 - (2) Paramedic is less likely to call for help if involved in patient care
 - (3) Begin triage
 - 2. Trauma
 - a. Mechanism of injury - determine from the patient, family or bystanders and inspection of the scene the mechanism of injury
 - b. Determine the total number of patients
 - c. If there are more patients than the responding unit can effectively handle, initiate a mass casualty plan
 - (1) Obtain additional help prior to contact with patients
 - (2) Paramedic is less likely to call for help when involved in patient care
 - (3) Begin triage
 - (4) If the responding crew can manage the situation, consider spinal precautions and continue care
- II. Initial assessment
 - A. General impression of the patient
 - 1. The general impression is formed to determine priority of care and is based on the paramedic's immediate assessment of the environment and the patient's chief complaint
 - 2. Determine if ill, i.e., medical or injured (trauma)
 - a. If injured, identify mechanism of injury
 - b. If ill, identify nature of illness

3. Age
 4. Sex
 5. Race
 - B. Assess the patient and determine if the patient has a life threatening condition
 1. If a life threatening condition is found, treat immediately
 2. Assess nature of illness or mechanism of injury
 - C. Assess patient's mental status (maintain spinal immobilization if needed)
 1. Levels of mental status (AVPU)
 - a. Alert
 - b. Responds to verbal stimuli
 - c. Responds to painful stimuli
 - d. Unresponsive - no gag or cough
 - D. Assess the patient's airway status
 1. Patent
 2. Obstructed
 - a. Suction
 - b. Position
 - c. Airway adjuncts
 - d. Invasive techniques
 - (1) ETI
 - (2) Multi-lumen airways
 - (3) Trans tracheal
 - E. Assess the patient's breathing
 1. Adequate
 2. Inadequate
 - F. Assess the patient's circulation
 1. Assess the patient's pulse
 2. Assess if major bleeding is present - if bleeding is present, control bleeding
 3. Assess the patient's perfusion by evaluating skin color, temperature and condition
 - G. Identify priority patients
 1. Consider
 - a. Poor general impression
 - b. Unresponsive patients - no gag or cough
 - c. Responsive, not following commands
 - d. Difficulty breathing
 - e. Shock (hypoperfusion)
 - f. Complicated childbirth
 - g. Chest pain with BP <100 systolic
 - h. Uncontrolled bleeding
 - i. Severe pain anywhere
 - j. Multiple injuries
 2. Expedite transport of the patient
 - H. Proceed to the appropriate focused history and physical examination
- III. Focused history and physical exam - medical patients
- A. Responsive medical patients
 1. Assess patient history
 - a. Chief complaint
 - b. History of present illness
 - (1) Attributes of a symptom
 - (a) Location

- i) Where is it
 - ii) Does it radiate
 - (b) Quality
 - i) What is it like
 - (c) Quantity or severity
 - i) How bad is it
 - (d) Timing
 - i) When did it start
 - ii) How long does it last
 - (e) The setting in which it occurs
 - i) Emotional response
 - ii) Environmental factors
 - (f) Factors that make it better or worse
 - (g) Associated manifestations
 - c. Past medical history
 - d. Current health status
 - 2. Perform physical examination
 - a. Utilize the techniques of physical examination to
 - (1) Assess the head as necessary
 - (2) Assess the neck as necessary
 - (3) Assess the chest as necessary
 - (4) Assess the abdomen as necessary
 - (5) Assess the pelvis as necessary
 - (6) Assess the extremities as necessary
 - (7) Assess the posterior body as necessary
 - 3. Assess baseline vital signs
 - (1) Consider orthostatic vital signs
 - 4. Provide emergency medical care based on signs and symptoms in consultation with medical direction
 - B. Unresponsive medical patients
 - 1. Perform rapid assessment
 - 2. Utilize the techniques of patient assessment
 - a. Position patient to protect airway
 - b. Assess the head
 - c. Assess the neck
 - d. Assess the chest
 - e. Assess the abdomen
 - f. Assess the pelvis
 - g. Assess the extremities
 - h. Assess the posterior aspect of the body
 - 3. Assess baseline vital signs
 - 4. Obtain patient history from bystander, family, friends, and/ or medical identification devices/ services
 - a. Chief complaint
 - b. History of present illness
 - c. Past medical history
 - d. Current health status
- IV. Focused history and physical exam - trauma patients
 - A. Re-consider mechanism of injury
 - 1. Helps to identify priority patients

2. Helps to guide the assessment
 3. Significant mechanism of injury
 - a. Ejection from vehicle
 - b. Death in same passenger compartment
 - c. Falls > 20 feet
 - d. Roll-over of vehicle
 - e. High-speed vehicle collision
 - f. Vehicle-pedestrian collision
 - g. Motorcycle crash
 - h. Unresponsive or altered mental status
 - i. Penetrations of the head, chest, or abdomen
 - j. Hidden injuries
 - (1) Seat belts
 - (a) If buckled, may have produced injuries
 - (b) If patient had seat belt on, it does not mean they do not have injuries
 - (2) Airbags
 - (a) May not be effective without seat belt
 - (b) Patient can hit wheel after deflation
 - (c) Lift the deployed airbag and look at the steering wheel for deformation
 - i) "Lift and look" under the bag after the patient has been removed
 - ii) Any visible deformation of the steering wheel should be regarded as an indicator of potentially serious internal injury, and appropriate action should be taken
 - iii) Child safety seats
 - a) Injury patterns with airbags
 - b) Proper use in vehicles with airbags
 4. Additional infant and child considerations
 - a. Falls >10 feet
 - b. Bicycle collision
 - c. Vehicle in medium speed collision
- B. Perform rapid trauma physical examination on patients with significant mechanism of injury to determine life-threatening injuries
1. In the responsive patient, symptoms should be sought before and during the trauma assessment
 2. Continue spinal stabilization
 3. Reconsider transport decision
 4. Assess mental status
 5. As you inspect and palpate, look and feel for injuries or signs of injury
 6. Examination
 - a. Assess the head, inspect and palpate for injuries or signs of injury
 - b. Assess the neck, inspect and palpate for injuries or signs of injury
 - c. Apply cervical spinal immobilization collar (CSIC) (may use information from the head injury unit at this time)
 - d. Assess the chest
 - e. Assess the abdomen, inspect and palpate for injuries or signs of injury
 - f. Assess the pelvis, inspect and palpate for injuries or signs of injury
 - g. Assess all four extremities, inspect and palpate for injuries or signs of injury
 - h. Roll patient with spinal precautions and assess posterior body, inspect and

- palpate, examining for injuries or signs of injury
 - i. Look for medical identification devices
 - j. Assess baseline vital signs
 - k. Assess patient history
 - (1) Chief complaint
 - (2) History of present illness
 - (3) Past medical history
 - (4) Current health status
 - C. For patients with no significant mechanism of injury, e.g., cut finger
 - 1. Perform focused history and physical exam of injuries based on the techniques of examination
 - 2. The focused assessment is performed on the specific injury site
 - 3. Assess baseline vital signs
 - 4. Assess patient history
 - a. Chief complaint
 - b. History of present illness
 - c. Past medical history
 - d. Current health status
- V. Detailed physical exam
 - A. Patient and injury specific, e.g., cut finger would not require the detailed physical exam
 - B. Perform a detailed physical examination on the patient to gather additional information
 - C. General approach
 - 1. Assess patient history
 - a. Chief complaint
 - b. History of present illness
 - c. Past medical history
 - d. Current health status
 - 2. Examine the patient systematically
 - 3. Place special emphasis on areas suggested by the present illness and chief complaint
 - 4. Keep in mind that most patients view a physical exam with apprehension and anxiety - they feel vulnerable and exposed
 - D. Overview of the detailed physical exam
 - 1. Mental status
 - a. Appearance and behavior
 - b. Posture and motor behavior
 - c. Speech and language
 - d. Mood
 - e. Thought and perceptions
 - f. Assess thought content
 - g. Assess perceptions
 - h. Assess insight and judgement
 - i. Memory and attention
 - j. Assess remote memory (i.e. birthdays)
 - k. Assess recent memory (i.e. events of the day)
 - l. Assess new learning ability
 - 2. General survey
 - 1. Level of consciousness
 - 2. Signs of distress
 - 3. Apparent state of health

4. Skin color and obvious lesions
 5. Height and build
 6. Sexual development
 7. Weight
 8. Posture, gait and motor activity
 9. Dress, grooming and personal hygiene
 10. Odors of breath or body
 11. Facial expression
1. Skin
 2. Head
 3. Eyes
 4. Ears
 5. Nose and sinuses
 6. Mouth and pharynx
 7. Neck
 8. Thorax and lungs
 9. Cardiovascular system
 10. Abdomen
 11. Genitalia
 12. Anus and rectum
 13. Peripheral vascular system
 14. Musculoskeletal system
 15. Nervous system
- E. Recording examination findings
- F. Assess baseline vital signs
- VI. On-going assessment
- A. Repeat initial assessment
 1. For a stable patient, repeat and record every 15 minutes
 2. For an unstable patient, repeat and record at a minimum every 5 minutes
 3. Reassess mental status
 4. Reassess airway
 5. Monitor breathing for rate and quality
 6. Reassess circulation
 7. Re-establish patient priorities
 - B. Reassess and record vital signs
 - C. Repeat focused assessment regarding patient complaint or injuries
 - D. Assess interventions
 1. Assess response to management
 2. Maintain or modify management plan

UNIT TERMINAL OBJECTIVE

- 3-4 At the end of this unit, the paramedic student will be able to apply a process of clinical decision making to use the assessment findings to help form a field impression.

COGNITIVE OBJECTIVES

At the end of this unit, the paramedic student will be able to:

- 3-4.1 Compare the factors influencing medical care in the out-of-hospital environment to other medical settings. (C-2)
- 3-4.2 Differentiate between critical life-threatening, potentially life-threatening, and non life-threatening patient presentations. (C-3)
- 3-4.3 Evaluate the benefits and shortfalls of protocols, standing orders and patient care algorithms. (C-3)
- 3-4.4 Define the components, stages and sequences of the critical thinking process for paramedics. (C-1)
- 3-4.5 Apply the fundamental elements of critical thinking for paramedics. (C-2)
- 3-4.6 Describe the effects of the "fight or flight" response and the positive and negative effects on a paramedic's decision making. (C-1)
- 3-4.7 Summarize the "six Rs" of putting it all together: Read the patient, Read the scene, React, Reevaluate, Revise the management plan, Review performance. (C-1)

AFFECTIVE OBJECTIVES

At the end of this unit, the paramedic student will be able to:

- 3-4.8 Defend the position that clinical decision making is the cornerstone of effective paramedic practice. (A-3)
- 3-4.9 Practice facilitating behaviors when thinking under pressure. (A-1)

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

- I. Introduction and key concepts
 - A. The cornerstones of effective paramedic practice
 1. Gathering, evaluating, and synthesizing information
 2. Developing and implementing appropriate patient management plans
 3. Applying judgment and exercising independent decision making
 4. Thinking and working effectively under pressure
 - B. The out-of-hospital environment
 1. Unlike other environments where medical care is traditionally rendered
 2. Unique, heavily influenced by factors that don't exist in other medical settings
 - C. The spectrum of patient care in out-of-hospital care in the out-of-hospital setting
 1. Obvious, critical life-threats
 - a. Major, multi-system trauma
 - b. Devastating single system trauma
 - c. End stage disease presentations
 - d. Acute presentations of chronic conditions
 2. Potential life-threats
 - a. Serious, multi-system trauma
 - b. Multiple disease etiologies
 3. Non life-threatening presentations
 - D. Providing guidance and authority for paramedic action and treatments
 1. Protocols, standing orders, and patient care algorithms
 - a. Can clearly define and outline performance parameters
 - b. Promote a standardized approach
 2. Limitations of protocols, standing orders and patient care algorithms
 - a. Only addresses "classic" patient presentations
 - (1) Non-specific patient complaints don't follow model
 - (2) Limited clarity of presenting patient problems
 - b. Don't speak to multiple disease etiologies
 - c. Don't speak to multiple treatment modalities
 - d. Promotes linear thinking, "cookbook medicine"
- II. Components, stages, and sequence of critical thinking process for paramedics
 - A. Concept formation
 1. MOI/ scene assessment
 2. Initial assessment and physical examination
 3. Chief complaint
 4. Patient history
 5. Patient affect
 6. Diagnostic tests
 - B. Data interpretation
 1. Data gathered
 2. Paramedic knowledge of anatomy and physiology, and pathophysiology
 3. Paramedic attitude
 4. Previous experience base of the paramedic
 - C. Application of principle
 1. Field impression/ working diagnosis

- 2. Protocols/ standing orders
 - 3. Treatment/ intervention
 - D. Evaluation
 - 1. Reassessment of patient
 - 2. Reflection in action
 - 3. Revision of impression
 - 4. Protocol/ standing orders
 - 5. Revision of treatment/ intervention
 - E. Reflection on action
 - 1. Run critique
 - 2. Addition to/ modification of experience base of the paramedic
- III. Fundamental elements of critical thinking for paramedics
- A. Adequate fund of knowledge
 - B. Ability to focus on specific and multiple elements of data
 - C. Ability to gather and organize data and form concepts
 - D. Ability to identify and deal with medical ambiguity
 - E. Ability to differentiate between relevant and irrelevant data
 - F. Ability to analyze and compare similar situations
 - G. Ability to recall contrary situations
 - H. Ability to articulate decision making reasoning and construct arguments
- IV. Considerations with field application of assessment based patient management
- A. The patient acuity spectrum
 - 1. EMS is activated for countless reasons
 - 2. Few out-of-hospital calls constitute true life-threatening emergencies
 - a. Minor medical and traumatic events require little critical thinking and have relatively easy decision making
 - b. Patients with obvious life-threats pose limited critical thinking challenges
 - c. Patients who fall on the acuity spectrum between minor and life-threatening pose the greatest critical thinking challenge
 - B. Thinking under pressure
 - 1. Hormonal influence i.e. "fight or flight" response impacts paramedic decision making both positively and negatively
 - a. Enhanced visual and auditory acuity
 - b. Improved reflexes and muscle strength
 - c. Impaired critical thinking skills
 - d. Diminished concentration and assessment ability
 - 2. Mental conditioning is the key to effective performance under pressure
 - a. Skills learned at a pseudo-instinctive performance level
 - b. Automatic response for technical treatment requirements
 - C. Mental checklist for thinking under pressure
 - 1. Stop and think
 - 2. Scan the situation
 - 3. Decide and act
 - 4. Maintain clear, concise control
 - 5. Regularly and continually reevaluate the patient
 - D. Facilitating behaviors

1. Stay calm, don't panic
 2. Assume and plan for the worst; err on the side of the patient
 3. Maintain a systematic assessment pattern
 4. Balance analysis, data processing and decision making styles
 - a. Situation analysis styles - reflective versus impulsive
 - b. Data processing styles - divergent versus convergent
 - c. Decision making styles - anticipatory versus reactive
- E. Situation awareness
1. Reading the scene
 2. Reading the patient
- F. Putting it all together - "the six Rs"
1. Read the patient
 - a. Observe the patient
 - (1) Level of responsiveness/ consciousness
 - (2) Skin color
 - (3) Position and location of patient - obvious deformity or asymmetry
 - b. Talk to the patient
 - (1) Determine the chief complaint
 - (2) New problem or worsening of preexisting condition?
 - c. Touch the patient
 - (1) Skin temperature and moisture
 - (2) Pulse rate, strength, and regularity
 - d. Auscultate the patient
 - (1) Identify problems with the lower airway
 - (2) Identify problems with the upper airway
 - e. Status of ABCs - identifying life-threats
 - f. Complete and accurate set of vital signs
 - (1) Use as triage tool to estimate severity
 - (2) Can assist in identifying the majority of life threatening conditions
 - (3) Influenced by patient age, underlying physical and medical conditions, and current medications
 2. Read the scene
 - a. General environmental conditions
 - b. Evaluate immediate surroundings
 - c. Mechanism of injury
 3. React
 - a. Address life-threats in the order they are found
 - b. Determine the most common and statistically probable cause that fits the patient's initial presentation
 - c. Consider the most serious condition that fits the patient's initial presentation
 - d. If a clear medical problem is elusive, treat based on presenting signs and symptoms
 4. Reevaluate
 - a. Focused and detailed assessment
 - b. Response to initial management/ interventions
 - c. Discovery of less obvious problems
 5. Revise management plan
 6. Review performance at run critique

UNIT TERMINAL OBJECTIVE

- 3-5 At the completion of this unit, the paramedic student will be able to follow an accepted format for dissemination of patient information in verbal form, either in person or over the radio.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 3-5.1 Identify the importance of communications when providing EMS. (C-1)
- 3-5.2 Identify the role of verbal, written, and electronic communications in the provision of EMS. (C-1)
- 3-5.3 Describe the phases of communications necessary to complete a typical EMS event. (C-1)
- 3-5.4 Identify the importance of proper terminology when communicating during an EMS event. (C-1)
- 3-5.5 Identify the importance of proper verbal communications during an EMS event. (C-1)
- 3-5.6 List factors that impede effective verbal communications. (C-1)
- 3-5.7 List factors which enhance verbal communications. (C-1)
- 3-5.8 Identify the importance of proper written communications during an EMS event. (C-1)
- 3-5.9 List factors which impede effective written communications. (C-1)
- 3-5.10 List factors which enhance written communications. (C-1)
- 3-5.11 Recognize the legal status of written communications related to an EMS event. (C-1)
- 3-5.12 State the importance of data collection during an EMS event. (C-1)
- 3-5.13 Identify technology used to collect and exchange patient and/ or scene information electronically. (C-1)
- 3-5.14 Recognize the legal status of patient medical information exchanged electronically. (C-1)
- 3-5.15 Identify the components of the local EMS communications system and describe their function and use. (C-1)
- 3-5.16 Identify and differentiate among the following communications systems: (C-3)
 - a. Simplex
 - b. Multiplex
 - c. Duplex
 - d. Trunked
 - e. Digital communications
 - f. Cellular telephone
 - g. Facsimile
 - h. Computer
- 3-5.17 Identify the components of the local dispatch communications system and describe their function and use. (C-1)
- 3-5.18 Describe the functions and responsibilities of the Federal Communications Commission. (C-1)
- 3-5.19 Describe how an EMS dispatcher functions as an integral part of the EMS team. (C-1)
- 3-5.20 List appropriate information to be gathered by the Emergency Medical Dispatcher. (C-1)
- 3-5.21 Identify the role of Emergency Medical Dispatch in a typical EMS event. (C-1)
- 3-5.22 Identify the importance of pre-arrival instructions in a typical EMS event. (C-1)
- 3-5.23 Describe the purpose of verbal communication of patient information to the hospital. (C-1)
- 3-5.24 Describe information that should be included in patient assessment information verbally reported to medical direction. (C-1)
- 3-5.25 Diagram a basic model of communications. (C-3)
- 3-5.26 Organize a list of patient assessment information in the correct order for electronic transmission to medical direction according to the format used locally. (C-3)

AFFECTIVE OBJECTIVES

At the end of this unit, the paramedic student will be able to:

3-5.27 Show appreciation for proper terminology when describing a patient or patient condition. (A-2)

PSYCHOMOTOR OBJECTIVES

At the end of this unit, the paramedic student will be able to:

3-5.28 Demonstrate the ability to use the local dispatch communications system. (P-1)

3-5.29 Demonstrate the ability to use a radio. (P-1)

3-5.30 Demonstrate the ability to use the biotelemetry equipment used locally. (P-1)

DECLARATIVE

- I. General
 - A. The importance of communications when providing EMS
 - 1. Paramedic functions as one part of a team
 - 2. Need to effectively communicate patient information and scene assessment
 - 3. Medical direction
 - 4. System control and administration
 - 5. Scene control
 - B. The role of verbal, written, and electronic communications in the provision of EMS
 - 1. Communications between party requesting help and the dispatcher
 - 2. Communications between the dispatcher and the paramedic
 - 3. Communications between paramedic in the field and receiving hospital and/ or medical direction physician (on-line)
 - 4. Communication with receiving hospital personnel (on-arrival)
 - C. The phases of communications necessary to complete a typical EMS event
 - 1. Occurrence
 - 2. Detection
 - 3. Notification and response
 - 4. Treatment and preparation for transport
 - 5. Preparation for next event
 - a. Pre-arrival instructions
 - b. Communication on-scene among other providers and with patient
 - D. Diagram of a basic model of communications
 - 1. Idea
 - 2. Encoder
 - 3. Sender
 - 4. Media or channel
 - 5. Receiver
 - 6. Decoder
 - 7. Feedback
 - E. The role of proper terminology when communicating during an EMS event
 - 1. Can shorten transmissions/ narratives
 - 2. Unambiguous
 - 3. Common means of communications with other medical professionals
 - F. The role of proper verbal communications during an EMS event
 - 1. Exchange of system information
 - 2. Exchange of patient information
 - 3. Medical control
 - 4. Professionalism
 - G. Factors that impede effective verbal communications
 - 1. Semantic
 - 2. Technical
 - H. Factors which enhance verbal communications
 - 1. Semantic

- 2. Technical
 - I. The importance of proper written communications during an EMS event
 - 1. Written record of incident
 - 2. Legal record of incident
 - 3. Professionalism
 - 4. Other
 - a. Medical audit
 - b. Quality improvement
 - c. Billing
 - d. Data collection
 - J. Factors which impede effective written communications
 - 1. Semantic
 - 2. Technical
 - K. Factors which enhance written communications
 - 1. Semantic
 - 2. Technical
 - L. Legal status of written communications related to an EMS event
 - 1. Record of incident
 - 2. Part of medical record
 - 3. Confidentiality/ disclosure
 - M. The importance of data collection during an EMS event
 - 1. System administration
 - 2. Research
 - 3. Quality management - often results in policy change
 - N. New technology used to collect and exchange patient and/ or scene information electronically
 - 1. Technology based
 - 2. Real-time capture of events/ information
 - 3. Integrated with diagnostic technology
 - 4. Reduces dependance on traditional means of documentation, i.e. written
 - 5. Influences role of medical direction
 - a. Provides for advanced notification
 - b. Potential for reduced time to in-hospital diagnosis and therapy
 - O. The legal status of patient medical information exchanged electronically
 - 1. Same status as traditional written documentation
 - 2. May not have a "paper record" of incident
- II. Systems
- A. Methodology used for EMS communication
 - 1. Simplex
 - a. Advantages - allows speaker to get message out without interruption
 - b. Disadvantages
 - (1) Slows process
 - (2) More formal
 - (3) Takes away ability to discuss case
 - 2. Multiplex

- a. Advantages
 - (1) Either party can interrupt as necessary
 - (2) Facilitates discussion
- b. Disadvantages
 - (1) Each end has tendency to interrupt the other
 - (2) Voice interferes with data transmission
- 3. Duplex
 - a. Advantages
 - (1) Either party can interrupt as necessary
 - (2) Facilitates discussion
 - b. Disadvantages - each end has tendency to interrupt the other
- 4. Trunked
 - a. Advantages
 - b. Disadvantages
- 5. Digital
 - a. Advantages
 - b. Disadvantages
- 6. Cellular telephone
 - a. Advantages
 - (1) Less formal
 - (2) Promotes discussion
 - (3) Can reduce on-line times,
 - (4) Physician can speak directly with patient
 - b. Disadvantages
 - (1) Geography can interfere with signal
 - (2) Cell site may be unavailable
 - (3) External antenna necessary
 - (4) Problems with denied access to cell (PIN numbers unknown or forgotten)
- 7. Facsimile
 - a. Advantages
 - (1) Provides earlier notification
 - (2) Produces another piece of medical documentation
 - b. Disadvantages - must have access to a fax machine (at each end)
- 8. Computer
 - a. Advantages
 - (1) Potential to save retrospective data entry step
 - (2) Can document in real time
 - (3) Sort on many categories
 - (4) Create multiple reporting formats
 - (5) Provide system data quickly
 - b. Disadvantages
 - (1) Subject to limitation of machine and man
 - (2) Lose flexibility
- B. Components of the local dispatch communications system and function
 - 1. Define 9-1-1 and E 9-1-1

2. Public safety access point
 - a. Types
 - b. Functions
3. Emergency medical dispatcher
 - a. Functions
4. Pre-arrival instructions
 - a. Purpose
 - b. Types
5. System dispatcher
 - a. Functions

III. Regulation

- A. Functions and responsibilities of the Federal Communications Commission
 1. Federal agency established to regulate telecommunications in the U.S.
 2. Functions
 - a. Licensing
 - b. Frequency allocation
 - c. Technical standards
 - d. Rule making and enforcement

IV. Dispatch

- A. The functions of an EMS dispatcher
 1. Call taking
 2. Alerting and directing response
 3. Monitoring and coordinating communications
 4. Pre-arrival instructions
 5. Maintaining incident record
- B. Appropriate information to be gathered by the emergency medical dispatcher
 1. Caller's name and call-back number
 - a. Enhanced 9-1-1 system
 2. Address of event
 3. Nature of event
 4. Specific event information
 - a. Call screening
 - b. Pre-arrival instructions
- C. The role of Emergency Medical Dispatch in a typical EMS event
 1. Part of the EMS system team
 2. First contact with the EMS system
 3. Coordination of response
 4. Coordination of communications
 5. Provision of pre-arrival instructions to mitigate event prior to arrival of units
 6. Incident data collection
- D. The importance of pre-arrival Instructions in a typical EMS event
 1. Provides immediate assistance
 2. Complements call screening

3. Provides updated information to responding unit(s)
4. May be life sustaining in critical incidents
5. Emotional support for caller/ bystanders/ victim

V. Procedures

A. Information that should be verbally reported to medical direction

1. Depends of technology used for transmission
2. May vary with local protocol
3. Based on patient priority
4. Standard format
 - a. Efficient use of communications system
 - b. Assists medical direction
 - c. Assures no significant information is omitted
5. Information
 - a. Unit identification/ provider identification
 - b. Description of scene
 - c. Patient's age, sex, and approximate weight (for drug orders)
 - d. Patient's chief complaint
 - e. Associated symptoms
 - f. Brief, pertinent history of the present illness/ injury
 - g. Pertinent past medical history, medications and allergies
 - h. Pertinent physical exam findings
 - i. Treatment given so far
 - j. Estimated time of arrival at hospital
 - k. Other pertinent information

B. General procedures for exchange of information

1. Protect privacy of the patient
2. Use proper unit numbers, hospital numbers, proper names and titles
3. Do not use slang or profanity
4. Use standard formats for transmission
5. Utilize the "echo" procedure when receiving directions from the dispatcher or physician orders
6. Obtain confirmation that message was received

UNIT TERMINAL OBJECTIVE

3-6 At the completion of this unit, the paramedic student will be able to effectively document the essential elements of patient assessment, care and transport.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 3-6.1 Identify the general principles regarding the importance of EMS documentation and ways in which documents are used. (C-1)
- 3-6.2 Identify and use medical terminology correctly. (C-1)
- 3-6.3 Recite appropriate and accurate medical abbreviations and acronyms. (C-1)
- 3-6.4 Record all pertinent administrative information. (C-1)
- 3-6.5 Explain the role of documentation in agency reimbursement. (C-1)
- 3-6.6 Analyze the documentation for accuracy and completeness, including spelling. (C-3)
- 3-6.7 Identify and eliminate extraneous or nonprofessional information. (C-1)
- 3-6.8 Describe the differences between subjective and objective elements of documentation. (C-1)
- 3-6.9 Evaluate a finished document for errors and omissions. (C-3)
- 3-6.10 Evaluate a finished document for proper use and spelling of abbreviations and acronyms. (C-3)
- 3-6.11 Evaluate the confidential nature of an EMS report. (C-3)
- 3-6.12 Describe the potential consequences of illegible, incomplete, or inaccurate documentation. (C-1)
- 3-6.13 Describe the special considerations concerning patient refusal of transport. (C-3)
- 3-6.14 Record pertinent information using a consistent narrative format. (C-3)
- 3-6.15 Explain how to properly record direct patient or bystander comments. (C-1)
- 3-6.16 Describe the special considerations concerning mass casualty incident documentation. (C-1)
- 3-6.17 Apply the principles of documentation to computer charting, as access to this technology becomes available. (C-2)
- 3-6.18 Identify and record the pertinent, reportable clinical data of each patient interaction. (C-1)
- 3-6.19 Note and record "pertinent negative" clinical findings. (C-1)
- 3-6.20 Correct errors and omissions, using proper procedures as defined under local protocol. (C-1)
- 3-6.21 Revise documents, when necessary, using locally-approved procedures. (C-1)
- 3-6.22 Assume responsibility for self-assessment of all documentation. (C-3)
- 3-6.23 Demonstrate proper completion of an EMS event record used locally. (C-3)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 3-6.24 Advocate among peers the relevance and importance of properly completed documentation. (A-3)
- 3-6.25 Resolve the common negative attitudes toward the task of documentation. (A-3)

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

- I. Introduction
 - A. Importance of documentation
 - B. Written record of incident
 - 1. May be the only source of information for persons subsequently interested in the event
 - a. Provides a source for identifying pertinent reportable clinical data from each patient interaction
 - 2. Legal record of incident
 - a. May be used in court proceedings
 - b. May be the paramedic's sole source of reference to a case
 - 3. Professionalism
 - a. As a link to subsequent care, documentation may be the only means for paramedics to represent themselves as professionals to certain other health professionals
 - C. Other uses of documentation
 - 1. Medical audit
 - a. May be used in run review conferences
 - b. Other educational forums
 - 2. Quality improvement
 - a. May be used to tally the individual's performance of patient care procedures and to review individual performance
 - b. May be used to identify systems issues regarding quality improvement
 - 3. Billing and administration
 - a. May be used for acquiring the billing and administrative data necessary for economic survival of many EMS agencies
 - 4. Data collection
 - a. May be used for research purposes
- II. General considerations
 - A. Be familiar with common medical terms, their meaning and their correct spelling
 - B. Be familiar with commonly-accepted medical abbreviations and their correct spelling
 - C. Be familiar with common industry acronyms
 - D. Incident times
 - 1. Understand the legal purposes of accurate recording of the following incident times
 - a. Time of call
 - b. Time of dispatch
 - c. Time of arrival at the scene
 - d. Time(s) of medication administration and certain medical procedures as defined by local protocol
 - e. Time of departure from the scene
 - f. Time of arrival at the medical facility (when transporting a patient)
 - g. Time back in service
 - E. Accurately note in the document narrative (and elsewhere, when applicable) medical direction's advice and orders, and the results of implementing that advice and those orders
 - F. "Pertinent negatives"
 - 1. Record "pertinent negative" findings, that is, findings that warrant no medical care or intervention, but which, by seeking them, show evidence of the thoroughness of the

- paramedic's examination and history of the event
 - G. Pertinent oral statements made by patients and other on-scene people
 - 1. Record statements made which may have an impact on subsequent patient care or resolution of the situation, including reports of
 - a. Mechanism of injury
 - b. Patient's behavior
 - c. First aid interventions attempted prior to the arrival of EMS personnel
 - d. Safety-related information, including disposition of weapons
 - e. Information of interest to crime scene investigators
 - f. Disposition of valuable personal property (e.g. watches, wallets)
 - 2. Use of quotations
 - a. The paramedic should put into quotation marks any statements by patients or others which relate to possible criminal activity or admissions of suicidal intention
 - H. Record support services used (e.g. helicopter, coroner, rescue/ extrication, etc.)
 - I. Record use of mutual aid services
- III. Elements of a properly written EMS document
- A. Accurate
 - 1. Document accuracy depends on all information provided, both narrative and checkbox, being
 - a. Precise
 - b. Comprehensive
 - 2. All checkbox sections of a document must show that the paramedic attended to them, even if a given section was unused on a call
 - 3. Medical terms, abbreviations and acronyms are properly used and correctly spelled
 - B. Legible
 - 1. Legibility means that handwriting, especially in the narrative portion of the document, can be read by others without difficulty
 - 2. Checkbox marking should be clear and consistent from the top page of the document to all underlying pages
 - C. Timely - documentation should be completed ideally before the paramedic handles tasks subsequent to the patient interaction
 - D. Unaltered
 - 1. While writing the document, should the paramedic make an error, a single line should be drawn through the error, and the area initialed and dated
 - 2. Should alterations to a document be required after the document has been submitted, see "document revision/ correction" (below)
 - E. Free of non-professional/ extraneous information
 - 1. Jargon
 - 2. Slang
 - 3. Bias
 - 4. Libel/ slander
 - 5. Irrelevant opinion/ impression
- IV. Systems of narrative writing
- A. Head to toe approach
 - 1. The narrative uses a comprehensive, consistent physical approach from head to toe
 - B. Body systems approach

- 1. The narrative uses a comprehensive review of the primary body systems
 - C. Call incident approach
 - D. Patient management approach
 - E. Other formats
 - F. Know how to differentiate subjective from objective elements of documentation
- V. Special considerations of documentation
- A. Documentation of patient's refusal of care and/ or transport
 - 1. When a patient refuses medical care, the paramedic must show in the report the process undergone to come to that conclusion, including
 - a. The paramedic's advice to the patient
 - b. The advice rendered by medical direction by telephone or radio
 - c. Signatures of witness(es) to the event, according to local protocol
 - d. Complete narrative, including quotations or statements by others
 - B. Document decisions/ events where care and transportation were not needed
 - 1. If canceled en route, note canceling authority and the time
 - 2. If canceled at scene, note canceling authority and special circumstances (e.g. "On scene officer reported no injuries and asked us to leave the scene - no patient contacts made")
 - C. Documentation in mass casualty situations
 - 1. In unusual circumstances, comprehensive documentation has to wait until after mass casualties are triaged and transported
 - 2. The paramedic should know and follow local procedures for documentation of mass casualty situations
- VI. Document revision/ correction
- A. How done
 - 1. Write revisions to documents on separate report forms
 - 2. Note the purpose of the revision, and why the information did not appear on the original document
 - 3. Note the date and time
 - 4. Revisions should be made by the original author of a document
 - 5. When the need for revision is realized, it should be done as soon as possible
 - B. Acceptable method(s)
 - 1. Corrections
 - a. Written narrative is appropriate, on a new report form which is then attached to the original
 - 2. Deletions and additions
 - a. Should not be done on the original report form
 - b. These should only be done on a new report form
 - 3. Supplemental narratives
 - a. If more information comes to the paramedic's attention, a supplemental narrative can be written on a separate report form and attached to the original
- VII. Consequences of inappropriate documentation
- A. Implications to medical care
 - 1. An incomplete, inaccurate, or illegible report may cause subsequent care givers to provide inappropriate care to a patient
 - B. Legal implications
-

1. A lawyer considering the merits of an impending lawsuit can be dissuaded from a case when the documentation is done correctly
 2. The converse is true if documentation is anything less
- C. Timeliness

VIII. Closing

- A. The paramedic shall assume responsibility for self-assessment of all documentation
- B.P Peer advocacy of proper appreciation for the importance of good documentation
1. Documentation is a maligned task in EMS, but one of utmost importance for a variety of reasons
 2. A professional EMS provider appreciates this and strives to set a good example to others regarding the completion of the documentation tasks
- C. Respect the confidential nature of an EMS report
- D. Principals of documentation are to remain valid regarding computer charting, as that technology becomes available

UNIT TERMINAL OBJECTIVE

- 4-1 At the completion of this unit, the Paramedic student will be able to integrate the principles of kinematics to enhance the patient assessment and predict the likelihood of injuries based on the patient's mechanism of injury.

COGNITIVE OBJECTIVES

At the completion of this unit, the Paramedic student will be able to:

- 4-1.1 List and describe the components of a comprehensive trauma system. (C-1)
- 4-1.2 Describe the role of and differences between levels of trauma centers. (C-3)
- 4-1.3 Describe the criteria for transport to a trauma center. (C-1)
- 4-1.4 Describe the criteria and procedure for air medical transport. (C-1)
- 4-1.5 Define energy and force as they relate to trauma. (C-1)
- 4-1.6 Define laws of motion and energy and understand the role that increased speed has on injuries. (C-1)
- 4-1.7 Describe each type of impact and its effect on unrestrained victims (e.g., "down and under," "up and over," compression, deceleration). (C-1)
- 4-1.8 Describe the pathophysiology of the head, spine, thorax, and abdomen that result from the above forces. (C-1)
- 4-1.9 List specific injuries and their causes as related to interior and exterior vehicle damage. (C-1)
- 4-1.10 Describe the kinematics of penetrating injuries. (C-1)
- 4-1.11 List the motion and energy considerations of mechanisms other than motor vehicle crashes. (C-1)
- 4-1.12 Define the role of kinematics as an additional tool for patient assessment. (C-1)

AFFECTIVE OBJECTIVES

None identified for this unit.

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

- I. Introduction
 - A. Epidemiology of trauma
 - 1. A leading cause of death for people 1- 44 years of age
 - 2. 140,000 unexpected deaths per year
 - 3. Automobile related deaths are > 40,000
 - 4. Penetrating trauma may exceed blunt in near future
 - 5. Pre-incident, incident, post-incident phase
 - B. History
 - 1. Complete and accurate history of incident will identify possibility for 95% of the injuries present
 - 2. Incident site
 - a. Indications of severity of injury
 - 3. Major factors of tissue injury
 - 4. Amount of energy exchanged
 - 5. Anatomical structures potentially involved
- II. Trauma systems
 - A. Components
 - 1. Injury prevention
 - 2. Prehospital care
 - a. Treatment
 - b. Transportation
 - c. Trauma triage guidelines
 - 3. Emergency department care
 - 4. Interfacility transportation - if necessary
 - 5. Definitive care
 - 6. Trauma critical care
 - 7. Rehabilitation
 - 8. Data collection/ trauma registry
 - B. Trauma centers
 - 1. Levels
 - 2. Qualifications
 - a. Essential
 - b. Desired
 - 3. Role
 - C. Transport considerations
 - 1. Level of receiving facility
 - 2. Mode of transport
 - a. Ground transport
 - (1) If appropriate facility can be reached within reasonable time
 - (2) To a more accessible landing zone for air medical transport
 - b. Air medical transport
 - (1) Indications

- (2) Contraindications
 - (3) Procedure
- III. Energy
- A. Physical laws
 - 1. Newton's first law of motion
 - a. A body at rest or a body in motion will remain in that state until acted upon by an outside force
 - b. In a vehicle traveling at 50 mph, the occupant is also traveling at 50 mph
 - c. When the car stops, the occupant continues to travel at 50 mph until some force acts on the occupant
 - 2. Conservation of energy
 - a. Energy cannot be created nor destroyed
 - b. It can be changed in form
 - c. Energy can be absorbed producing deformation of substance
 - 3. Kinetic energy (KE)
 - a. $KE = \frac{1}{2}$ the mass of the object multiplied by the velocity (speed) of the object squared ($Mass/2 \times V^2$)
 - b. Velocity (V) influences KE more than mass
 - c. Greater speed means more energy generated
 - 4. Force
 - a. Force = Mass x Acceleration
 - b. Force = Mass x Deceleration
 - c. Mass x Acceleration = Force = Mass x Deceleration
 - d. Simply put, to accelerate a bullet from a the muzzle of a weapon requires the force from the explosion of the gunpowder; once the bullet is set in motion by this explosion, an equal amount of tissue destruction must occur inside the body to stop it as was used to start it
 - 5. Energy law summary
 - a. Motion is created by force (energy exchange)
 - b. Force (energy exchange) must stop this motion
 - c. If such energy exchange occurs inside the body tissue damage is produced
 - B. Energy exchange
 - 1. Cavitation
 - a. Energy exchange produces particle motion
 - b. Temporary cavity
 - (1) Short lived
 - (2) Produced by stretching
 - (3) Dependent on the elasticity of the object involved
 - (4) Produces particle compression at the limits of the cavity
 - c. Permanent cavity
 - (1) Visible when the energy exchange has been completed
 - (2) Produced by compression and destruction
 - 2. Interaction between two bodies
 - a. At least one must be in motion

- b. Both can be in motion
- 3. Dependent on number of particles involved in the interface of the interaction
 - a. Density of the interacting bodies
 - (1) Air density (few particles)
 - (a) Lung
 - (b) Intestinal tract
 - (2) Water density (more particles)
 - (a) Vascular system
 - (b) Liver
 - (c) Spleen
 - (d) Muscle
 - (3) Solid density (thick particles)
 - (a) Bone
 - (b) Asphalt
 - (c) Steel
 - b. Area on interaction
 - (1) Shape of object
 - (2) Position of object
 - (3) Fragmentation of object
- C. Types on trauma based on ingress
 - 1. Blunt
 - a. Tissue not penetrated
 - b. Cavitation away from site of impact
 - c. Cavitation in direction of impact
 - 2. Penetrating
 - a. Tissue penetrated
 - b. Cavitation at 90° to bullet pathway
 - (1) Tissue inline to penetration is crushed

IV. Blunt trauma

- A. Vehicle collisions
 - 1. Frontal
 - 2. Lateral
 - 3. Rear
 - 4. Rotational
 - 5. Roll over
- B. Occupant collisions
 - 1. Frontal impacts
 - a. Down and under
 - (1) Feet impact floor pan
 - (2) Knees impact dash
 - (a) Tibia impact
 - i) Knee dislocation
 - ii) Popliteal artery disruption
 - iii) Knee support disruption

- (b) Femur impact
 - i) Femur fracture
 - ii) Acetabular posterior fracture dislocation
 - (3) Torso rotates
 - (a) Steering column
 - (b) Dash
 - (c) Windshield
 - b. Up and over
 - (1) Head impact
 - (a) Windshield
 - (b) Roof
 - (c) Mirror
 - (2) Chest impact
 - (a) Steering column
 - (b) Dash
 - (3) Abdominal impact
 - (a) Steering column
 - (b) Dash
 - 2. Lateral impacts
 - a. Vehicle moves into and impacts body
 - (1) Chest
 - (2) Pelvis
 - (3) Body moves laterally
 - (a) Neck
 - i) Rotates
 - ii) Lateral flexion
 - iii) Combination
 - 3. Rear impacts
 - a. Vehicle seat pushes body
 - (1) All body parts in contact with seat move
 - (2) Body parts not in contact dragged along with torso
 - b. Secondary impact if vehicle hits another object
 - (1) Similar to frontal impact
 - 4. Rotational impacts
 - a. Part of vehicle stops; the rest remains in motion
 - b. Combination of frontal and lateral impacts
 - 5. Roll over
 - a. Difficult to predict the body impacts
- C. Organ collisions
 - 1. Two types of injury from blunt trauma
 - a. Compression
 - b. Change in velocity
 - (1) Acceleration
 - (a) Shear
 - (b) Avulsion

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-
- (2) Deceleration
 - (a) Shear
 - (b) Avulsion
 - 2. Organ collisions with different vehicular collisions
 - a. Frontal impacts
 - (1) Head
 - (a) Compression
 - i) Skull fractures
 - ii) Cerebral contusion
 - (b) Deceleration
 - i) Opposite end separation
 - ii) Hemorrhage
 - iii) Brain stem stretch
 - (2) Neck
 - (a) Compression
 - i) Vertebral body
 - a) Compression fracture
 - b) Hyperextension injury
 - Posterior element compression
 - Anterior body separation
 - c) Hyperflexion injury
 - Anterior body compression
 - Posterior element separation
 - (b) Shear
 - i) Not significant
 - (3) Thorax
 - (a) Chest wall
 - i) Compression
 - a) Fracture rib(s) - producing single rib fractures, flail chest, and/or pneumothorax
 - ii) Shear
 - a) Fracture thoracic spine
 - (b) Heart
 - i) Compression
 - a) Contusion
 - b) Rupture
 - ii) Shear
 - a) Not significant
 - (c) Aorta
 - i) Compression
 - a) Not significant
 - ii) Shear
 - a) Junction arch and descending portions
 - b) Aortic origin at the aortic valve

- c) At the diaphragm
 - (d) Lung
 - i) Compression
 - a) Pneumothorax
 - b) Rib fracture and penetration
 - ii) Shear
 - a) Not significant
- (4) Abdomen
 - (a) Abdominal cavity
 - i) Diaphragm
 - a) Compression tears
 - b) Shear - not significant
 - ii) Abdominal wall
 - a) Compression tears
 - b) Shear - not significant
 - (b) Liver
 - i) Compression
 - a) Burst type injuries
 - ii) Shear
 - a) Tears from Ligamentum Teres
 - b) Avulsion of liver from inferior vena cava at the hepatic veins
 - (c) Spleen
 - i) Compression
 - a) Burst
 - ii) Shear
 - a) Avulsion of pedicle
 - (d) Gastrointestines
 - i) Compression
 - a) Rupture
 - ii) Shear
 - a) Avulsion of mesenteric vessels from aorta or vena cava
 - b) Tears along mesenteric vessels
 - c) Avulsion of vessels from intestine
 - (e) Gall bladder
 - i) Compression
 - a) Rupture
 - ii) Shear
 - a) Avulsion from liver
 - b) Avulsion of cystic duct
- b. Lateral impacts
 - (1) Head
 - (a) Compression
 - i) Similar to frontal except lateral head and on the

- side of the impact to the vehicle
 - (b) Shear
 - i) Shear of brain and vessels opposite side of the impact
- (2) Cervical spine
 - (a) Compression
 - i) Minimal unless head hits the top of the passenger compartment or the support for the windows
 - (b) Shear
 - i) Two fold mechanism
 - ii) Rotation
 - a) Center of gravity of the head is anterior to the pivot point of the head and the spine at the odontoid process; as lateral impact occurs the torso and then the C-spine is pushed under the head; the head rotates in relative position to the body, toward the impact
 - b) The center of gravity of the head is also cephalad to the point of support at the cervical spine; as the lateral forces push the torso away from the point of impact the motion of the head produces lateral flexion of the head
 - c) The combination of these two forces is lateral flexion of the neck opening the facets opposite the side of impact and rotation of the vertebral bodies in relation to each other; the result is jumped facets and if the force is great enough significant torsion of the spinal cord
- (3) Thorax
 - (a) Compression
 - i) Impact of the door into the thorax
 - a) Lateral ribs - fractures and flail chest
 - b) Lung - pneumothorax
 - c) Spleen or liver - lacerations and hemorrhage
 - (b) Shear
 - i) Lateral motion of the thoracic spine as the torso is pushed away from the impact
 - ii) Thoracic aorta moves with the spine
 - iii) Arch and heart do not move until traction on the arch

- iv) Shear forces tear the aorta at the junction of the movable arch and the descending aorta that is attached to the thoracic spine
- (4) Abdomen
 - (a) Compression
 - i) Liver or spleen depending of the side of the impact
 - ii) Kidneys depending of the side of the impact
 - iii) Diaphragm similar to frontal impact
 - (b) Shear
 - i) Abdominal aorta moves with the lumbar spine
 - a) Shear of the renal vessels
 - b) Shear of the splenic vessels
- (5) Pelvis
 - (a) Compression
 - i) Impact on the femur
 - a) Femoral head driven through the acetabulum
 - b) Fracture of the ileum
 - c) Sacro-iliac joint fracture
 - d) Fracture of the other bones of the pelvis
- (6) Extremities
 - (a) Compression
 - i) Clavicle compressed between the humerus and the sternum
 - ii) Lateral compression of the humerus
- c. Rear impact
 - (1) Physics
 - (a) Energy (velocity) imparted to the rear
 - i) Moves all attached parts of the vehicle
 - ii) Occupants in direct contact with vehicle move also
 - iii) Parts of the occupants not in direct contact do not move until pulled along
 - a) Newton's first law of motion
 - b) Unrestricted body parts will be separated or at least stretched by this differential velocity
 - iv) The force of the energy exchange depends on the differential energy of the two vehicles and the exchange of energy between the two
 - (2) Head
 - (a) Compression
 - i) Into structures behind the seat
 - ii) Energy of compression depends on the force of

- the change of energy between the vehicle and the impact into the head
- (b) Shear
 - i) Separation of the brain and skull in front
 - (3) Neck
 - (a) Compression
 - i) Unrestrained occupant into the top of the passenger compartment or into the rear seat
 - (b) Shear
 - i) Head restraint not in the correct position to move the head forward with the motion of the vehicle
 - ii) Neck hyperextended over the malpositioned head restraint; usually only ligamentous and tendon stretch and no fractures
 - (4) Torso
 - (a) As most of the torso is in contact with the seat and springs of the seat only minimal differential energy is exchanged onto the body parts
 - (b) Unless there is rebound when the vehicle hits another vehicle there is little injury to the torso in the rear impact collision
 - (5) Extremities
 - (a) The extremities move with the torso and receive very little differential exchange with rear impacts
 - d. Rotational impacts
 - (1) In the pure rotational impact, one part of the vehicle hits an immovable object, while the rest continues in motion (Newton's first law of motion)
 - (2) As the one part stops and the rest of the vehicle continues to move the vehicle moves around the fixed point
 - (3) The motion to the occupant is a combination of two motions
 - (a) Frontal and lateral
 - (b) Rear and lateral
 - (4) The injuries are combinations of the two motions with emphasis on the initial impact motion
 - e. Roll over
 - (1) In a roll over the pattern of injuries is very difficult as the unrestrained occupant can hit all parts of the vehicle
 - f. Ejection
 - (1) If the force is such and the occupant is unrestrained then ejection is possible
 - (2) The major injuries occur inside of the vehicle and on the way out rather than afterward on impact the ground or some other object
 - (3) Since the major part of the injuries occur on the way out, the Paramedic can better predict the injuries by thinking of the first

part of the collision rather than the latter portion

D. Restraints

1. Restraints are systems for absorbing the energy of the impact before the occupant hits something hard and limiting the distance the body has to travel thus helping to decrease velocity (speed)
2. Belt restraint
 - a. Contrary to popular belief the belt restraints work on lateral impacts as well as in frontal impacts (they are not quite as effective in lateral impacts because the hard parts of the passenger compartment is closer on the sides than in the front therefore the belt systems do not have as much distance to be effective)
 - b. The benefit of the belt restraint can be seen on any Sunday at the automobile race track
 - c. Lap belts
 - (1) Benefits
 - (a) Hold the lower torso in close approximation to the seat and away from the dash or steering column
 - (b) Prevent
 - i) Forward motion of the lower torso in frontal collisions
 - ii) Moves the torso with the vehicle and away from the impact in lateral impact collisions
 - iii) Prevents multiple impacts in rollover collisions
 - iv) Prevents ejection
 - (c) Attached to the floor behind the occupant at a 45° angle to the floor
 - (d) Prevent forward motion of the pelvis by supporting the anterior part of the pelvis
 - (e) No impingement on the soft intra-abdominal contents
 - (2) Limitations
 - (a) Upper torso is not supported
 - (b) If positioned above the anterior iliac spine, the belt stops the forward motion of the body against the lumbar spine with the intra-abdominal organs crushed between the belt and the spine
 - (c) High position can fracture or dislocate the lumbar spine
 - (d) Increased intra-abdominal pressure can rupture the diaphragm
 - d. Shoulder restraints
 - (1) Benefits
 - (a) Prevents
 - i) Forward motion of the upper torso in frontal impact collisions
 - ii) Hyper flexion of the upper torso around the lap belts preventing spinal injuries

- (b) Moves the upper torso with the vehicle in lateral impact collisions
 - (2) Limitations
 - (a) If worn without the lap belt neck injuries can occur
 - (b) Lessened benefit if the seat is very close to the dash or steering column
 - e. Air bags
 - (1) Benefits
 - (a) Supplemental protection
 - (b) Frontal impact protection only with frontal bags
 - (2) Limitations
 - (a) Minimally effective alone
 - (b) Can produce significant injuries if too close to the occupant
 - i) Bag expansion
 - ii) Protective cover into the face or chest
 - (c) Projects standing children into the seat producing cervical spine fractures
 - (d) Facial and forearm abrasions
 - (e) Deployed air bag may hide structural damage to the vehicle that may aid in assessment
 - f. Child safety seats
 - (1) Age and types
 - (2) Proper use
 - (3) Injury patterns
 - (4) Proper use with airbags
- E. Motorcycle collisions
 - 1. Frontal impact
 - a. Bike stops
 - b. Occupant continues forward
 - (1) Impacts parts of the bike
 - (a) Face
 - (b) Chest
 - (c) Abdomen
 - (d) Upper legs (femur)
 - (2) Ejected over the bike
 - (a) Into vehicle
 - (b) Onto ground
 - (c) Into objects in the pathway
 - (3) Injuries
 - (a) C-spine fractures
 - (b) Torso
 - i) Compression injuries
 - a) Solid organ crush
 - b) Hollow organ rupture (e.g. lungs)

- ii) Deceleration (sheer injuries)
 - a) Aorta
 - b) Pedicled organs
 - (c) Compound tibia/ fibula fractures
 - 2. Angular impact
 - a. Collapse of bike onto vehicle
 - (1) Legs trapped between bike and vehicle
 - (2) Open fracture and/or dislocations
 - b. Lateral motion of torso into vehicle
 - c. Injuries
 - (1) Cervical spine
 - (a) Similar to lateral impact in vehicle
 - (2) Torso
 - (a) Compression
 - i) Lateral chest
 - ii) Lateral abdomen
 - (b) Deceleration
 - i) Aorta
 - ii) Pedicled organs
 - 3. Protection
 - a. Head
 - (1) Helmet
 - (a) 300% increase brain injury without helmet
 - (b) Spine
 - i) Small protection
 - ii) No increase
 - b. Skin
 - (1) Leathers
 - (2) Very protective during slides on asphalt
 - c. Ankles and feet
 - (1) Strong boots
- F. Pedestrian versus motor vehicle
 - 1. Injuries patterns depends on
 - a. Height
 - b. Body area facing impact
 - 2. Three phases
 - a. Vehicle pedestrian impact
 - (1) Legs
 - (a) Feet stay in place on asphalt
 - (b) Legs pushed by bumper
 - (c) Torso moves after the legs
 - (2) Torso
 - (a) Pelvis
 - (b) Crushed by front of vehicle
 - (c) Lateral or posterior angulation

- i) Lumbar fractures
 - ii) Thoracic fractures
 - b. Pedestrian rotates onto hood
 - (1) Impact onto torso
 - (a) Compression injuries
 - (b) Acceleration (shear) injures
 - (2) Cervical spine
 - (a) Severe flexion or lateral flexion
 - (b) Torsion
 - (c) Fractures and dislocations
 - c. Pedestrian rolls off onto the ground (asphalt)
 - (1) Beside vehicle
 - (a) Impact into the ground as fall from height
 - (2) In front of vehicle
 - (a) Run over by the vehicle
 - (b) Dragged by the vehicle
- G. Falls
 - 1. Factors
 - a. Height of fall
 - b. Surface of the impact
 - c. Objects struck during the fall
 - d. Body part of first impact
 - 2. Feet first
 - a. Impact onto calcaneus
 - b. Continued motion of the torso
 - (1) Ankles, knees, femur
 - (2) Acetabulum, pelvis
 - (3) Spine
 - (a) Break the "S"
 - (b) Arch
 - i) Convexity stretched & opened
 - ii) Concavity compressed
 - (4) Torso
 - (a) Deceleration (shear)
 - i) Liver
 - ii) Kidney
 - iii) Spleen
 - iv) Aorta
 - 3. Head first
 - a. Compression
 - (1) Skull fracture
 - (2) Brain
 - (a) Contusion
 - (b) Laceration
 - (3) Spine

- b. Deceleration (shear)
 - (1) Aorta
 - (2) Kidney
 - (3) Other
- 4. Parallel to ground
 - a. Compression
 - (1) All parts of the impact

V. Penetrating injuries

A. Energy exchange

- 1. Number of particles involved
 - a. Density of tissue
 - (1) Gas
 - (a) Lung
 - (b) Gastrointestinal tract
 - (2) Liquid
 - (a) Blood vessels
 - (b) Muscle
 - (c) Solid organs
 - i) Spleen
 - ii) Liver
 - iii) Kidney
 - iv) Other
 - (3) Solid
 - (a) Bone
 - b. Area of interaction
 - (1) Deformation of bullet
 - (2) Tumble
 - (3) Fragmentation
- 2. Cavitation
 - a. Permanent
 - (1) Visible when examined
 - (2) Crushed tissue
 - b. Temporary
 - (1) Compression wave of tissue particles
 - (2) Away from the pathway of the bullet
 - (3) Lasts only a few microseconds
 - (4) Tissue damage produced by stretch
- 3. Available energy
 - a. $KE = M/2 \times V^2$
 - (1) Velocity more important than the mass
 - b. Mass x acceleration = FORCE = mass x deceleration
 - (1) Then energy used to place the mass in motion must be completely exchanged into the body tissues to stop the mass
 - c. Energy potential

- (1) Continuum of energy increase
 - (2) Can be broken down into artificial but workable groups
 - (3) Energy
 - (a) Low energy objects
 - i) Hand driven
 - a) Knife
 - b) Ice pick
 - c) Ax
 - d) Other
 - ii) Minimal cavitation
 - iii) Damage only by cutting edge
 - (b) Medium energy
 - i) Muzzle velocity > 1500 feet/ second
 - ii) Hand guns, low power rifle
 - iii) Small projectile
 - iv) Cavitation 6-10 x bullet frontal area
 - (c) High energy
 - i) Muzzle velocity < 1500 feet/ second
 - ii) Military high velocity small caliber weapons
 - a) Examples (M16, AK 47/74)
 - b) Other
 - iii) Cavitation 20-30 x frontal area of missile
 - (d) Implications of soft body armor
- B. Anatomy
- 1. Organs injured
 - 2. Pathway of missile
 - a. Entrance wound
 - (1) Hole is crushed inward
 - (2) Round or oval shaped
 - (3) Rim
 - (a) Dark
 - (b) 1-2 mm width
 - (c) Produced by grease and other substance on the bullet
 - (4) Abrasion
 - (a) Produced by spinning of the bullet
 - (b) Largest with greatest contact of skin
 - i) Larger when impact is at an angle
 - (5) Burn
 - (a) Flame from barrel
 - (b) End of weapon 4-6 inches from the skin
 - b. Exit wound
 - (1) Pushed outward
 - (2) Stellate or slit

VI. Blast

- A. Introduction
 - 1. The blast effect is broken down in to three phases depending on the type of force that occurs during that phase
 - 2. Each phase has a different energy pattern
- B. Phases
 - 1. Primary
 - a. Pressure wave of the blast
 - (1) Major effect on gas containing organs
 - (a) Organ systems
 - i) Lungs
 - ii) Intestinal tract
 - (b) Pathology
 - i) Rupture of the organ
 - (c) Air emboli
 - b. Heat wave
 - (1) Burns on unprotected part of body
 - (2) Skin burns
 - (3) Eye burns
 - 2. Secondary
 - a. Struck by flying particles
 - (1) Glass
 - (2) Bricks
 - (3) Wood
 - (4) Metal
 - b. Pathology
 - (1) Compression
 - (2) Lacerations
 - 3. Tertiary
 - a. Patient becomes flying object
 - (1) Impact into other objects
 - (2) Similar to falls

UNIT TERMINAL OBJECTIVE

- 4-2 the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement the treatment plan for the patient with shock or hemorrhage.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 4-2.1 Describe the epidemiology, including the morbidity/ mortality and prevention strategies, for shock and hemorrhage. (C-1)
- 4-2.2 Discuss the anatomy and physiology of the cardiovascular system. (C-1)
- 4-2.3 Predict shock and hemorrhage based on mechanism of injury. (C-1)
- 4-2.4 Discuss the various types and degrees of shock and hemorrhage. (C-1)
- 4-2.5 Discuss the pathophysiology of hemorrhage and shock. (C-1)
- 4-2.6 Discuss the assessment findings associated with hemorrhage and shock. (C-1)
- 4-2.7 Identify the need for intervention and transport of the patient with hemorrhage or shock. (C-1)
- 4-2.8 Discuss the treatment plan and management of hemorrhage and shock. (C-1)
- 4-2.9 Discuss the management of external hemorrhage. (C-1)
- 4-2.10 Differentiate between controlled and uncontrolled hemorrhage. (C-3)
- 4-2.11 Differentiate between the administration rate and amount of IV fluid in a patient with controlled versus uncontrolled hemorrhage. (C-3)
- 4-2.12 Relate internal hemorrhage to the pathophysiology of compensated and decompensated hemorrhagic shock. (C-3)
- 4-2.13 Relate internal hemorrhage to the assessment findings of compensated and decompensated hemorrhagic shock. (C-3)
- 4-2.14 Discuss the management of internal hemorrhage. (C-1)
- 4-2.15 Define shock based on aerobic and anaerobic metabolism. (C-1)
- 4-2.16 Describe the incidence, morbidity, and mortality of shock. (C-1)
- 4-2.17 Describe the body's physiologic response to changes in perfusion. (C-1)
- 4-2.18 Describe the effects of decreased perfusion at the capillary level. (C-1)
- 4-2.19 Discuss the cellular ischemic phase related to hemorrhagic shock. (C-1)
- 4-2.20 Discuss the capillary stagnation phase related to hemorrhagic shock. (C-1)
- 4-2.21 Discuss the capillary washout phase related to hemorrhagic shock. (C-1)
- 4-2.22 Discuss the assessment findings of hemorrhagic shock. (C-1)
- 4-2.23 Relate pulse pressure changes to perfusion status. (C-3)
- 4-2.24 Relate orthostatic vital sign changes to perfusion status. (C-3)
- 4-2.25 Define compensated and decompensated hemorrhagic shock. (C-1)
- 4-2.26 Discuss the pathophysiological changes associated with compensated shock. (C-1)
- 4-2.27 Discuss the assessment findings associated with compensated shock. (C-1)
- 4-2.28 Identify the need for intervention and transport of the patient with compensated shock. (C-1)
- 4-2.29 Discuss the treatment plan and management of compensated shock. (C-1)
- 4-2.30 Discuss the pathophysiological changes associated with decompensated shock. (C-1)
- 4-2.31 Discuss the assessment findings associated with decompensated shock. (C-1)
- 4-2.32 Identify the need for intervention and transport of the patient with decompensated shock. (C-1)
- 4-2.33 Discuss the treatment plan and management of the patient with decompensated shock. (C-1)
- 4-2.34 Differentiate between compensated and decompensated shock. (C-3)
- 4-2.35 Relate external hemorrhage to the pathophysiology of compensated and decompensated hemorrhagic shock. (C-3)

- 4-2.36 Relate external hemorrhage to the assessment findings of compensated and decompensated hemorrhagic shock. (C-3)
- 4-2.37 Differentiate between the normotensive, hypotensive, or profoundly hypotensive patient. (C-3)
- 4-2.38 Differentiate between the administration of fluid in the normotensive, hypotensive, or profoundly hypotensive patient. (C-3)
- 4-2.39 Discuss the physiologic changes associated with the pneumatic anti-shock garment (PASG). (C-1)
- 4-2.40 Discuss the indications and contraindications for the application and inflation of the PASG. (C-1)
- 4-2.41 Apply epidemiology to develop prevention strategies for hemorrhage and shock. (C-1)
- 4-2.42 Integrate the pathophysiological principles to the assessment of a patient with hemorrhage or shock. (C-3)
- 4-2.43 Synthesize assessment findings and patient history information to form a field impression for the patient with hemorrhage or shock. (C-3)
- 4-2.44 Develop, execute and evaluate a treatment plan based on the field impression for the hemorrhage or shock patient. (C-3)

AFFECTIVE OBJECTIVES

None identified for this unit.

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 4-2.45 Demonstrate the assessment of a patient with signs and symptoms of hemorrhagic shock. (P-2)
- 4-2.46 Demonstrate the management of a patient with signs and symptoms of hemorrhagic shock. (P-2)
- 4-2.47 Demonstrate the assessment of a patient with signs and symptoms of compensated hemorrhagic shock. (P-2)
- 4-2.48 Demonstrate the management of a patient with signs and symptoms of compensated hemorrhagic shock. (P-2)
- 4-2.49 Demonstrate the assessment of a patient with signs and symptoms of decompensated hemorrhagic shock. (P-2)
- 4-2.50 Demonstrate the management of a patient with signs and symptoms of decompensated hemorrhagic shock. (P-2)
- 4-2.51 Demonstrate the assessment of a patient with signs and symptoms of external hemorrhage. (P-2)
- 4-2.52 Demonstrate the management of a patient with signs and symptoms of external hemorrhage. (P-2)
- 4-2.53 Demonstrate the assessment of a patient with signs and symptoms of internal hemorrhage. (P-2)
- 4-2.54 Demonstrate the management of a patient with signs and symptoms of internal hemorrhage. (P-2)

DECLARATIVE

- I. Pathophysiology, assessment, and management of hemorrhage
 - A. Hemorrhage
 1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Prevention strategies
 2. Pathophysiology
 - a. Location
 - (1) External
 - (a) Controlled
 - (b) Uncontrolled
 - (2) Internal
 - (a) Trauma
 - (b) Non-trauma
 - i) Common sites
 - ii) Uncommon sites
 - (c) Controlled
 - (d) Uncontrolled
 - b. Anatomical type
 - (1) Arterial
 - (2) Venous
 - (3) Capillary
 - c. Timing
 - (1) Acute
 - (2) Chronic
 - d. Severity
 - (1) Amounts of blood loss tolerated by
 - (a) Adults
 - (b) Children
 - (c) Infants
 - e. Physiological response to hemorrhage
 - (1) Clotting
 - (2) Localized vasoconstriction
 - f. Stages of hemorrhage
 - (1) Stage 1
 - (a) Up to 15% intravascular loss
 - (b) Compensated by constriction of vascular bed
 - (c) Blood pressure maintained
 - (d) Normal pulse pressure, respiratory rate, and renal output
 - (e) Pallor of the skin
 - (f) Central venous pressure low to normal
 - (2) Stage 2
 - (a) 15-25% intravascular loss
 - (b) Cardiac output cannot be maintained by arteriolar constriction
 - (c) Reflex tachycardia
 - (d) Increased respiratory rate

- (e) Blood pressure maintained
 - (f) Catecholamines increase peripheral resistance
 - (g) Increased diastolic pressure
 - (h) Narrow pulse pressure
 - (i) Diaphoresis from sympathetic stimulation
 - (j) Renal output almost normal
 - (3) Stage 3
 - (a) 25-35% intravascular loss
 - (b) Classic signs of hypovolemic shock
 - i) Marked tachycardia
 - ii) Marked tachypnea
 - iii) Decreased systolic pressure
 - iv) 5-15 ml per hour urine output
 - v) Alteration in mental status
 - vi) Diaphoresis with cool, pale skin
 - (4) Stage 4
 - (a) Loss greater than 35%
 - (b) Extreme tachycardia
 - (c) Pronounced tachypnea
 - (d) Significantly decreased systolic blood pressure
 - (e) Confusion and lethargy
 - (f) Skin is diaphoretic, cool, and extremely pale
3. Assessment
- a. Bright red blood from wound, mouth, rectum or other orifice
 - b. Coffee ground appearance of vomitus
 - c. Melena
 - d. Hematochezia
 - e. Dizziness or syncope on sitting or standing
 - f. Orthostatic hypotension
 - g. Signs and symptoms of hypovolemic shock
4. Management
- a. Airway and ventilatory support
 - b. Circulatory support
 - (1) Bleeding from nose or ears after head trauma
 - (a) Refrain from applying pressure
 - (b) Apply loose sterile dressing to protect from infection
 - (2) Bleeding from other areas
 - (a) Control bleeding
 - i) Direct pressure
 - ii) Elevation if appropriate
 - iii) Pressure points
 - iv) Tourniquet
 - v) Splinting
 - vi) Packing of large gaping wounds with sterile dressings
 - vii) PASG
 - (b) Apply sterile dressing and pressure bandage
 - (3) Transport considerations
 - (4) Psychological support/ communication strategies

II. Shock

A. Epidemiology

1. Mortality/ morbidity
2. Prevention strategies
3. Pathophysiology
 - a. Perfusion depends on cardiac output (CO), systemic vascular resistance (SVR) and transport of oxygen
 - (1) $CO = HR \times SV$
 - (a) HR - heart rate
 - (b) SV - stroke volume
 - (2) $BP = CO \times SVR$
 - (3) Hypoperfusion can result from
 - (a) Inadequate cardiac output
 - (b) Excessive systemic vascular resistance
 - (c) Inability of red blood cells to deliver oxygen to tissues
 - b. Compensation for decreased perfusion
 - (1) Occurrence of event resulting in decreased perfusion, e.g., blood loss, myocardial infarction, loss of vasomotor tone or tension pneumothorax
 - (2) Baroreceptors sense decreased flow and activate vasomotor center
 - (a) Normally stimulated between 60-80 mm Hg systolic (lower in children)
 - (b) Located in carotid sinuses and aortic arch
 - (c) Arterial pressure drop decreases stretch
 - i) Nerve impulse through Vagus and Hering's nerve to glossopharyngeal nerve
 - ii) Impulse transmitted to vasomotor center
 - iii) Frequency of inhibitory impulses decreases
 - iv) Increase in vasomotor activity
 - v) Sympathetic nervous system stimulated
 - (iv) Decrease in systolic less than 80 mmHg stimulates vasomotor center to increase arterial pressure
 - (3) Chemoreceptors are stimulated by decrease in PaO_2 and increase in $PaCO_2$
 - (4) Sympathetic nervous system
 - (5) Adrenal medulla glands secrete epinephrine and norepinephrine
 - (a) Epinephrine
 - i) Alpha 1
 - a) Vasoconstriction
 - b) Increase in peripheral vascular resistance
 - c) Increased afterload from arteriolar constriction
 - ii) Alpha 2 regulated release of alpha 1
 - iii) Beta 1
 - a) Positive chronotropy
 - b) Positive inotropy
 - c) Positive dromotropy
 - iv) Beta 2
 - a) Bronchodilation

- b) Gut smooth muscle dilation
 - (b) Norepinephrine
 - i) Primarily alpha 1 and alpha 2
 - a) Vasoconstriction
 - b) Increase in peripheral vascular resistance
 - c) Increased afterload from arteriolar constriction
- (6) Arginine vasopressin (AVP)
 - (a) Also known as antidiuretic hormone (ADH)
 - (b) Released from anterior pituitary gland
 - (c) Effects
 - i) Increases free water absorption in distal tubule and collecting ducts of kidney
 - ii) Decreases urine output
 - iii) Splanchnic vascular constriction
- (7) Renin-angiotensin system
 - (a) Renin released from kidney arteriole
 - (b) Renin and angiotensinogen combine in renal arteriole to produce angiotensin I
 - (c) Angiotensin I converted to angiotensin II by angiotensin converting enzyme
 - (d) Effects of angiotensin II
 - i) Potent vasoconstrictor
 - ii) Sodium reabsorption decreases urine output
 - iii) Positive inotrope and chronotrope
- (8) Aldosterone
 - (a) Defends fluid volume
 - (b) Secreted by cells of adrenal cortex in response to stress
 - (c) Promotes sodium reabsorption and water retention in kidney
 - (d) Reduces urine output
- (9) Insulin
 - (a) Secretion is diminished by circulating epinephrine
 - (b) Impaired effect on peripheral tissue
 - (c) Contributes to hyperglycemia seen following injury and volume loss
- (10) Glucagon
 - (a) Stimulated to be released by epinephrine
 - (b) Promotes
 - i) Liver glycogenolysis
 - ii) Gluconeogenesis
 - iii) Amino acid uptake for conversion into glucose
 - iv) Transfer of fatty acid into mitochondria
- (11) ACTH (adrenocorticotropic hormone)-cortisol system
 - (a) ACTH release stimulates the release of cortisol from the adrenal cortex of kidney
 - (b) Cortisol increases glucose production by inhibiting enzymes that break down glucose
- (12) Growth hormone
 - (a) Secreted by anterior pituitary gland

- (b) Early effects of growth hormone
 - i) Promotes uptake of glucose and amino acids in muscle
 - ii) Stimulates protein synthesis
 - (13) Failure of compensation to preserve perfusion
 - (14) Preload decreases
 - (15) Cardiac output decreases
 - (16) Myocardial blood supply and oxygenation decrease
 - (a) Myocardial perfusion decreases
 - (b) Cardiac output decreases further
 - (c) Coronary artery perfusion decreases
 - (d) Myocardial ischemia
 - (17) Capillary and cellular changes
 - (a) Ischemia
 - i) Minimal blood flow to capillaries
 - ii) Cells go from aerobic to anaerobic metabolism
 - (b) Stagnation
 - (c) Precapillary sphincter relaxes in response to
 - a) Lactic acid
 - b) Vasomotor center failure
 - c) Increased carbon dioxide
 - i) Postcapillary sphincters remain constricted
 - ii) Capillaries engorge with fluid
 - iii) Anaerobic metabolism continues, increasing lactic acid production
 - a) Aggregation of red blood cells and formation of microemboli
 - b) Potent vasodilator
 - c) Destroys capillary cell membrane
 - iv) Plasma leaks from capillaries
 - v) Interstitial fluid increases
 - a) Distance from capillary to cell increases
 - b) Oxygen transport decreases secondary to increased capillary-cell distance
 - vi) Myocardial toxin factor released by ischemic pancreas
 - (d) Washout
 - i) Postcapillary sphincter relaxes
 - ii) Hydrogen, potassium, carbon dioxide, thrombosed - erythrocytes wash out
 - iii) Metabolic acidosis results
 - iv) Cardiac output drops further
- c. Stages of shock
 - (1) Compensated or nonprogressive
 - (a) Characterized by signs and symptoms of early shock
 - (b) Arterial blood pressure is normal or high
 - (c) Treatment at this stage will typically result in recovery
 - (2) Decompensated or progressive
 - (a) Characterized by signs and symptoms of late shock
 - (b) Arterial blood pressure is abnormally low

- (c) Treatment at this stage will sometimes result in recovery
 - (3) Irreversible
 - (a) Characterized by signs and symptoms of late shock
 - (b) Arterial blood pressure is abnormally low
 - (c) Even aggressive treatment at this stage does not result in recovery
 - d. Etiologic classifications
 - (1) Hypovolemic
 - (a) Hemorrhage
 - (b) Plasma loss
 - (c) Fluid and electrolyte loss
 - (d) Endocrine
 - (2) Distributive (vasogenic)
 - (a) Increased venous capacitance
 - (b) Low resistance, vasodilation
 - (3) Cardiogenic
 - (a) Myocardial insufficiency
 - (b) Filling or outflow obstruction (obstructive)
 - (4) Spinal neurogenic shock
 - (a) Refers to temporary loss of all types of spinal cord function distal to injury
 - i) Flaccid paralysis distal to injury site
 - ii) Loss of bladder and bowel control
 - iii) Priapism
 - iv) Loss of thermoregulation
 - (b) Does not always involve permanent primary injury
 - (5) Spinal shock
 - (a) Also called spinal vascular shock
 - (b) Temporary loss of the autonomic function of the cord at the level of injury which controls cardiovascular function
 - (c) Presentations includes
 - i) Loss of sympathetic tone
 - ii) Relative hypotension
 - a) Systolic pressure 80 - 100 mmHg
 - iii) Skin is pink, warm and dry
 - a) Due to cutaneous vasodilation
 - iv) Relative bradycardia
 - (d) Occurrence is rare
 - (e) Shock presentation is usually the result of hidden volume loss
 - i) Chest injuries
 - ii) Abdominal injuries
 - iii) Other violent injuries
 - (f) Treatment
 - i) Focus primarily on volume replacement
4. Assessment - hypovolemic shock due to hemorrhage
- (1) Early or compensated
 - (a) Tachycardia
 - (b) Pale, cool skin

- (c) Diaphoresis
- (d) Level of consciousness
 - i) Normal
 - ii) Anxious or apprehensive
- (e) Blood pressure maintained
- (f) Narrow pulse pressure
 - i) Pulse pressure is the difference between the systolic and diastolic pressures, i.e., pulse pressure = systolic - diastolic
 - ii) Pulse pressure reflects the tone of the arterial system and is more sensitive to changes in perfusion than the systolic or diastolic alone
- (g) Positive orthostatic tilt test
- (h) Dry mucosa
- (i) Complaints of thirst
- (j) Weakness
- (k) Possible delay of capillary refill
- (2) Late or progressive
 - (a) Extreme tachycardia
 - (b) Extreme pale, cool skin
 - (c) Diaphoresis
 - (d) Significant decrease in level of consciousness
 - (e) Hypotension
 - (f) Dry mucosa
 - (g) Nausea
 - (h) Cyanosis with white waxy looking skin
- a. Differential shock assessment findings
 - (1) Shock is assumed to be hypovolemic until proven otherwise
 - (2) Cardiogenic shock
 - (a) Differentiated from hypovolemic shock by one or more of the following
 - i) Chief complaint (chest pain, dyspnea, tachycardia)
 - ii) Heart rate (bradycardia or excessive tachycardia)
 - iii) Signs of congestive heart failure (jugular vein distention, rales)
 - iv) Dysrhythmias
 - (b) Distributive shock
 - (c) Differentiated from hypovolemic shock by presence of one or more of following
 - i) Mechanism that suggests vasodilation, e.g., spinal cord injury, drug overdose, sepsis, anaphylaxis
 - ii) Warm, flushed skin, especially in dependent areas
 - iii) Lack of tachycardia response (not reliable, though, since significant number of hypovolemic patients never become tachycardic)
 - (d)) Obstructive shock
 - i) Differentiated from hypovolemic shock by presence of signs and symptoms suggestive of

- ii) Cardiac tamponade
- iii) Tension pneumothorax
- 5. Management/ treatment plan
 - a. Airway and ventilatory support
 - (1) Ventilate and suction as necessary
 - (2) Administer high concentration oxygen
 - (3) Reduce increased intrathoracic pressure in tension pneumothorax
 - b. Circulatory support
 - (1) Hemorrhage control
 - (2) Intravenous volume expanders
 - (a) Types
 - i) Isotonic solutions
 - ii) Hypertonic solutions
 - iii) Synthetic solutions
 - iv) Blood and blood products
 - v) Experimental solutions
 - vi) Blood substitutes
 - (b) Rate of administration
 - i) External hemorrhage that can be controlled
 - ii) External hemorrhage that can not be controlled
 - iii) Internal hemorrhage
 - a) Blunt trauma
 - b) Penetrating trauma
 - (3) Pneumatic anti-shock garment
 - (a) Effects
 - i) Increased arterial blood pressure above garment
 - ii) Increased systemic vascular resistance
 - iii) Immobilization of pelvis and possibly lower extremities
 - iv) Increased intra-abdominal pressure
 - (b) Mechanism
 - i) Increases systemic vascular resistance through direct compression of tissues and blood vessels
 - ii) Negligible autotransfusion effect
 - (c) Indications
 - i) Hypoperfusion with unstable pelvis
 - ii) Conditions of decreased SVR not corrected by other means
 - iii) As approved locally, other conditions characterized by hypoperfusion with hypotension
 - iv) Research studies
 - (d) Contraindications
 - i) Advanced pregnancy (no inflation of abdominal compartment)
 - ii) Object impaled in abdomen or evisceration (no inflation of abdominal compartment)
 - iii) Ruptured diaphragm
 - iv) Cardiogenic shock
 - v) Pulmonary edema

- (4) Needle chest decompression of tension pneumothorax to improve impaired cardiac output
- (5) Recognize the need for expeditious transport of suspected cardiac tamponade for pericardiocentesis
- c. Pharmacological interventions
 - (1) Hypovolemic shock
 - (a) Volume expanders
 - (2) Cardiogenic shock
 - (a) Volume expanders
 - (b) Positive cardiac inotropes
 - (c) Vasoconstrictor
 - (d) Rate altering medications
 - (3) Distributive shock
 - (a) Volume expanders
 - (b) Positive cardiac inotropes
 - (c) Vasoconstriction
 - (d) PASG
 - (4) Obstructive shock
 - (a) Volume expanders
 - (5) Spinal shock
 - (a) Volume expanders
- d. Psychological support/communication strategies
- e. Transport considerations
 - (1) Indications for rapid transport
 - (2) Indications for transport to a trauma center
 - (3) Considerations for air medical transportation

III. Integration

UNIT TERMINAL OBJECTIVE

- 4-3 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and the assessment findings to formulate a field impression and implement the treatment plan for the patient with soft tissue trauma.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 4-3.1 Describe the incidence, morbidity, and mortality of soft tissue injuries. (C-1)
- 4-3.2 Describe the layers of the skin, specifically: (C-1)
- a. Epidermis and dermis (cutaneous)
 - b. Superficial fascia (subcutaneous)
 - c. Deep fascia
- 4-3.3 Identify the major functions of the integumentary system. (C-1)
- 4-3.4 Identify the skin tension lines of the body. (C-1)
- 4-3.5 Predict soft tissue injuries based on mechanism of injury. (C-1)
- 4-3.6 Discuss the pathophysiology of wound healing, including: (C-1)
1. Hemostasis
 2. Inflammation phase
 3. Epithelialization
 4. Neovascularization
 5. Collagen synthesis
- 4-3.7 Discuss the pathophysiology of soft tissue injuries. (C-2)
- 4-3.8 Differentiate between the following types of closed soft tissue injuries: (C-3)
- a. Contusion
 2. Hematoma
 3. Crush injuries
- 4-3.9 Discuss the assessment findings associated with closed soft tissue injuries. (C-1)
- 4-3.10 Discuss the management of a patient with closed soft tissue injuries. (C-2)
- 4-3.11 Discuss the pathophysiology of open soft tissue injuries. (C-2)
- 4-3.12 Differentiate between the following types of open soft tissue injuries: (C-3)
- a. Abrasions
 2. Lacerations
 3. Major arterial lacerations
 4. Avulsions
 5. Impaled objects
 6. Amputations
 7. Incisions
 8. Crush injuries
 9. Blast injuries

10. Penetrations/ punctures
- 4-3.13 Discuss the incidence, morbidity, and mortality of blast injuries. (C-1)
- 4-3.14 Predict blast injuries based on mechanism of injury, including: (C-2)
 - a. Primary
 2. Secondary
 3. Tertiary
- 4-3.15 Discuss types of trauma including: (C-1)
 - a. Blunt
 2. Penetrating
 3. Barotrauma
 4. Burns
- 4-3.16 Discuss the pathophysiology associated with blast injuries. (C-1)
- 4-3.17 Discuss the effects of an explosion within an enclosed space on a patient. (C-1)
- 4-3.18 Discuss the assessment findings associated with blast injuries. (C-1)
- 4-3.19 Identify the need for rapid intervention and transport of the patient with a blast injury. (C-1)
- 4-3.20 Discuss the management of a patient with a blast injury. (C-1)
- 4-3.21 Discuss the incidence, morbidity, and mortality of crush injuries. (C-1)
- 4-3.22 Define the following conditions: (C-1)
 1. Crush injury
 2. Crush syndrome
 3. Compartment syndrome
- 4-3.23 Discuss the mechanisms of injury in a crush injury. (C-1)
- 4-3.24 Discuss the effects of reperfusion and rhabdomyolysis on the body. (C-1)
- 4-3.25 Discuss the assessment findings associated with crush injuries. (C-1)
- 4-3.26 Identify the need for rapid intervention and transport of the patient with a crush injury. (C-1)
- 4-3.27 Discuss the management of a patient with a crush injury. (C-1)
- 4-3.28 Discuss the pathophysiology of hemorrhage associated with soft tissue injuries, including: (C-2)
 1. Capillary
 2. Venous
 3. Arterial

- 4-3.29 Discuss the assessment findings associated with open soft tissue injuries. (C-1)
- 4-3.30 Discuss the assessment of hemorrhage associated with open soft tissue injuries. (C-1)
- 4-3.31 Differentiate between the various management techniques for hemorrhage control of open soft tissue injuries, including: (C-3)
 - a. Direct pressure
 - 2. Elevation
 - 3. Pressure dressing
 - 4. Pressure point
 - 5. Tourniquet application
- 4-3.32 Differentiate between the types of injuries requiring the use of an occlusive versus non-occlusive dressing. (C-3)
- 4-3.33 Identify the need for rapid assessment, intervention and appropriate transport for the patient with a soft tissue injury. (C-2)
- 4-3.34 Discuss the management of the soft tissue injury patient. (C-2)
- 4-3.35 Define and discuss the following: (C-1)
 - a. Dressings
 - 1. Sterile
 - 2. Non-sterile
 - 3. Occlusive
 - 4. Non-occlusive
 - 5. Adherent
 - 6. Non-adherent
 - 7. Absorbent
 - 8. Non-absorbent
 - 9. Wet
 - 10. Dry
 - 2. Bandages
 - 1. Absorbent
 - 2. Non-absorbent
 - 3. Adherent
 - 4. Non-adherent
 - 3. Tourniquet
- 4-3.36 Predict the possible complications of an improperly applied dressing, bandage, or tourniquet. (C-2)
- 4-3.37 Discuss the assessment of wound healing. (C-1)
- 4-3.38 Discuss the management of wound healing. (C-1)
- 4-3.39 Discuss the pathophysiology of wound infection. (C-1)
- 4-3.40 Discuss the assessment of wound infection. (C-1)
- 4-3.41 Discuss the management of wound infection. (C-1)

- 4-3.42 Integrate pathophysiological principles to the assessment of a patient with a soft tissue injury. (C-3)
- 4-3.43 Formulate treatment priorities for patients with soft tissue injuries in conjunction with: (C-3)
 - a. Airway/ face/ neck trauma
 - 2. Thoracic trauma (open/ closed)
 - 3. Abdominal trauma
- 4-3.44 Synthesize assessment findings and patient history information to form a field impression for the patient with soft tissue trauma. (C-3)
- 4-3.45 Develop, execute, and evaluate a treatment plan based on the field impression for the patient with soft tissue trauma. (C-3)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 4-3.46 Defend the rationale explaining why immediate life-threats must take priority over wound closure. (A-3)
- 4-3.47 Defend the management regimens for various soft tissue injuries. (A-3)
- 4-3.48 Defend why immediate life-threatening conditions take priority over soft tissue management. (A-3)
- 4-3.49 Value the importance of a thorough assessment for patients with soft tissue injuries. (A-3)
- 4-3.50 Attend to the feelings that the patient with a soft tissue injury may experience. (A-2)
- 4-3.51 Appreciate the importance of good follow-up care for patients receiving sutures. (A-2)
- 4-3.52 Understand the value of the written report for soft tissue injuries, in the continuum of patient care. (A-2)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 4-3.53 Demonstrate the assessment and management of a patient with signs and symptoms of soft tissue injury, including: (P-2)
 - 1. Contusion
 - 2. Hematoma
 - 3. Crushing
 - 4. Abrasion
 - 5. Laceration
 - 6. Avulsion
 - 7. Amputation

8. Impaled object
9. Penetration/ puncture
10. Blast

DECLARATIVE

- I. Introduction
 - A. Epidemiology
 - 1. Incidence
 - 2. Mortality/ morbidity
 - 3. Risk factors
 - 4. Prevention strategies
 - B. Body substance isolation review
 - 1. Risks from exposure to body substances
 - a. Bloodborne pathogens
 - (1) HIV
 - (2) HBV
 - (3) Other bloodborne pathogens
 - b. Other body substances posing risk
 - 2. Relationship to body substance isolation
 - a. Universal precautions
 - (1) Gloves
 - (2) Hand washing
 - (3) Protective eyewear
 - (4) Masks
 - (5) Gowns
 - (6) Handling and disposal of sharps
 - b. Disposal of contaminated materials
 - C. Anatomy and physiology review
 - 1. Layers
 - a. Cutaneous layer
 - (1) Epidermis
 - (a) Stratum germinativum (Basal Layer)
 - (b) Stratum corneum
 - (2) Dermis
 - (a) Fibroblasts
 - (b) Macrophages
 - (c) Mast cells
 - (d) Lymphocytes
 - (e) Papillary dermis
 - (f) Reticular dermis
 - b. Subcutaneous layer (superficial fascia)
 - (1) Loose connective tissue
 - (2) Fat
 - (a) Insulation
 - (b) Protection from trauma
 - c. Deep fascia

- (1) Thick, dense layer of fibrous tissue
- (2) Support and protect underlying structures
2. Functions
 - a. Protection against mechanical trauma
 - b. Regulation of body temperature
 - c. Sensory function
 - (1) Pain
 - (2) Touch
 - (3) Heat
 - (4) Cold
 - d. Protection against bacterial invasion
 - e. Maintenance of fluid balance
3. Skin tension lines
 - a. Static tension
 - (1) Constant force due to taut nature of skin
 - (2) Effects on scar formation
 - (3) Consideration in wound debridement and revision
 - (4) Consideration in foreign body removal
 - b. Dynamic tension
 - (1) Caused by underlying muscle contraction
 - (2) Effects on scar formation
 - (3) Consideration in wound debridement and revision
 - (4) Consideration in foreign body removal
4. Process of normal wound healing
 - a. Hemostasis of wound healing
 - (1) Injury causes changes in normal skin anatomy
 - (2) Reflex vasoconstriction for up to 10 minutes
 - (3) Clotting process begins
 - b. Inflammatory phase
 - (1) Role of granulocytes
 - (2) Role of lymphocytes
 - (3) Role of macrophages
 - c. Epithelialization phase
 - (1) Wound healing within 12 hours
 - (2) Healing through re-establishment of skin layers
 - d. Neovascularization
 - (1) Role of new vessel formation
 - (2) Neovascularization as soon as 3 days after, lasting a total of 21 days
 - (3) New vessel formation

- e. Collagen synthesis
 - (1) Role of fibroblasts in collagen synthesis
 - (2) Time factors involved with collagen fibers
 - (3) Process of collagen lysis and wound healing
 - (4) Time table for the healing and tensile strength of wound
- 5. Alteration of wound healing
 - a. Anatomic factors
 - (1) Body region
 - (2) Static skin tension
 - (3) Dynamic skin tension
 - (4) Pigmented skin
 - (5) Oily skin
 - b. Concurrent drug use
 - (1) Corticosteroids
 - (2) NSAID
 - (3) Penicillin
 - (4) Colchicine
 - (5) Anticoagulants
 - (6) Antineoplastic agents
 - c. Medical conditions and diseases
 - (1) Advanced age
 - (2) Severe alcoholism
 - (3) Acute uremia
 - (4) Diabetes
 - (5) Hypoxia
 - (6) Severe anemia
 - (7) PVD
 - (8) Malnutrition
 - (9) Advanced cancer
 - (10) Hepatic failure
 - (11) Cardiovascular disease
 - d. High risk wounds
 - (1) Bites (human and animal)
 - (2) Foreign bodies
 - (3) Wounds contaminated with organic matter
 - (4) Injection wounds
 - (5) Wounds with significant devitalized tissue
 - (6) Crush wounds
 - (7) Any wound in immunocompromised patients
 - (8) Any wound in patients with poor peripheral circulation
- 6. Abnormal scar formation

- a. Keloid
 - (1) Excessive accumulation of scar tissue that extends beyond original wound borders
 - (2) More common in darkly pigmented individuals
 - (3) Most common locations
 - (a) Ears
 - (b) Upper extremities
 - (c) Lower abdomen
 - (d) Sternum
- b. Hypertrophic scar formation
 - (1) Excessive accumulation of scar tissue confined within the original wound borders
 - (2) More common in areas of high tissue stress, such as flexion creases across joints
- c. Wounds requiring closure
 - (1) Cosmetic regions (face, lip, eyebrow, etc.)
 - (2) Gaping wounds
 - (3) Wounds over tension areas
 - (4) Degloving injuries
 - (5) Ring injuries
 - (6) Skin tearing

II. Pathophysiology and assessment of soft tissue injuries

A. Identification of closed soft tissue injuries

- 1. Contusion
 - a. Epidermis remains intact
 - b. Cells damaged and blood vessels in dermis are torn
 - c. Swelling and pain typically present - may occur up to 24 to 48 hours later
 - d. Blood accumulation causes ecchymosis
- 2. Hematoma
 - a. Collection of blood beneath skin
 - b. Larger amount of tissue damage as compared to contusion
 - c. Larger vessels are damaged
 - d. May lose one or more liters of blood in confined space
- 3. Crush injuries
 - a. Crushing force applied to body area
 - b. Can cause internal organ rupture
 - c. Associated with severe fractures
 - d. Overlying skin may remain intact, but internal bleeding may be severe, with shock

- B. Identification of open soft tissue injuries
1. Abrasions
 - a. Outermost layer of skin is damaged by shearing forces
 - b. Painful injury
 - c. Superficial
 - d. No blood, or very little oozing of blood
 - (1) Contamination should be expected
 2. Lacerations
 - a. Break in skin of varying depth
 - b. May be linear (regular) or stellate (irregular)
 - c. Jagged wound ends that bleed freely
 - d. May occur in isolation or together with other types of soft tissue injury
 - e. Caused by forceful impact with a sharp object
 - f. Bleeding may be severe
 3. Incisions
 - a. Break in skin of varying depth
 - b. Similar to laceration except wound ends are smooth and even, not jagged
 - c. Tend to heal better than lacerations
 - d. Caused by very sharp objects, such as knife, sharp metal, or scalpel
 4. Avulsion
 - a. Flap of skin or tissue torn loose or pulled completely off
 - b. Avulsed tissue may or may not be viable
 5. Amputations
 - a. Involves the extremities or other body parts
 - b. Jagged skin and/ or bone edges are typically present at site of amputation
 - c. Massive bleeding may be present or bleeding may be limited
 - d. Three types of amputations
 - (1) Complete
 - (2) Partial
 - (3) Degloving
 6. Crush injuries
 - a. Causes of injuries
 - (1) Collapse of masonry or steel structures
 - (a) Earthquakes
 - (b) Tornadoes
 - (c) Construction accidents

- (2) Collapse of earth
 - (a) Mudslides
 - (b) Earthquakes
 - (3) Motor vehicle collisions
 - (4) Warfare injuries
 - (5) Industrial accidents
 - (6) Any prolonged compression in a chronic situation
 - (a) Unconscious person lying on an extremity
 - (b) Prolonged application of PASG
 - (c) Improperly applied casts
- b. Crush injuries - definitions
- (1) Crush injury - injury sustained from a compressive force sufficient to interfere with the normal metabolic function of the involved tissue
 - (2) Crush syndrome - traumatic rhabdomyolysis; "smiling death"
 - (3) Systemic manifestations of crush injuries consisting of rhabdomyolysis, electrolyte and acid-base abnormalities, hypovolemia (shock), and acute renal failure
 - (4) Compartment syndrome - local manifestations of muscle ischemia resulting from compressive forces on a closed space
- c. Pathophysiology of crush syndrome
- (1) Damage to soft tissue and internal organs
 - (2) May cause painful, swollen, deformed extremities
 - (3) External bleeding may be minimal or absent
 - (4) Internal bleeding may be severe
 - (5) Reperfusion phenomenon - systemic effects and even microvascular injury occur after the affected tissue is reperfused
 - (6) Oxygen free radicals
 - (7) Xanthine oxidase - xanthine oxidase requires two substrates - hypoxanthine and oxygen on reperfusion; oxygen is supplied so xanthine oxidase uses oxygen as an electron acceptor generating the oxygen free radical - oxygen superoxide
 - (8) Lipid peroxidation - pressure stretch myopathy

- (9) High intracellular calcium levels
- d. Rhabdomyolysis
- (1) Destruction of muscle
 - (2) Influx from extracellular fluid into muscle cells
 - (a) Water
 - (b) NaCl
 - (c) Ca⁺⁺
 - (3) Eflux from muscle to extracellular fluid
 - (a) K⁺
 - (b) Purines from disintegrating cell nuclei
 - (c) Phosphate
 - (d) Lactic acid
 - (e) Myoglobin
 - (f) Thromboplastin
 - (g) Creatine kinase & creatinine
 - (4) Consequences - all contribute to development of renal failure
 - (a) Hypovolemia - adds to cardiotoxicity
 - (b) Hypocalcemia - adds to cardiotoxicity
 - (c) Hyperkalemia - adds to cardiotoxicity
 - (d) Hyperuricemia
 - (e) Hyperphosphatemia
 - (f) Metabolic acidosis
 - (g) Possible DIC
 - (h) Increased levels of serum creatine and creatinine
- e. Pathophysiology of compartment syndrome
- (1) Tissue pressure rises above capillary hydrostatic pressure resulting in ischemia to muscle
 - (2) Edema of muscle cells develop
 - (3) Prolonged ischemia (> 6 to 8 hours) leads to tissue hypoxia and anoxia, and ultimately cell death
 - (4) Direct soft tissue trauma adds to the edema and ischemia
- f. Renal failure pathogenesis
- (1) Hypovolemia
 - (2) Obstructed renal tubules by casts
 - (3) Nephrotoxic agents
 - (4) Other factors
- g. Crush injury clinical presentation

- (1) General
 - (a) Alert to unresponsive
 - (b) Affected limb may appear almost normal
 - (2) Local signs and symptoms
 - (a) Flaccid paralysis and sensory loss that are unrelated to peripheral nerve distribution
 - (b) May mimic spinal cord injury
 - (c) Early - rigor of the joint distal to the involved muscles, wooden texture of the affected skin and muscles, and loss of voluntary muscle contraction
 - (d) Varying combinations of pain, swelling, sensory changes, weakness, and pain on passive stretching of muscles
 - (e) May have pulses present and warm skin
 - (3) Compartment syndrome
 - (a) Pain
 - (b) Paresthesia
 - (c) Paresis
 - (d) Pressure
 - (e) Passive stretch pain
 - (f) Pulselessness
7. Blast injuries
- a. Causes of blast injuries
 - (1) Natural gas or gasoline explosions
 - (2) Firework explosions
 - (3) Dust within a grain elevator
 - (4) Terrorism (bombs)
 - b. Primary injuries
 - (1) Initial air blast
 - (2) Compression injuries to air filled organs
 - (a) Ruptured ear drum
 - (b) Sinuses
 - (c) Lungs
 - (d) Stomach
 - (e) Intestines
 - c. Secondary injuries due to flying debris striking victim
 - d. Tertiary injuries
 - (1) Victim is thrown from the blast and strikes an object
 - (2) All can lead to superficial and deep internal

- injuries
- 8. Punctures/ penetrations
 - a. Caused by a foreign object that enters the body
 - b. Bleeding is minimal or absent if extremity injury
 - c. Bleeding may be severe if abdominal or thoracic injury
 - d. Underlying damage can be extensive
 - (1) Thoracic
 - (a) Simple pneumothorax
 - (b) Open pneumothorax
 - (c) Tension pneumothorax
 - (d) Hemothorax
 - (e) Pericardial tamponade
 - (f) Penetrating heart wound
 - (g) Rupture of esophagus
 - (h) Rupture of aorta
 - (i) Rupture of diaphragm
 - (j) Rupture of mainstem bronchus
 - (2) Abdominal
 - (a) Solid organ damage
 - (b) Hollow organ damage
 - (c) Peritonitis
 - i) Bacterial
 - ii) Chemical
 - (d) Evisceration
 - e. Increased risk of infection/ complications
 - 9. Impaled objects
 - a. Specific type of puncture wound
 - b. Instrument that caused injury remains impacted in wound
 - 10. Major arterial lacerations
 - a. Any of these injuries can involve major arterial lacerations
 - b. Bleeding often will be severe
 - c. Spurting, bright red blood flow
 - d. Artery may spasm which may decrease blood flow
 - e. Can result in shock and death if severe enough blood loss

III. Management principles for soft tissue injuries

- A. Treatment priorities
 - 1. Emphasize scene survey to protect yourself and crew
 - a. Have the police ruled out the presence of another

- bomb or device?
- b. Have the police apprehended the perpetrator?
 - 2. Treat for hypoperfusion (shock)
 - 3. Consider the power of the explosion
 - 4. Internal and external injuries are possible (refer to specific units on specific injuries encountered)
 - 5. Be aware of possibility of multiple trauma
 - 6. Treatment priorities for patient with a soft tissue injury
 - a. Treatment of life-threatening injury should occur prior to isolated soft tissue trauma
 - (1) Life-threatening airway deficit
 - (2) Life-threatening breathing deficit
 - (3) Life-threatening circulatory deficit
 - 7. Methods of hemorrhage control based on injury severity
 - a. Direct pressure
 - (1) General description
 - (a) Quickest/ efficient means
 - (2) Pressure applied directly to wound
 - (a) Dressing and gloved hand
 - (b) Gloved hand
 - (3) Physiology of intervention
 - (a) Limit additional significant blood loss
 - (b) Promote localized clotting
 - (4) Indications
 - (a) Mild hemorrhage
 - (b) Profuse hemorrhage
 - (5) Contraindications - none
 - (6) Assessment of intervention
 - (a) Positive hemorrhage control
 - (b) Prevention of additional significant blood loss
 - (7) Considerations
 - (a) Never remove dressing once in place
 - i) Restart bleed
 - ii) Additional injury
 - (b) Positive hemorrhage control
 - i) Secure in place with bandage
 - (c) Negative hemorrhage control
 - i) Continue direct pressure
 - ii) Apply additional dressing
 - iii) Elevation of extremity with direct pressure

- b. Elevation
 - (1) General description
 - (a) Used concurrent with direct pressure
 - (b) Extremity involvement only
 - (c) Elevation of extremity
 - (2) Physiology of intervention
 - (a) Wound above level of heart
 - (b) Gravity decreases blood pressure in extremity
 - (c) Slow hemorrhage
 - (d) Promote localized clotting
 - (3) Indications
 - (a) Control of hemorrhage
 - (b) Failure of direct pressure to control hemorrhage
 - (4) Contraindications
 - (a) Possible musculoskeletal injury to involved extremity
 - (b) Object impaled in involved extremity
 - (c) Possible spinal injury
 - (5) Assessment of intervention
 - (a) Positive hemorrhage control
 - (b) Prevention of additional significant blood loss
 - (6) Considerations
 - (a) Positive control - continue elevation
 - (b) Negative control
 - i) Continue elevation
 - ii) Consider pressure dressing
- c. Pressure dressing
 - (1) General description
 - (a) Dressing firmly wrapped with self adhering roller bandage
 - (b) Continuous mechanical pressure
 - i) Over injury site
 - ii) Above injury site
 - iii) Below injury site
 - (2) Physiology of intervention
 - (a) Limit additional significant blood loss with continuous pressure
 - (b) Promote localized clotting
 - (3) Indications
 - (a) Hemorrhage control

- (b) Failure of other methods to control hemorrhage
 - i) Direct pressure
 - ii) Elevation
- (4) Contraindications - none
- (5) Assessment of intervention
 - (a) Positive control of hemorrhage
 - (b) Prevent additional significant blood loss
- (6) Considerations
 - (a) Check distal pulse after application
 - i) Positive pulse - leave in place
 - ii) Negative pulse - adjust to establish circulation
 - iii) Some arterial bleeds will stop circulation needed for pulse
 - (b) Certain body regions not conducive to direct pressure
 - (c) If bleeding continues adjust with more pressure
- d. Pressure points
 - (1) General description
 - (a) Site where main artery lies near surface
 - (b) Direct compression applied to site
 - i) Brachial artery
 - ii) Femoral artery
 - (2) Physiology of intervention
 - (a) Decrease blood flow to extremity
 - (b) Limit additional significant blood loss
 - (c) Promote localized clotting
 - (3) Indications
 - (a) Need for hemorrhage control
 - (b) Failure of other methods of hemorrhage control
 - i) Direct pressure
 - ii) Elevation
 - iii) Pressure dressings
 - (4) Contraindications - none
 - (5) Assessment of intervention
 - (a) Positive hemorrhage control
 - (b) Prevention of additional significant blood loss
 - (6) Considerations

- (a) Skill needed to locate pressure points
- (b) Distal wounds difficult to control with pressure points
- (c) Proper application
 - i) Considerable force needed
 - ii) Loss of distal pulses
- e. Tourniquet application
 - (1) General description
 - (a) Last resort
 - (b) Tourniquet placed between heart and wound
 - (c) Tourniquet placed within 2" of wound
 - (2) Physiology of intervention
 - (a) Restriction of blood flow to and from extremity
 - (b) Prevent additional significant blood loss
 - (c) Promote localized clotting
 - (3) Indications
 - (a) Control of profuse hemorrhage
 - (b) Last resort after failure of other methods
 - i) Direct pressure
 - ii) Elevation
 - iii) Pressure dressings
 - iv) Pressure points
 - (4) Contraindications - bleeding controllable by other methods
 - (5) Assessment of intervention
 - (a) Positive control of hemorrhage
 - (b) Prevention of additional significant blood loss
 - (6) Considerations
 - (a) Last resort technique
 - (b) Used only on wounds to extremities
 - (c) Never apply directly to knee or elbow
 - (d) Once in place never loosen
 - i) Emboli
 - ii) Restart bleed
 - iii) Tourniquet shock
 - (e) Never use wire/ string/ rope

IV. Review of bandaging and dressing material used in conjunction

with soft tissue trauma

A. Dressings

1. Sterile
 - a. Has gone through process to eliminate bacteria from dressing material
 - b. Used when infection is a concern
2. Non-sterile
 - a. Has not gone through process of sterilization
 - b. Used when infection is not a concern
3. Occlusive
 - a. Does not allow passage of air through dressing
 - b. Useful for wounds involving thorax and major vessels
 - (1) Negative pressure may cause air to enter thorax or vessel
 - (2) Occlusive dressing may prevent pneumothorax and air embolism
 - (3) Be aware of the possibility of developing tension pneumothorax
4. Non-occlusive
 - a. Allows air to pass through dressing
 - b. Useful for most standard open soft tissue injuries
5. Adherent
 - a. Dressing may adhere to wound surface by incorporating wound exudate into dressing mesh
 - b. May assist in controlling acute bleeding
6. Non-adherent
 - a. Allows passage of wound exudate so that dressing will not adhere to wound surface
 - b. Will not damage surface of wound when removed
 - c. Used after wound closure

B. Complications of improperly applied dressings

1. Hemodynamic
 - a. Hemorrhage
 - b. Exsanguination
 - c. Ischemia
2. Structural - immediate and distal
 - a. Vessels
 - b. Nerves
 - c. Tendons
 - d. Muscles
 - e. Integument/ tissue
 - f. Organ

- 3. Patient discomfort
- C. Basic concepts of open wound dressing
 - 1. Assessment
 - a. Cleansing
 - b. Irrigation
 - c. Debridement
 - d. Definitive care as appropriate
 - 2. Non-adherent based dressing
 - a. Function/ description
 - b. Indications
 - c. Contraindications
 - d. Considerations
 - e. Technique
 - (1) Location
 - (2) Application/ implementation
 - 3. Absorbent gauze sponges
 - a. Function/ description
 - b. Indications
 - c. Contraindications
 - d. Considerations
 - e. Technique
 - (1) Location
 - (2) Application/ implementation
 - 4. Gauze wrappings
 - a. Function/ description
 - b. Indications
 - c. Contraindications
 - d. Considerations
 - e. Technique
 - (1) Location
 - (2) Application/ implementation
 - 5. Taping
 - a. Function/ description
 - b. Indications
 - c. Contraindications
 - d. Considerations
 - e. Technique
 - (1) Location
 - (2) Application/ implementation
- V. Management of specific soft tissue injuries not requiring closure
 - A. Dressing and bandaging specific soft tissue injuries
 - 1. General principles

- a. Dressing application
 - b. Antibacterial ointment
 - c. Immobilization
 - d. Bandaging
 2. Injury location
 - a. Scalp dressings
 - b. Facial dressings
 - c. Ear or mastoid dressings
 - d. Neck dressings
 - e. Shoulder dressings
 - f. Truncal dressings
 - g. Groin, hip, and upper dressings
 - h. Hand and finger dressings
 - i. Elbow and knee dressings
 - j. Ankle, knee, and foot dressings
 3. Open wounds that should be dressed, bandaged and then transported for further evaluation
 - a. Wound with neural compromise
 - b. Wound with vascular compromise
 - c. Wound with muscular compromise
 - d. Wound with tendon/ ligament compromise
 - e. Wound with heavy contamination
 - f. Wound with cosmetic complications
 - g. Wound with foreign body complication
 4. Any other soft tissue trauma can be dressed and bandaged
 - a. Consider transport versus patient discharge on-scene
- B. Evaluation
1. Overview
 - a. Treat and release
 - b. Treat and refer
 - c. Treat and transport
 2. Tetanus vaccine
 - a. Overview
 - b. Tetanus vaccine preparation
 - c. Immunization recommendations
 - d. Allergic/ hypersensitive reactions
 3. Patient instructions
 - a. Verbal
 - (1) Overview of written
 - (2) Patient counseling
 - b. Written

- (1) Protection and care of wound area
 - (2) Dressing change and follow-up
 - (3) Wound cleansing recommendations
 - (4) Signs of wound infection
- C. Potential and seriousness of wound infection
1. Description
 - a. Common complication
 - b. Serious complication
 - c. Goal
 - (1) Prevent from infection
 - (2) Protect from infection
 2. Mechanism
 - a. Interruption in stratum corneum
 - b. Non sterile external environment
 - c. Integumentary microflora
 3. Risk factors
 - a. Wound characteristics
 - b. Wound mechanism
 - c. Technical elements
 - d. General patient condition
 4. Complication of wound infection
 - a. General patient recovery
 - b. Localized
 - c. Systemic
 - d. Ancillary conditions
- D. Wound infection causal factors
1. Time
 - a. Cleansing
 - b. Repair
 2. Mechanism
 3. Location
 4. Severity
 - a. Complications
 - b. Tissue damage
 5. Contamination
 6. Preparation
 7. Cleansing
 8. Technique of repair
 9. General patient condition

- VI. Special considerations regarding soft tissue injuries
- A. Treatment priorities for patients with soft tissue injuries in conjunction with other life-threatening injuries

1. Assess for and treat any existing critical injuries to
 - a. Airway
 - (1) Obstructed airway
 - (2) Concurrent immobilization of spine
 - b. Breathing
 - (1) Inadequate breathing
 - c. Circulation
 - (1) Hypoperfusion
 - (2) Hemorrhage
 2. Life-threatening injuries are managed prior to isolated soft tissue trauma
 3. Institute appropriate emergency medical care for life-threat
 - a. Life-threatening airway trauma
 - b. Life-threatening head trauma
 - c. Life-threatening thoracic trauma
 - d. Life-threatening abdominal trauma
- B. Emergency medical care of patients with penetrating impalations, chest, and abdominal injuries
1. Penetrating chest injury
 2. Open wound to the abdomen
 3. Impaled object
 - a. Assessment
 - (1) Location
 - (2) Complications
 - b. Treatment
 - (1) Stabilization
- C. Treatment priorities for patients with amputations and avulsion
1. Avulsion
 - a. Assessment
 - b. Emergency care of avulsion
 - (1) Airway, ventilation, and circulation
 - (2) Stabilize affected area
 - (3) Dress and bandage wound appropriately
 - (4) Package avulsed area, if complete avulsion, for transport
 - (5) Immediate and safe transport to appropriate facility
 2. Amputations
 - a. Assessment
 - b. Emergency care of amputations
 - (1) Airway, ventilation, and circulation

- (2) Stabilize injured area
 - (3) Do not complete partial amputations
 - (4) Dress and bandage wound appropriately
 - (5) Package amputated body part for transport
 - (6) Immediate and safe transport to appropriate facility
3. Crush injuries
- a. Treatment should be started before the patient arrives in the ED
 - b. Goals
 - (1) Prevent sudden death
 - (2) Prevent renal failure
 - (3) Salvage limbs
 - (4) Institute as early as possible (in the field before the patient is extricated)
 - (5) ABCs as always
 - c. Fluid therapy for hypovolemia
 - (1) Consider bolus of 1-1.5 liters
 - (2) Up to 12 liters may be needed in the first 24 hours
 - d. Alkalinization of the urine
 - (1) Consider adding sodium bicarbonate to IV fluid at one amp per liter to start
 - (2) The goal is to maintain urine Ph > 6.5
 - (3) Controls hyperkalemia and acidosis to prevent acute myoglobinuria renal failure (changes the structure of myoglobin so it passes through the renal tubules)
 - (4) If done in the emergency department, irrelevant to out-of-hospital
 - e. Maintain urine output
 - (1) Goal of diuresis of at least 300 cc per hour
 - (2) Consider Mannitol (10 g or 20% solution to each liter of IV fluid)
 - (3) Loop diuretics such as Lasix are not recommended as they may acidify the urine
 - (4) The "ideal fluid" for crush injury is D5 1/2 normal saline with one amp sodium bicarbonate and 10 g or 20% solution of mannitol
 - (5) Treats hypovolemia
 - (6) Corrects acidosis
 - (7) Treats hyperkalemia, thus preventing sudden cardiac dysrhythmias

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-
- (8) Prevents renal failure
 - f. Further treatment of hyperkalemia
 - (1) Forced alkaline diuresis may be adequate
 - (2) CaCl is not indicated unless there is a danger of hyperkalemia dysrhythmia
 - (3) Consider insulin/ glucose for severe hyperkalemia (25cc D50W followed by 10 units regular insulin IV)
 - g. Other considerations for management - physician may come to the scene prior to extrication
 - (1) Amiloride
 - (a) K⁺ sparing diuretic
 - (b) Inhibits Na-Ca exchange - protection against "Ca⁺⁺paradox"
 - (c) Administer before reperfusion - before crushed limb is extricated
 - i) Free radical scavengers
 - (d) Superoxide dismutase (superoxide-anion scavenger)
 - (2) Catalase (H₂O₂ ----> H₂O and O₂)
 - (3) Mannitol - scavenges hydroxyl free radicals
 - (4) Allopurinol (xanthine oxidase inhibitor)
 - (a) May prevent reperfusion induced injury in ischemic skeletal muscle and organs such as the kidneys
 - (b) Would have to administer before extrication or as soon as possible afterwards
 - (5) Hospital use of hemodialysis
 - (a) Role in patient who ultimately develops renal failure
 - (b) Can prevent permanent renal damage in patient who is not septic
 - (c) Prevention is the key - delays in IV fluid therapy leads to acute renal failure
 - 4. Local injury treatment is controversial
 - 5. Closed crush injury
 - a. Use of a tourniquet prior to release of crushed limb may be beneficial
 - b. Compartment syndrome
 - (1) If intracompartmental pressure > 40mm Hg or > diastolic pressure - 30 mm Hg, fasciotomy is

- recommended by many if accompanied by clinical signs and symptoms
 - (2) Concern of increasing tissue necrosis requiring disfiguring debridement and increased risk of sepsis in those injuries older than 8 hours old
 - (3) Early fasciotomy can preserve limb, avoid Volkmann's contracture and preserve cutaneous sensation
 - (4) Medical direction may consider a field fasciotomy
- 6. Open crush injuries
 - a. Wound care required - thorough cleansing, debridement, prophylactic antibiotics, administration of tetanus prophylaxis
 - b. ED surgical consultation
 - 7. Amputation
 - a. Field - increased risk of infection/ sepsis, but may be necessary for extrication
 - b. In-hospital - for severely injured limb
 - 8. Hyperbaric oxygen treatment
 - a. Shown to decrease tissue necrosis
 - b. Can inhibit lipid peroxidation from oxygen free radicals (via increased levels of superoxide dismutase)
 - c. Decreases muscle edema
 - d. Most useful if done early
- D. Documentation/ record keeping for patients with soft tissue trauma
 - 1. Document patency of airway, ventilation, and circulation and any interventions administered
 - 2. Document patient assessment thoroughly
 - 3. Document general description of wound as to size, location, depth, associated complications
 - a. Neurovascular status
 - b. Joint injury
 - c. Infection
 - 4. Document past medical history, medications, and allergies to medications
 - 5. Document all treatment/ interventions rendered
 - 6. Document patient's response(s) to treatment rendered
 - 7. Document patient's understanding of procedure

UNIT TERMINAL OBJECTIVE

- 4-4 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and the assessment findings to formulate a field impression and implement the management plan for the patient with a burn injury.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 4-4.1 Describe the anatomy and physiology pertinent to burn injuries. (C-1)
- 4-4.2 Describe the epidemiology, including incidence, mortality/ morbidity, risk factors, and prevention strategies for the patient with a burn injury. (C-1)
- 4-4.3 Describe the pathophysiologic complications and systemic complications of a burn injury. (C-1)
- 4-4.4 Identify and describe types of burn injuries, including a thermal burn, an inhalation burn, a chemical burn, an electrical burn, and a radiation exposure. (C-1)
- 4-4.5 Identify and describe the depth classifications of burn injuries, including a superficial burn, a partial-thickness burn, a full-thickness burn, and other depth classifications described by local protocol. (C-1)
- 4-4.6 Identify and describe methods for determining body surface area percentage of a burn injury including the "rules of nines," the "rules of palms," and other methods described by local protocol. (C-1)
- 4-4.7 Identify and describe the severity of a burn including a minor burn, a moderate burn, a severe burn, and other severity classifications described by local protocol. (C-1)
- 4-4.8 Differentiate criteria for determining the severity of a burn injury between a pediatric patient and an adult patient. (C-3)
- 4-4.9 Describe special considerations for a pediatric patient with a burn injury. (C-1)
- 4-4.10 Discuss considerations which impact management and prognosis of the burn injured patient. (C-1)
- 4-4.11 Discuss mechanisms of burn injuries. (C-1)
- 4-4.12 Discuss conditions associated with burn injuries, including trauma, blast injuries, airway compromise, respiratory compromise, and child abuse. (C-1)
- 4-4.13 Describe the management of a burn injury, including airway and ventilation, circulation, pharmacological, non-pharmacological, transport considerations, psychological support/ communication strategies, and other management described by local protocol. (C-1)
- 4-4.14 Describe the epidemiology of a thermal burn injury. (C-1)
- 4-4.15 Describe the specific anatomy and physiology pertinent to a thermal burn injury. (C-1)
- 4-4.16 Describe the pathophysiology of a thermal burn injury. (C-1)
- 4-4.17 Identify and describe the depth classifications of a thermal burn injury. (C-1)
- 4-4.18 Identify and describe the severity of a thermal burn injury. (C-1)
- 4-4.19 Describe considerations which impact management and prognosis of the patient with a thermal burn injury. (C-1)
- 4-4.20 Discuss mechanisms of burn injury and conditions associated with a thermal burn injury. (C-1)
- 4-4.21 Describe the management of a thermal burn injury, including airway and ventilation, circulation, pharmacological, non-pharmacological, transport considerations, and psychological support/ communication strategies. (C-1)
- 4-4.22 Describe the epidemiology of an inhalation burn injury. (C-1)
- 4-4.23 Describe the specific anatomy and physiology pertinent to an inhalation burn injury. (C-1)
- 4-4.24 Describe the pathophysiology of an inhalation burn injury. (C-1)
- 4-4.25 Differentiate between supraglottic and infraglottic inhalation injuries. (C-3)
- 4-4.26 Identify and describe the depth classifications of an inhalation burn injury. (C-1)

- 4-4.27 Identify and describe the severity of an inhalation burn injury. (C-1)
- 4-4.28 Describe considerations which impact management and prognosis of the patient with an inhalation burn injury. (C-1)
- 4-4.29 Discuss mechanisms of burn injury and conditions associated with an inhalation burn injury. (C-1)
- 4-4.30 Describe the management of an inhalation burn injury, including airway and ventilation, circulation, pharmacological, non-pharmacological, transport considerations, and psychological support/ communication strategies. (C-1)
- 4-4.31 Describe the epidemiology of a chemical burn injury and a chemical burn injury to the eye. (C-1)
- 4-4.32 Describe the specific anatomy and physiology pertinent to a chemical burn injury and a chemical burn injury to the eye. (C-1)
- 4-4.33 Describe the pathophysiology of a chemical burn injury, including types of chemicals and their burning processes and a chemical burn injury to the eye. (C-1)
- 4-4.34 Identify and describe the depth classifications of a chemical burn injury. (C-1)
- 4-4.35 Identify and describe the severity of a chemical burn injury. (C-1)
- 4-4.36 Describe considerations which impact management and prognosis of the patient with a chemical burn injury and a chemical burn injury to the eye. (C-1)
- 4-4.37 Discuss mechanisms of burn injury and conditions associated with a chemical burn injury. (C-1)
- 4-4.38 Describe the management of a chemical burn injury and a chemical burn injury to the eye, including airway and ventilation, circulation, pharmacological, non-pharmacological, transport considerations, and psychological support/ communication strategies. (C-1)
- 4-4.39 Describe the epidemiology of an electrical burn injury. (C-1)
- 4-4.40 Describe the specific anatomy and physiology pertinent to an electrical burn injury. (C-1)
- 4-4.41 Describe the pathophysiology of an electrical burn injury. (C-1)
- 4-4.42 Identify and describe the depth classifications of an electrical burn injury. (C-1)
- 4-4.43 Identify and describe the severity of an electrical burn injury. (C-1)
- 4-4.44 Describe considerations which impact management and prognosis of the patient with an electrical burn injury. (C-1)
- 4-4.45 Discuss mechanisms of burn injury and conditions associated with an electrical burn injury. (C-1)
- 4-4.46 Describe the management of an electrical burn injury, including airway and ventilation, circulation, pharmacological, non-pharmacological, transport considerations, and psychological support/ communication strategies. (C-1)
- 4-4.47 Describe the epidemiology of a radiation exposure. (C-1)
- 4-4.48 Describe the specific anatomy and physiology pertinent to a radiation exposure. (C-1)
- 4-4.49 Describe the pathophysiology of a radiation exposure, including the types and characteristics of ionizing radiation. (C-1)
- 4-4.50 Identify and describe the depth classifications of a radiation exposure. (C-1)
- 4-4.51 Identify and describe the severity of a radiation exposure. (C-1)
- 4-4.52 Describe considerations which impact management and prognosis of the patient with a radiation exposure. (C-1)
- 4-4.53 Discuss mechanisms of burn injury associated with a radiation exposure. (C-1)
- 4-4.54 Discuss conditions associated with a radiation exposure. (C-1)
- 4-4.55 Describe the management of a radiation exposure, including airway and ventilation, circulation, pharmacological, non-pharmacological, transport considerations, and psychological support/ communication strategies. (C-1)
- 4-4.56 Integrate pathophysiological principles to the assessment of a patient with a thermal burn injury. (C-3)
- 4-4.57 Integrate pathophysiological principles to the assessment of a patient with an inhalation burn injury. (C-3)

- 4-4.58 Integrate pathophysiological principles to the assessment of a patient with a chemical burn injury. (C-3)
- 4-4.59 Integrate pathophysiological principles to the assessment of a patient with an electrical burn injury. (C-3)
- 4-4.60 Integrate pathophysiological principles to the assessment of a patient with a radiation exposure. (C-3)
- 4-4.61 Synthesize patient history information and assessment findings to form a field impression for the patient with a thermal burn injury. (C-3)
- 4-4.62 Synthesize patient history information and assessment findings to form a field impression for the patient with an inhalation burn injury. (C-3)
- 4-4.63 Synthesize patient history information and assessment findings to form a field impression for the patient with a chemical burn injury. (C-3)
- 4-4.64 Synthesize patient history information and assessment findings to form a field impression for the patient with an electrical burn injury. (C-3)
- 4-4.65 Synthesize patient history information and assessment findings to form a field impression for the patient with a radiation exposure. (C-3)
- 4-4.66 Develop, execute and evaluate a management plan based on the field impression for the patient with a thermal burn injury. (C-3)
- 4-4.67 Develop, execute and evaluate a management plan based on the field impression for the patient with an inhalation burn injury. (C-3)
- 4-4.68 Develop, execute and evaluate a management plan based on the field impression for the patient with a chemical burn injury. (C-3)
- 4-4.69 Develop, execute and evaluate a management plan based on the field impression for the patient with an electrical burn injury. (C-3)
- 4-4.70 Develop, execute and evaluate a management plan based on the field impression for the patient with a radiation exposure. (C-3)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 4-4.71 Value the changes of a patient's self-image associated with a burn injury. (A-2)
- 4-4.72 Value the impact of managing a burn injured patient. (A-2)
- 4-4.73 Advocate empathy for a burn injured patient. (A-2)
- 4-4.74 Assess safety at a burn injury incident. (A-3)
- 4-4.75 Characterize mortality and morbidity based on the pathophysiology and assessment findings of a patient with a burn injury. (A-3)
- 4-4.76 Value and defend the sense of urgency in burn injuries. (A-3)
- 4-4.77 Serve as a model for universal precautions and body substance isolation (BSI). (A-3)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 4-4.78 Take body substance isolation procedures during assessment and management of patients with a burn injury. (P-2)
- 4-4.79 Perform assessment of a patient with a burn injury. (P-2)
- 4-4.80 Perform management of a thermal burn injury, including airway and ventilation, circulation, pharmacological, non-pharmacological, transport considerations, psychological support/ communication strategies, and other management described by local protocol. (P-2)
- 4-4.81 Perform management of an inhalation burn injury, including airway and ventilation, circulation,

- pharmacological, non-pharmacological, transport considerations, psychological support/ communication strategies, and other management described by local protocol. (P-2)
- 4-4.82 Perform management of a chemical burn injury, including airway and ventilation, circulation, pharmacological, non-pharmacological, transport considerations, psychological support/ communication strategies, and other management described by local protocol. (P-2)
- 4-4.83 Perform management of an electrical burn injury, including airway and ventilation, circulation, pharmacological, non-pharmacological, transport considerations, psychological support/ communication strategies, and other management described by local protocol. (P-2)
- 4-4.84 Perform management of a radiation exposure, including airway and ventilation, circulation, pharmacological, non-pharmacological, transport considerations, psychological support/ communication strategies, and other management described by local protocol. (P-2)

DECLARATIVE

- I. Introduction
 - A. Epidemiology
 - 1. Incidence
 - a. Supportive statistics
 - 2. Mortality/ morbidity
 - a. Supportive statistics
 - 3. Risk factors
 - 4. Prevention strategies
 - B. Review the anatomy and physiology of the integumentary system
- II. General system pathophysiology, assessment and management
 - A. Pathophysiology
 - 1. Pathophysiologic and systemic complications of a burn injury
 - a. Fluid loss
 - b. Electrolyte loss
 - c. Increased catecholamine release
 - d. Acidosis
 - e. Vasoconstriction
 - f. Renal failure
 - g. Liver failure
 - h. Heart failure
 - i. Hypoxia
 - j. Anoxia
 - k. Arrhythmias
 - l. Formation of eschar
 - m. Hypothermia
 - n. Hypovolemia
 - o. Infection
 - p. Complications of a circumferential burn
 - B. Assessment findings
 - 1. Types of burn injuries
 - a. Thermal burn
 - b. Inhalation burn
 - c. Chemical burn
 - d. Electrical burn
 - (1) Lightning
 - e. Radiation exposure
 - 2. Depth classification of a burn injury
 - a. Superficial burn
 - b. Partial-thickness burn
 - c. Full-thickness burn
 - d. Other depth classifications according to local protocol
 - 3. Methods for determining body surface area percentage of a burn injury
 - a. The "rule of nines"

- (1) Adult
 - (2) Pediatric
 - b. The "rule of palms"
 - c. Other methods according to local protocol
4. Severity of a burn
 - a. Minor burn
 - b. Moderate burn
 - c. Severe burn
 - d. Other severity classifications according to local protocol
5. Criteria for determining severity of a burn injury
 - a. The adult patient
 - b. The pediatric patient
 - (1) Special considerations
6. Considerations which impact management and prognosis of the burn injured patient
 - a. Age
 - b. Preexisting medical conditions
 - c. Trauma
7. Mechanisms of burn injuries
 - a. Burn trauma
 - b. Blast/ explosion trauma
 - c. Fall injury
 - d. Other injuries
8. Conditions associated with burn injuries
 - a. Trauma
 - (1) Soft tissue injuries
 - (2) Musculoskeletal injuries
 - b. Blast injuries
 - c. Airway compromise
 - d. Respiratory compromise
 - e. Child abuse
9. Signs and symptoms of burn injuries
 - a. Pain
 - b. Changes in skin condition relative to the affected burn site
 - c. Adventitious sounds
 - d. Sloughing of the affected skin
 - e. Hoarseness
 - f. Dysphagia
 - g. Dysphasia
 - h. Burnt hair
 - i. Nausea/ vomiting
 - j. Unconsciousness
 - k. Altered level of consciousness
 - l. Edema
 - m. Paresthesia
 - n. Hemorrhage
 - o. Other soft tissue injuries

- p. Musculoskeletal injuries
 - q. Dyspnea
 - r. Chest pain
- C. Management
- 1. Airway, oxygenation, and ventilation
 - 2. Circulatory management
 - 3. Pharmacological support
 - a. Analgesia
 - 4. Non-pharmacological management
 - 5. Transport considerations
 - a. Appropriate mode
 - b. Appropriate facility
 - 6. Psychological support/ communication strategies
 - a. Patient and family advocacy
- III. Specific burn injuries
- A. Thermal burn injury
- 1. Epidemiology of a thermal burn injury
 - a. Incidence
 - (1) Supportive statistics
 - b. Mortality/ morbidity
 - (1) Supportive statistics
 - c. Risk factors
 - d. Prevention strategies
 - 2. Review the specific anatomy and physiology pertinent to the integumentary system
 - 3. Review of heat energy and the components of the burning agent
 - 4. Pathophysiology of a thermal burn injury
 - a. The process of burn shock
 - (1) Emergent phase
 - (2) Fluid shift phase
 - (3) Hypermetabolic phase
 - (4) Resolution phase
 - b. Jackson's thermal wound theory
 - (1) Zone of coagulation
 - (2) Zone of stasis
 - (3) Zone of hyperemia
 - c. Inhalation injury (present in 60-70% of all burn patients who die)
 - (1) Carbon monoxide poisoning
 - (2) Cyanide intoxication
 - d. Infectious insult
 - e. Eschar formation
 - (1) Respiratory compromise secondary to circumferential eschar around the thorax
 - (2) Circulatory compromise secondary to circumferential eschar around an extremity
 - (3) Escharotomies
-

5. Assessment findings in a thermal burn injury
 - a. Depth classifications of a thermal burn
 - b. Severity of a thermal burn
 - c. Criteria for determining severity of a burn injury
 - (1) The adult patient
 - (2) The pediatric patient
 - d. Considerations which impact care and prognosis of the thermal burn injured patient
 - e. Mechanisms of burn injury
 - (1) Scalding
 - (2) Steam
 - (3) Flame
 - (4) Flash
 - (5) Retained heat
 - (6) Other trauma
 - f. Conditions associated with thermal burn injuries
 6. Management of a thermal burn injury
 - a. Remove patient to safe area
 - b. Stop the burning process
 - c. Airway, oxygenation, and ventilation
 - d. Circulatory management
 - e. Pharmacological management
 - (1) Topical applications
 - (2) Tetanus and antibiotic therapy
 - (3) Fluid therapy
 - f. Non-pharmacological management
 - (1) Thermal burn injury management according to local protocol
 - g. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - (3) Transport considerations in conjunction with burn injury management according to local protocol
 - h. Psychological support/ communication strategies
- B. Inhalation burn injury
1. Epidemiology of an inhalation burn injury
 - a. Incidence
 - (1) Supportive statistics (e.g., 20-35% of the patients admitted to burn centers have an inhalation injury)
 - (2) Chemical inhalation injuries are more frequent than thermal inhalation injuries
 - b. Mortality/ morbidity
 - (1) Supportive statistics
 - c. Risk factors
 - (1) Often associated with a burn environment
 - (2) Factors that increase the risk for inhalation injury
 - (a) Standing

- (b) Screaming
 - (c) Enclosed area
 - d. Prevention strategies
 - 2. Review the specific anatomy and physiology pertinent to the respiratory system
 - 3. Pathophysiology of an inhalation injury
 - a. Compromises the upper airway (supraglottic)
 - b. Compromises the lower airway (infraglottic)
 - c. Complications may occur later
 - 4. Assessment findings in an inhalation injury
 - a. Mechanism of injury/ conditions associated with an inhalation burn injury
 - (1) Toxic inhalations
 - (2) Smoke inhalation
 - (3) Carbon monoxide poisoning
 - (4) Thiocyanate intoxication
 - (5) Thermal burn
 - (6) Chemical burn
 - b. Criteria for determining severity of a burn injury
 - (1) The adult patient
 - (2) The pediatric patient
 - c. Considerations which impact care and prognosis of an inhalation burn injured patient
 - d. Conditions associated with inhalation burn trauma
 - e. Focused history
 - 5. Management of an inhalation burn injury
 - a. Airway, oxygenation, and ventilation
 - b. Circulatory management
 - c. Pharmacological management
 - (1) Sodium thiosulfate therapy
 - d. Non-pharmacological management
 - (1) Thermal burn injury management according to local protocol
 - (2) Hyperbaric therapy - for carbon monoxide
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological support/ communication strategies
- C. Chemical burn injury
 - 1. Epidemiology of a chemical burn injury
 - a. Incidence
 - (1) Supportive statistics
 - b. Mortality/ morbidity
 - (1) Supportive statistics
 - c. Risk factors
 - d. Prevention strategies
 - 2. Anatomy and physiology review
 - 3. Pathophysiology
 - a. Types of chemicals which cause chemical burn injuries

- (1) Acids
 - (2) Bases (alkali)
 - (a) Cement
 - (3) Dry chemicals
 - (4) Phenols
 - b. Characteristics of the burning process of chemicals
 - (1) The burning process of an acid
 - (2) The burning process of an alkali
 - (3) The burning process of dry chemicals
 - 4. Assessment of a chemical burn injury
 - a. Mechanism of injury/ conditions for a chemical burn injury
 - (1) Industrial accidents most frequent
 - b. Depth classification
 - c. Severity
 - d. Criteria for determining severity of a burn injury
 - (1) The adult patient
 - (2) The pediatric patient
 - e. Considerations which impact care and prognosis of a chemical burn injured patient
 - 5. Management of a chemical burn injury
 - a. Airway, oxygen, and ventilation
 - b. Circulatory management
 - c. Pharmacological management
 - d. Non-pharmacological management
 - (1) Acid burn injury management according to local protocol
 - (2) Alkali burn injury management according to local protocol
 - (3) Chemical burn injury to the eye according to local protocol
 - (4) Dry chemical burn injury according to local protocol
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological support/ communication strategies
- D. Chemical burn injury of the eye
 - 1. Epidemiology of a chemical burn injury
 - a. Incidence
 - (1) Supportive statistics
 - b. Mortality/ morbidity
 - (1) Supportive statistics
 - c. Risk factors
 - d. Prevention strategies
 - 2. Anatomy and physiology review of the eye
 - 3. Pathophysiology
 - a. Types of chemicals which cause chemical burn injuries to the eye
 - (1) Acids
 - (2) Bases (alkali)
 - (a) Cement

- (3) Dry chemicals
 - (4) Phenols
 - (5) Mace/ pepper spray
 - 4. Assessment of a chemical burn injury
 - a. Mechanism of injury/ conditions for a chemical burn injury
 - (1) Industrial accidents most frequent
 - b. Severity
 - c. Criteria for determining severity of a eye injury
 - d. Considerations which impact care and prognosis of a chemical injury to the eye
 - 5. Management of a chemical burn injury of the eye
 - a. Airway, oxygenation, and ventilation
 - b. Circulation management
 - c. Pharmacological management
 - d. Non-pharmacological management
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological support/ communication strategies
- E. Electrical burn injuries
 - 1. Epidemiology of an electrical burn injury
 - a. Incidence
 - (1) Supportive statistics
 - b. Mortality/ morbidity
 - (1) Supportive statistics
 - c. Risk factors
 - d. Prevention strategies
 - 2. Anatomy and physiology review
 - 3. Review of the characteristics of electrical current
 - 4. Pathophysiology
 - a. External burn injuries
 - b. Internal burn injuries
 - c. Musculoskeletal injuries
 - d. Cardiovascular injuries
 - e. Respiratory injuries
 - f. Neurological injuries
 - g. Myoglobin release and renal involvement
 - 5. Assessment of an electrical burn injury
 - a. Mechanism of injury/ conditions for an electrical burn injury
 - (1) Contact burn injuries
 - (2) Arc injuries
 - (3) Flame or flash burn injuries
 - (a) Welder's flash
 - (4) Lightning injuries
 - (a) Direct stroke
 - (b) Side flash (splash)
 - (c) Step voltage

- b. Depth classification
 - c. Severity
 - d. Criteria for determining severity of an electrical burn injury
 - (1) The adult patient
 - (2) The pediatric patient
 - e. Considerations which impact care and prognosis of an electrical burn injured patient
6. Management of an electrical burn injury
- a. Airway, oxygenation, and ventilation
 - b. Circulation management
 - c. Pharmacological management
 - d. Non-pharmacological management
 - (1) Thermal burn injury management according to local protocol
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological support/ communication strategies
- F. Radiation exposure
- 1. Epidemiology of a radiation exposure
 - a. Incidence
 - (1) Supportive statistics
 - b. Mortality/ morbidity
 - (1) Supportive statistics
 - c. Risk factors
 - (1) Accidents associated with the improper handling of radiological materials
 - d. Prevention strategies
 - 2. Anatomy and physiology review
 - 3. Types of radiation which cause burn injury
 - a. Alpha radiation
 - b. Beta radiation
 - c. Gamma radiation
 - 4. Characteristics of ionizing radiation
 - a. Alpha radiation
 - b. Beta radiation
 - c. Gamma radiation
 - 5. Aspects of exposure
 - a. Duration of exposure
 - b. Distance from the source
 - c. Shielding
 - 6. Other considerations of exposure
 - a. Direct exposure to ionizing radiation
 - b. Exposure to contaminants containing small particles of active material
 - 7. Assessment of a radiation exposure
 - a. Mechanism of injury
 - b. Depth classifications
 - (1) Immediate versus delayed injuries and affects

- c. Severity
 - (1) Immediate versus delayed injuries and effects
 - d. Criteria for determining severity of a radiation exposure and associated burn injury
 - (1) The adult patient
 - (2) The pediatric patient
 - e. Considerations which impact care and prognosis of a radiation exposure and burn injuries
8. Management of a radiation exposure and associated burn injuries
- a. Scene safety
 - b. Airway, oxygenation, and ventilation
 - c. Circulation management
 - d. Pharmacological management
 - e. Non-pharmacological management
 - (1) Injury management according to local protocol
 - (2) Management of a radiation accident scene
 - f. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - g. Psychological support/ communication strategies

IV. Integration

UNIT TERMINAL OBJECTIVE

4-5 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the trauma patient with a suspected head injury.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 4-5.1 Describe the incidence, morbidity, and mortality of facial injuries. (C-1)
- 4-5.2 Explain facial anatomy and relate physiology to facial injuries. (C-1)
- 4-5.3 Predict facial injuries based on mechanism of injury. (C-1)
- 4-5.4 Predict other injuries commonly associated with facial injuries based on mechanism of injury. (C-2)
- 4-5.5 Differentiate between the following types of facial injuries, highlighting the defining characteristics of each: (C-3)
 - a. Eye
 - 2. Ear
 - 3. Nose
 - 4. Throat
 - 5. Mouth
- 4-5.6 Integrate pathophysiological principles to the assessment of a patient with a facial injury. (C-3)
- 4-5.7 Differentiate between facial injuries based on the assessment and history. (C-3)
- 4-5.8 Formulate a field impression for a patient with a facial injury based on the assessment findings. (C-3)
- 4-5.9 Develop a patient management plan for a patient with a facial injury based on the field impression. (C-3)
- 4-5.10 Explain the pathophysiology of eye injuries. (C-1)
- 4-5.11 Relate assessment findings associated with eye injuries to pathophysiology. (C-3)
- 4-5.12 Integrate pathophysiological principles to the assessment of a patient with an eye injury. (C-3)
- 4-5.13 Formulate a field impression for a patient with an eye injury based on the assessment findings. (C-3)
- 4-5.14 Develop a patient management plan for a patient with an eye injury based on the field impression. (C-3)
- 4-5.15 Explain the pathophysiology of ear injuries. (C-1)
- 4-5.16 Relate assessment findings associated with ear injuries to pathophysiology. (C-3)
- 4-5.17 Integrate pathophysiological principles to the assessment of a patient with an ear injury. (C-3)
- 4-5.18 Formulate a field impression for a patient with an ear injury based on the assessment findings. (C-3)
- 4-5.19 Develop a patient management plan for a patient with an ear injury based on the field impression. (C-3)
- 4-5.20 Explain the pathophysiology of nose injuries. (C-1)

- 4-5.21 Relate assessment findings associated with nose injuries to pathophysiology. (C-3)
- 4-5.22 Integrate pathophysiological principles to the assessment of a patient with a nose injury. (C-3)
- 4-5.23 Formulate a field impression for a patient with a nose injury based on the assessment findings. (C-3)
- 4-5.24 Develop a patient management plan for a patient with a nose injury based on the field impression. (C-3)
- 4-5.25 Explain the pathophysiology of throat injuries. (C-1)
- 4-5.26 Relate assessment findings associated with throat injuries to pathophysiology. (C-3)
- 4-5.27 Integrate pathophysiological principles to the assessment of a patient with a throat injury. (C-3)
- 4-5.28 Formulate a field impression for a patient with a throat injury based on the assessment findings. (C-3)
- 4-5.29 Develop a patient management plan for a patient with a throat injury based on the field impression. (C-3)
- 4-5.30 Explain the pathophysiology of mouth injuries. (C-1)
- 4-5.31 Relate assessment findings associated with mouth injuries to pathophysiology. (C-3)
- 4-5.32 Integrate pathophysiological principles to the assessment of a patient with a mouth injury. (C-3)
- 4-5.33 Formulate a field impression for a patient with a mouth injury based on the assessment findings. (C-3)
- 4-5.34 Develop a patient management plan for a patient with a mouth injury based on the field impression. (C-3)
- 4-5.35 Describe the incidence, morbidity, and mortality of head injuries. (C-1)
- 4-5.36 Explain anatomy and relate physiology of the CNS to head injuries. (C-1)
- 4-5.37 Predict head injuries based on mechanism of injury. (C-2)
- 4-5.38 Distinguish between head injury and brain injury. (C-3)
- 4-5.39 Explain the pathophysiology of head/ brain injuries. (C-1)
- 4-5.40 Explain the concept of increasing intracranial pressure (ICP). (C-1)
- 4-5.41 Explain the effect of increased and decreased carbon dioxide on ICP. (C-1)
- 4-5.42 Define and explain the process involved with each of the levels of increasing ICP. (C-1)
- 4-5.43 Relate assessment findings associated with head/ brain injuries to the pathophysiologic process. (C-3)
- 4-5.44 Classify head injuries (mild, moderate, severe) according to assessment findings. (C-2)
- 4-5.45 Identify the need for rapid intervention and transport of

- the patient with a head/ brain injury. (C-1)
- 4-5.46 Describe and explain the general management of the head/ brain injury patient, including pharmacological and non-pharmacological treatment. (C-1)
- 4-5.47 Analyze the relationship between carbon dioxide concentration in the blood and management of the airway in the head/ brain injured patient. (C-3)
- 4-5.48 Explain the pathophysiology of diffuse axonal injury. (C-1)
- 4-5.49 Relate assessment findings associated with concussion, moderate and severe diffuse axonal injury to pathophysiology. (C-3)
- 4-5.50 Develop a management plan for a patient with a moderate and severe diffuse axonal injury. (C-3)
- 4-5.51 Explain the pathophysiology of skull fracture. (C-1)
- 4-5.52 Relate assessment findings associated with skull fracture to pathophysiology. (C-3)
- 4-5.53 Develop a management plan for a patient with a skull fracture. (C-3)
- 4-5.54 Explain the pathophysiology of cerebral contusion. (C-1)
- 4-5.55 Relate assessment findings associated with cerebral contusion to pathophysiology. (C-3)
- 4-5.56 Develop a management plan for a patient with a cerebral contusion. (C-3)
- 4-5.57 Explain the pathophysiology of intracranial hemorrhage, including: (C-1)
- a. Epidural
 2. Subdural
 3. Intracerebral
 4. Subarachnoid
- 4-5.58 Relate assessment findings associated with intracranial hemorrhage to pathophysiology, including: (C-3)
- a. Epidural
 - b. Subdural
 3. Intracerebral
 4. Subarachnoid
- 4-5.59 Develop a management plan for a patient with a intracranial hemorrhage, including: (C-1)
- a. Epidural
 2. Subdural
 3. Intracerebral
 4. Subarachnoid
- 4-5.60 Describe the various types of helmets and their purposes. (C-1)
- 4-5.61 Relate priorities of care to factors determining the need

- for helmet removal in various field situations including sports related incidents. (C-3)
- 4-5.62 Develop a management plan for the removal of a helmet for a head injured patient. (C-3)
- 4-5.63 Integrate the pathophysiological principles to the assessment of a patient with head/ brain injury. (C-3)
- 4-5.64 Differentiate between the types of head/ brain injuries based on the assessment and history. (C-3)
- 4-5.65 Formulate a field impression for a patient with a head/ brain injury based on the assessment findings. (C-3)
- 4-5.66 Develop a patient management plan for a patient with a head/ brain injury based on the field impression. (C-3)

AFFECTIVE OBJECTIVES

None identified for this unit.

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

- I. Facial Injury
 - A. Introduction
 - 1. Incidence
 - 2. Morbidity and mortality
 - 3. Risk
 - B. Review of anatomy/ physiology of the face
 - 1. Arteries and nerves
 - 2. External carotid
 - a. Temporal artery
 - b. Mandibular artery
 - c. Maxillary artery
 - 3. Nerves
 - a. 5th cranial nerve - trigeminal
 - b. 7th cranial nerve - facial
 - 4. Bones
 - a. Nasal
 - b. Zygoma/ zygomatic arch
 - c. Maxilla
 - d. Mandible
 - C. Common mechanisms of injury
 - 1. Blunt
 - a. Motor vehicular crashes
 - b. Falls
 - c. Body-to-body contact
 - d. Augmented force (i.e. sticks, clubs, etc.)
 - 2. Penetrating
 - a. Gun shot wound, stabbing
 - b. Bites - dog, human, biting tongue
 - D. Other common associated injuries
 - 1. Airway compromise
 - 2. Cervical spine injury
 - 3. Brain injury
 - 4. Dental trauma or avulsion
 - E. Types of facial injuries
 - 1. Bony injury
 - a. Mandible
 - (1) Fracture
 - (2) Dislocation
 - b. Maxillary fracture
 - (1) LeFort I, II and III
 - c. Zygomatic fracture
 - d. Orbital fracture

- (1) Eye
- (2) Ear
- (3) Nose
- (4) Throat
- (5) Mouth
- e. Nasal fracture
- 2. Soft tissue
 - a. Face
 - b. Mouth and oropharynx and tongue
 - c. Ear
 - d. Eye
- F. Assessment
 - 1. Airway patency and adequate ventilation
 - 2. Cervical spine integrity
 - 3. Adequate perfusion
 - 4. Associated injury
 - a. Head injury
 - (1) Increased ICP
 - (2) Presence of CSF
 - b. Bony injury
 - (1) Malocclusion
 - (2) Depressed zygoma
 - (3) Facial asymmetry
 - (4) Diplopia/ blurred vision
 - c. Soft tissue injury
 - (1) Open wounds
 - (2) Hematomas
 - d. Broken or missing teeth
- G. History
 - 1. Mechanism of injury
 - 2. Events leading up to the injury
 - 3. Time it occurred
 - 4. Associated medical problems
 - 5. Allergies
 - 6. Medications
 - 7. Last intake
- H. Management
 - 1. Airway patency and adequate ventilations a priority
 - a. Suctioning
 - b. Intubating
 - c. Positioning
 - d. Ventilating
 - 2. Assuring adequate circulation
 - 3. Assuring cervical spine integrity

- II. Throat injuries
 - A. Introduction
 - 1. Incidence
 - 2. Morbidity and mortality
 - 3. Risk
 - B. Review of anatomy/ physiology of the throat
 - 1. Critical structures
 - a. Airway
 - (1) Oropharynx
 - (2) Larynx
 - (3) Trachea
 - b. Cervical spine
 - (1) Cord
 - (2) Vertebra
 - c. Major vessels
 - (1) Internal and external jugular veins
 - (2) Carotid arteries
 - (3) Vertebral arteries
 - 2. Associated structures
 - a. Vagus nerves
 - b. Thoracic duct
 - c. Pharynx and esophagus
 - d. Thyroid gland and parathyroid glands
 - e. Lower cranial nerves
 - f. Brachial plexus - responsible for lower arm and hand function
 - g. Muscles - platysma is major muscle
 - h. Soft tissue and fascia
 - C. Mechanism of injury
 - 1. Blunt - motor vehicle crashes, blow to the neck, hanging
 - 2. Penetrating - gun shot wound, stabbing, arrow
 - a. Lacerations or puncture
 - D. Pathophysiology
 - 1. Transected trachea
 - a. Larynx separated from trachea or fractured
 - (1) Vocal cord swelling or contusion
 - (2) Disruption of normal airway landmarks
 - (3) Associated soft tissue swelling
 - b. Open wound to trachea
 - 2. Vessel lacerated or torn
 - a. Arterial interruption
 - (1) Hypoxia to brain tissue and infarct

- (2) Open wound may cause an air embolism
 - b. Rapid exsanguination
 - 3. Cervical spine trauma
 - a. Vertebral instability
 - b. Cord interruption
 - (1) Paralysis or paresthesia
 - (2) Neurogenic shock
 - 4. Impaled object
 - a. Do not remove unless obstructing airway
 - b. Consider emergency cricothyrotomy
- E. Assessment
- 1. Signs - pale or cyanotic face, bruising of neck, redness of area, hematoma in neck, with open wound will see frothy blood or sputum in wound; subcutaneous air may be present
 - 2. Symptoms - voice changes, tickle or feeling of fullness in throat, pain on palpation
 - 3. Signs of stroke with air emboli or infarct
 - 4. Signs of paralysis, paresthesia or neurogenic shock if spinal cord involved
 - 5. Assess for other injury
- F. Management
- 1. Airway patency and adequate ventilation a priority
 - a. If open wound to trachea
 - (1) ET tube can be inserted to maintain patency
 - b. If closed wound
 - (1) BVM with oxygen supplement
 - (2) Consider intubation - soft tissue swelling may be extreme, aim for bubbles
 - (3) Consider emergency cricothyrotomy
 - 2. Maintenance of adequate tissue perfusion
 - a. If open wound to neck, lay patient on left side in Trendelenburg with occlusive dressing over neck wound
 - b. Direct pressure to bleeding site, avoid circumferential dressings, monitor pulse for reflex bradycardia
 - 3. Maintain cervical immobilization, avoid cervical collars or other devices that obstruct your view of the neck
 - 4. Stabilize impaled object if not obstructing airway

III. Nasal injuries

- A. Review of anatomy and physiology

1. Nasal bone - between the eyes
 2. Nasal cartilage - defines shape of nose
 3. Internal structures - septum, turbinates and sinuses
 - B. Mechanism of injury
 1. Blunt - motor vehicle crashes, body-to-body contact, falls
 2. Penetrating - gun shot wounds, stabbing
 3. Foreign bodies - beans, crayons, anything a child can pick up
 - C. Pathophysiology
 1. Epistaxis - nose bleeds (may compromise airway)
 - a. Anterior bleeds - from septum, venous bleeding
 - b. Posterior bleeds - often drains down back of throat
 - c. Associated injury
 - (1) Sphenoid and/ or ethmoid bone fractures
 - (2) Basilar skull fracture
 2. Foreign bodies
 - a. Common in young children
 - b. Leave alone and transport
 - c. Attempt to remove only if airway is compromised
 - D. Assessment
 1. Airway patency
 2. Cervical spine precautions
 3. CSF drainage
 4. Associated injuries
 - E. Management
 1. Direct pressure
 2. If bleeding severe, treatment similar to hemorrhagic shock
 - a. Sit upright, leaning forward or lying on side so blood is not swallowed
 3. If CSF detected do not apply direct pressure, let drain freely
 4. Elevate head of bed in reverse Trendelenburg
- IV. Ear injuries
- A. Review of anatomy and physiology
 1. Outer ear - Pinna
 - a. Cartilage
 - b. Poor blood supply
 2. External ear canal
 - a. Considered a mucous membrane but secretes wax for protection

3. Middle ear
 - a. Separated from external canal by ear drum
 - b. Delicate structures necessary for hearing
- B. Mechanism of injury
 1. Blunt - motor vehicle crashes, body-to-body contact, augmented force
 2. Penetrating - gun shot wound, cutting, foreign body, puncture wound
 3. Blast injuries-explosions
 4. Pressure injuries-diving
- C. Pathophysiology
 1. Ruptured ear drum
 2. Basilar skull fracture
 3. Separation of ear cartilage
- D. Assessment
 1. Adequate assessment of external ear canal and middle ear cannot be done in the field
 2. Airway patency and adequate ventilation a priority
 3. Maintaining adequate tissue perfusion
 4. Additional injuries
 - a. If mechanism warrants, cervical spine precautions
- E. Management
 1. Considerations
 - a. Difficult for cartilage to heal
 - b. Infection is prime influence for failure to heal
 2. Realign ear into position and gently bandage with sufficient padding
 3. Cover draining ear with loose dressing
- V. Eye injuries
 - A. Review of anatomy and physiology
 1. External parts
 - a. Bony orbit
 - b. Eyelids
 - c. Lacrimal apparatus
 2. Internal parts
 - a. Sclera
 - b. Cornea
 - c. Conjunctiva
 - d. Iris
 - e. Pupil
 - f. Lens
 - g. Retina
 - h. Optic nerve

- i. Muscle control
 - (1) Pairs
 - (2) Characteristics
 - 3. Types of vision
 - a. Central vision
 - b. Peripheral vision
- B. Mechanism of injury
 - 1. Penetrating - bullets, knives, glass, arrows, foreign bodies
 - 2. Blunt- balls, falls, vehicle crashes, motorcycles
 - 3. Burns- welding, sun, chemicals
- C. Pathophysiology
 - 1. Penetrating
 - a. Abrasions
 - b. Foreign bodies
 - (1) Superficial
 - (2) Deep
 - c. Lacerations
 - (1) Superficial
 - (2) Deep
 - 2. Blunt
 - a. Swelling
 - b. Conjunctival hemorrhage
 - c. Hyphema
 - d. Ruptured globe
 - e. Blow-out fracture of orbital rim
 - f. Retinal detachment
 - 3. Burns
 - a. Flash burns
 - b. Acid/ alkali
 - 4. Other
 - a. Lacerated eyelid
 - b. Impaled object
 - c. Avulsion
- D. Assessment
 - 1. History
 - a. When did the symptoms begin
 - b. Mechanism of injury
 - c. What did the patient first notice
 - d. Were both eyes effected?
 - e. Past history
 - (1) Visual acuity - glasses, contacts
 - (2) Diseases or conditions - glaucoma, etc.
 - f. Any medications

2. Physical assessment
 - a. Addressing priorities
 - (1) Maintaining open airway and assuring adequate ventilation
 - (2) Controlling bleeding and supporting cardiovascular system
 - (3) Potential for central nervous system injury
 - b. Orbital rim
 - c. Lids
 - d. Cornea
 - e. Conjunctiva
 - f. Eye movement
 - (1) Dysconjugate gaze
 - (2) Paralysis of gaze
 - g. Pupils
 - h. Visual acuity
- E. Management
 1. Blunt trauma treatment
 - a. Positioning
 - b. Bandaging eye(s)
 - (1) One versus both
 - (2) No pressure
 2. Penetrating trauma treatment
 - a. Positioning
 - b. Removal of foreign bodies versus not
 - c. Moist bandage versus dry
 - d. Stabilize impaled object
 3. Avulsion treatment
 4. Burn
 - a. Acid/ alkali
 - b. Flash burn
 5. Lacerated eyelid treatment

VI. Mouth injuries

- A. Introduction
 1. Incidence
 2. Morbidity and mortality
 3. Risk
- B. Review of anatomy/ physiology of the mouth
 1. Muscles
 - a. Tongue
 - b. Orbicular oris - lips
 - c. Masseter muscles - cheeks
 2. Nerves

- a. Hypoglossal
- b. Glossopharyngeal
- c. Trigeminal (mandibular branch)
- d. Facial
- 3. Bones
 - a. Hyoid
 - b. Palate
 - c. Mandible
 - d. Maxilla
- 4. Teeth
- 5. Salivary glands
- 6. Lymphoid tissue
- C. Mechanisms of injury
 - 1. Blunt
 - a. Motor vehicle crash
 - b. Blows to the mouth or chin
 - 2. Penetrating
 - a. Gun shot wounds
 - b. Lacerations or punctures
- D. Pathophysiology
 - 1. Lacerated tongue
 - a. Airway compromise
 - (1) Blood and tissue
 - (2) Inability to communicate
 - b. Broken or avulsed tooth
 - (1) Airway compromise
 - c. Impaled object
 - (1) Airway compromise
 - d. Lacerated mucous membranes
 - (1) Copious bleeding
 - (2) Airway compromise
 - 2. Assessment
 - a. Signs
 - (1) Copious bleeding
 - (2) Blood tinged mucous
 - b. Symptoms
 - (1) Inability to talk unless leaning forward to allow for drainage
 - 3. Management
 - a. Airway patency and adequate ventilation is the first priority
 - b. Impaled object
 - (1) If patient is able to breathe - stabilize
 - (2) Otherwise remove

- c. Collect tissue
 - (1) Tongue - manage as any other piece of tissue
 - (2) Tooth - rinse with normal saline and transport with patient

VII. Head trauma

A. Introduction

- 1. Incidence - approximately 4 million people sustain head injuries in the U.S. each year
- 2. Morbidity and mortality - approximately 450,000 require hospitalization
 - a. Most are minor injuries (GCS 13-15)
 - b. Major head injury (GCS <8) is the most common cause of death from trauma in trauma centers
 - c. Over 50% of all trauma deaths involve head injury
- 3. Risk
 - a. Highest in males 15-24 years of age
 - b. Infants 6 months to 2 years
 - c. Young school age children
 - d. The elderly

B. Review of anatomy/ physiology of head/ brain

- 1. Scalp
 - a. Hair
 - b. Subcutaneous tissue - contains major scalp veins which bleed profusely
 - c. Muscle - attached just above the eyebrows and at the base of the occiput
 - d. Galea - freely moveable sheet of connective tissue, helps deflect blows
 - e. Loose connective tissue - contains emissary veins that drain intracranially (becomes important as a route for infection)
- 2. Skull - divided into two main groups of bones - face and cranium
 - a. Cranial bones
 - (1) Composed of double layer of solid bone which surrounds a spongy middle layer gives greater strength
 - (2) Frontal, occipital, temporal, parietal, and mastoid
 - b. Middle meningeal artery
 - (1) Lies under temporal bone, if fractured can tear artery
 - (2) Source of epidural hematoma

- c. Skull floor - many ridges
- d. Foramen magnum - opening at base of skull for spinal cord
- 3. Brain - occupies 80% of intracranial space
 - a. Divisions
 - (1) Cerebrum - each lobe named after skull plates that lie immediately above
 - (a) Cortex controls
 - i) Voluntary skeletal movement - interference with will result in extremity paresthesia, weakness and/ or paralysis
 - ii) Level of awareness - part of consciousness
 - (b) Frontal lobe - personality, trauma here may result in placid reactions or seizures
 - (c) Parietal lobe - somatic sensory input, memory, emotions
 - (d) Temporal lobe - speech centers here, 85% of population has center on left, long term memory, taste and smell
 - (e) Occipital lobe - origin of optic nerve, trauma here may cause complaints of seeing "stars", blurred vision or other visual disturbances
 - (f) Hypothalamus - centers for vomiting, regulating body temperature and water
 - (2) Cerebellum - coordination of voluntary movement started by cerebral cortex
 - (3) Brain stem - connects the hemispheres of the brain, cerebellum and spinal cord responsible for vegetative functions and vital signs
 - (a) Parts - midbrain, pons and medulla oblongata
 - (b) Cranial nerves
 - i) CN III - oculomotor, origin from midbrain - controls pupil size - pressure on nerve paralyzes nerve, pupil unreactive
 - ii) CN X - vagal, origin from medulla - a bundle of nerves, primarily from parasympathetic system, that supply SA and AV node, stomach and

- GI tract - pressure on nerve stimulates bradycardia
- iii) Reticular activating system - level of arousal and responsible for specific motor movements
- b. Level of consciousness
 - (1) Reticular activating centers - level of arousal
 - (2) Intact cortical function - level of awareness
- c. Meninges - protective layers that surround and enfold entire CNS
 - (1) Dura mater - outer layer, tough and fibrous; literally two layers, inner layer serves to divide and separate various brain structures, forms the tentorium that surrounds the brain stem and separates the cerebellum below from the cerebral structures above, used as a landmark to describe intracranial lesions or when swelling is involved
 - (2) Arachnoid - middle layer, web-like with venous blood vessels that reabsorb cerebrospinal fluid
 - (3) Pia mater - inner layer, directly attached to brain tissue, provides form
- d. Cerebral spinal fluid (CSF) - clear, colorless fluid, circulates through entire brain and spinal cord
 - (1) Function - cushion and protect
 - (2) Ventricles - in center of brain, secrete CSF by filtering blood, forms blood-brain barrier
- e. Metabolism and perfusion
 - (1) High metabolic rate
 - (2) Nutrients
 - (a) Consumes 20% of body's oxygen
 - (b) Glucose
 - (c) Thiamine
 - (d) Other nutrients
 - (e) Nutrients cannot be stored
 - (3) Blood supply
 - (a) Vertebral arteries
 - (b) Receives 15% cardiac output
 - (4) Perfusion
 - (a) Cerebral perfusion pressure (CPP)
 - (b) Mechanism called autoregulation

regulates body's blood pressure to maintain CPP

- (c) CPP = mean arterial pressure (MAP) - ICP
- (d) MAP of at least 60 mmHg required to perfuse brain
- (e) Interference with CPP - edema, bleeding, hypotension

C. Mechanisms of injury

- 1. Motor vehicle crashes
 - a. Most common cause of head trauma
 - b. Most common cause of subdural hematoma
- 2. Sports
- 3. Falls
 - a. In elderly or in presence of alcohol abuse
 - b. Associated with chronic subdural hematomas
- 4. Penetrating trauma
 - a. Missiles (rifles, hand guns, shotguns) more common
 - b. Sharp projectiles (knives, ice picks, axes and screwdrivers) not as common

D. General categories of injury

- 1. Coup injuries
 - a. Directly below point of impact
 - b. More common when front of head struck because of irregularity of inner surface of frontal bones; occipital area is smooth
- 2. Contrecoup injuries
 - a. On the pole opposite the site of impact
 - b. More common when back of head struck because of irregularity of inner surface of frontal bones
- 3. Diffuse axonal injury (DAI)
 - a. Shearing, tearing, stretching force of nerve fibers with axonal damage
 - b. More common with vehicular occupants and pedestrians struck by vehicle
- 4. Focal injury
 - a. An identifiable site of injury limited to a particular area or region of the brain

E. Causes of brain injury

- 1. Direct or primary
 - a. Caused by the impact
 - b. Mechanical disruption of cells
 - c. Vascular permeability
- 2. Indirect - secondary or tertiary
 - a. Secondary - caused by edema, hemorrhage, infection

- and pressure inadequate perfusion (ischemia)
tissue hypoxia
- b. Tertiary - caused by apnea, hypotension, pulmonary resistance and change in ECG
- F. Head injury - broad and inclusive
 - 1. Defined - a traumatic insult to the head that may result in injury to soft tissue, bony structures and/or brain injury
 - 2. Categories - blunt (closed) trauma and open (penetrating trauma)
 - 3. Blunt head trauma
 - a. More common
 - b. Dura remains intact
 - c. Brain tissue not exposed to the environment
 - d. May result in fractures, focal brain injuries and/or diffuse axonal injuries (DAI)
 - 4. Penetrating head trauma
 - a. Less common, gun shot wound most frequent cause
 - b. Dura and cranial contents penetrated
 - c. Brain tissue exposed to the environment
 - d. Results in fractures and focal brain injury
- G. Brain injury
 - 1. Defined (by National Head Injury Foundation) - "a traumatic insult to the brain capable of producing physical, intellectual, emotional, social and vocational changes"
 - 2. Categories - focal injury, subarachnoid hemorrhage or diffuse axonal injury
 - a. Focal injury - specific, grossly observable brain lesions
 - (1) Cerebral contusion - related to severity of amount of energy transmitted
 - (2) Intracranial hemorrhage
 - (a) Penetrating
 - (b) Non-penetrating
 - (3) Epidural hemorrhage
 - b. Diffuse axonal injury (DAI) - effect of acceleration/ deceleration
 - (1) Concussion - mild and classic
 - (2) DAI - moderate and severe
- H. Pathophysiology of head/ brain injury
 - 1. Increased intracranial pressure (ICP)
 - a. Direct or indirect injury
 - (1) Edema

- (2) Bleeding
 - (3) Hypotension
 - (4) Hypercarbia
2. Mechanism
- a. As ICP approaches MAP the gradient for flow decreases, therefore cerebral blood flow is restricted
 - b. This decreases cerebral perfusion pressure (CPP)
 - c. As CPP decreases, cerebral vasodilation occurs which results in increased cerebral blood volume which leads to an increase in ICP which results in a decreased CPP which leads to further cerebral vasodilation and so on
 - d. Hypercarbia causes cerebral vasodilation which results in increased cerebral blood volume, which leads to increased ICP, etc.
 - e. Hypotension results in decreased CPP which leads to cerebral vasodilation, etc.
3. Assessment
- a. Pressure exerted downward
 - (1) Cerebral cortices and/ or reticular activating system effected
 - (a) Altered level of consciousness - amnesia of event, confusion, disorientation, lethargy or combativeness, focal deficit or weakness
 - (2) Hypothalamus - vomiting
 - (3) Brain stem
 - (a) Blood pressure elevates to maintain MAP and thus CPP
 - (b) Vagal nerve pressure - bradycardia
 - (c) Respiratory centers - irregular respirations or tachypnea
 - (d) Oculomotor nerve paralysis - unequal/ unreactive pupils
 - (e) Posturing - flexion/ extension
 - (4) Seizures - depending on location of injury
 - b. Levels of increasing ICP
 - (1) Cerebral cortex and upper brain stem involved
 - (a) BP rising and pulse rate begins slowing
 - (b) Pupils still reactive
 - (c) Cheyne-Stokes respirations
 - (d) Initially try to localize and remove painful stimuli

- i) Eventually withdraws then flexion occurs
 - (e) All effects reversible at this stage
 - (2) Middle brain stem involved
 - (a) Wide pulse pressure and bradycardia
 - (b) Pupils nonreactive or sluggish
 - (c) Central neurogenic hyperventilation (CNH)
 - (d) Extension
 - (e) Few patients function normally from this level
 - (3) Lower portion of brain stem involved/ medulla
 - (a) Pupil blown - same side as injury
 - (b) Respirations ataxic (erratic, no rhythm) or absent
 - (c) Flaccid
 - (d) Labile pulse rate, irregular often great pulse swings in rate
 - (e) QRS, S-T and T wave changes
 - (f) Decreased BP, often labile BP
 - (g) Not considered survivable
 - c. Glasgow coma scale - method to assess level of consciousness
 - (1) Three independent measurements
 - (a) Eye opening
 - (b) Verbal response
 - (c) Motor response
 - (2) Numerical score - 3 to 15
 - (3) Head injury classified according to score
 - (a) Mild - 13 to 15
 - (b) Moderate - 8 to 12
 - (c) Severe - < 8
 - d. Vital signs
 - e. Pupil size and reaction
 - f. Presence of focal deficit
 - g. History of unconsciousness or amnesia of event
4. Management
- a. Suspect cervical spine injury
 - b. Airway and ventilation - oxygenate to 95% -100% saturations
 - (1) Oxygenation does not always require hyperventilation
 - (2) Hyperventilate with signs and symptoms of increased ICP

- (a) Do not exceed rate of 30 - does not allow for adequate exhalation and retains carbon dioxide further contributing to hypercarbia
 - (3) Avoid if possible nasal intubation - increases ICP
 - c. Circulation - start IV of isotonic fluid (NS or LR) and titrate to BP
 - (1) Prevent hypotension to preserve CPP
 - (2) If hypotension present, look for internal bleeding
 - (3) Stop external bleeding
 - d. Disability - repeated assessment crucial to monitor presence of increased ICP, GCS and focal deficit
 - e. Pharmacology
 - (1) Osmotic diuretics
 - (a) Mannitol and/ or furosemide
 - (2) Paralytics/ sedation
 - (3) Avoid glucose unless hypoglycemia confirmed
 - f. Non-pharmacological treatment
 - (1) Position - head end of the backboard elevated 30 degrees
 - (2) Decrease CNS stimulation
 - g. Transport considerations
 - (1) Trauma center candidate - follow system guidelines
 - (a) Moderate to severe head injury (GCS \leq 12)
 - (2) Use of helicopter versus ground transport
 - (3) Use of lights/ sirens
 - h. Psychological support/ communication strategies
- I. Specific Injuries - diffuse axonal injury and focal injuries
 - 1. Diffuse axonal injury - shearing, stretching or tearing of nerve fibers with subsequent axonal damage
 - a. Concussion (mild DAI) - physiologic neurologic dysfunction without substantial anatomic disruption which results in transient episode of neuronal dysfunction with rapid return to normal neurologic activity
 - (1) Epidemiology - most common result of blunt trauma to the head
 - (2) Assessment - confusion, disorientation, amnesia of the event

- (3) Management - quiet, calm atmosphere, constant orientation and reassessment, intact airway with adequate tidal volume a priority
2. Moderate DAI - shearing, stretching or tearing results in minute petechial bruising of brain tissue, brain stem and reticular activating system may be involved leading to unconsciousness
 - a. Epidemiology - occurs in 20% of all severe head injuries and 45% of all cases of DAI, commonly associated with basilar skull fracture, most survive but with neurologic impairment common
 - b. Assessment - may result in immediate unconsciousness or persistent confusion, disorientation and amnesia of the event extending to amnesia of moment-to-moment events; may have focal deficit; residual cognitive (inability to concentrate), psychologic (frequent periods of anxiety, uncharacteristic mood swings) and sensorimotor deficits (sense of smell altered) may persist
 - c. Management - quiet, calm atmosphere, avoid bright lights due to photophobia, constant orientation if conscious, frequent reassessment with loss of consciousness, intact airway with adequate tidal volume a priority
3. Severe DAI - formerly called brain stem injury, involves severe mechanical disruption of many axons in both cerebral hemispheres and extending to the brainstem
 - a. Epidemiology - represents 16% of all severe head injuries and 36% of all cases of DAI
 - b. Assessment - unconsciousness for prolonged period, posturing common, other signs of increased ICP occur depending on various degrees of damage
 - c. Management
4. Focal injury
 - a. Skull fracture - the significance is in the amount of force involved
 - (1) Epidemiology - intact galea protects skull by deflecting force more common with augmented blunt injury, such as vehicular crashes or falls from a height
 - (2) Types
 - (a) Linear (80% of all skull fractures)

- i) May have fluid leak out forming a bulge
 - ii) Fluid leak may not occur for 24 hours
 - iii) If no associated injuries there is no danger
 - (b) Depressed
 - i) Bone fragments protrude into brain
 - ii) Neurologic signs and symptoms evident
 - (c) Basilar
 - i) Extension of linear fracture to floor of skull, may not be seen on X-ray/ CT
 - ii) Signs and symptoms depend on amount of damage
 - iii) Most frequently blood vessels disrupted
 - a) CSF/ blood from ear(s) or nose - target sign
 - b) Bilateral black eyes - raccoon's sign
 - c) Bruising behind ear(s) - battle's sign
 - iv) May have seizures due to irritation of blood on brain tissue
 - (d) Open skull fractures
 - i) Severe force involved, brain tissue may be exposed
 - ii) Neurologic signs and symptoms evident
- (3) Assessment - linear fractures may be missed, depressed and open skull fractures usually found on palpation of head, use balls of fingers to palpate
- (a) Airway patency and breathing adequacy a priority
 - (b) Vomiting and inadequate respirations are common
 - (c) Assess for signs and symptoms of increased intracranial pressure
 - i) Altered LOC
 - ii) Glasgow coma scale
 - iii) Vomiting

- iv) Pupil changes
- v) Pulse, respiration and BP changes
- (4) Management
 - (a) Cervical spine precautions
 - (b) Assuring clear airway and adequate ventilation with good tidal volume
 - (c) Hypoxia must be prevented to prevent secondary injury to brain tissue
 - (d) Cerebral perfusion pressure can be maintained with a systolic pressure of at least 70 mm Hg
- b. Cerebral contusion - a focal brain injury in which brain tissue is bruised and damaged in a local area; may occur at both the area of direct impact (coup) and/ or on the opposite side (contrecoup) of impact
 - (1) Epidemiology
 - (a) Relatively common in blunt head injury resulting in prolonged confusion
 - (b) Most commonly found in frontal lobes
 - (c) Often associated with a serious concussion
 - (d) Patients may have multiple sites of contusion
 - (2) Assessment
 - (a) Airway patency and breathing adequacy a priority
 - (b) Alteration in level of consciousness
 - i) Confusion or unusual behavior common
 - (c) May complain of progressive headache and/ or photophobia
 - (d) May be unable to lay down memory - repetitive phrases common
 - (e) Assess for signs and symptoms of increased intracranial pressure
 - i) Altered LOC
 - ii) Glasgow coma scale
 - iii) Vomiting
 - iv) Pupil changes
 - v) Pulse, respiration and BP changes
 - (3) Management
 - (a) Cervical spine precautions
 - (b) Assuring clear airway and adequate

- ventilation with good tidal volume
- (c) Hypoxia must be prevented to prevent secondary injury to brain tissue
- (d) Keep warm and comfortable
- (e) May need to repeat information
- c. Intracranial hemorrhage
 - (1) Types
 - (a) Epidural
 - (b) Subdural
 - (c) Intracerebral
 - (d) Subarachnoid
 - (2) Epidemiology
 - (a) Epidural hematomas almost always result from arterial tears, usually from the middle meningeal artery; they amount to about 0.5 to 1% of head injuries
 - (b) Subdural hematomas are more common, result from rupture of bridging veins between cortex and dura; may be acute or chronic (chronic bleeds more common in the elderly and the alcoholic)
 - (c) Subarachnoid hematoma results in bloody CSF and meningeal irritation
 - (d) Intracerebral hematoma is within the brain substance; many small, deep intracerebral hemorrhages are associated with other brain injuries (especially DAI); neurologic deficits depend on the associated injuries and the region involved, the size of the hemorrhage and whether bleeding continues
 - (3) Assessment
 - (a) May be impossible to tell which type of hematoma is present
 - i) History is important, what were they doing? What happened? What is wrong now? What doesn't seem right?
 - (b) More important to recognize the presence of brain injury
 - (c) Signs/ symptoms of increasing intracranial pressure
 - i) Headache that gets increasingly severe, vomiting, lethargy, confusion, changes in

- consciousness, comatose, pupil changes, pulse slows or becomes irregular, respirations become irregular, posturing, seizures
- (d) Signs/ symptoms of neurological deficit
- (e) Early signs and symptoms of alterations in level of consciousness
- (f) Signs of brain irritation - change in personality, irritability, lethargy, confusion, repeating words or phrases, changes in consciousness, paralysis of one side of the body, seizures
- (g) GCS
- (4) Management
 - (a) Cervical spine precautions
 - (b) Maintaining airway and adequate ventilation
 - (c) Elevating head of stretcher or backboard 30°
 - (d) Establish IV, manage hypotension with fluid boluses, not to exceed a systolic of 90-100 mmHg in the adult male <40 (avoid shock)
 - (e) Treat increased ICP first with assuring adequate tidal volume
 - (f) Osmotic diuretics debatable for use by paramedics
- 5. Helmet issues
 - a. Purpose of helmet
 - (1) Protect head
 - (2) Protect the brain
 - (3) Cervical spine remains vulnerable
 - b. Various types
 - (1) Full face or open face (motorcycle, bicycle, roller-blade, etc.)
 - (2) Sports helmet (football, moto-cross, etc.)
 - c. Controversy regarding removal, at scene versus hospital
 - (1) Priorities
 - (a) Airway management
 - (b) Spinal immobilization
 - (2) Factors determining need for immediate removal
 - (a) Access to airway

- (b) Patient's condition
- (3) Other considerations include
 - (a) Ready access of athletic trainer in case of sports helmet (often have special equipment to remove face piece, allowing access to airway)
 - (b) Presence of other garb which could further compromise the cervical spine if only the helmet were removed (e.g. shoulder pads)
 - (c) Firm fit of helmet may provide firm support for head
- d. Cervical spine immobilization must be done whether or not a helmet is present
- e. When helmet removal occurs
 - (1) Requires sufficient help (stay to help in ED)
 - (2) Training in specific technique necessary for efficient removal
 - (3) Requires sufficient padding

UNIT TERMINAL OBJECTIVE

- 4-6 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with a suspected spinal injury.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 4-6.1 Describe the incidence, morbidity, and mortality of spinal injuries in the trauma patient. (C-1)
- 4-6.2 Describe the anatomy and physiology of structures related to spinal injuries. (C-1)
- a. Cervical
 - b. Thoracic
 - c. Lumbar
 - d. Sacrum
 - e. Coccyx
 - f. Head
 - g. Brain
 - h. Spinal cord
 - i. Nerve tract(s)
 - j. Dermatomes
- 4-6.3 Predict spinal injuries based on mechanism of injury. (C-2)
- 4-6.4 Describe the pathophysiology of spinal injuries. (C-1)
- 4-6.5 Explain traumatic and non-traumatic spinal injuries. (C-1)
- 4-6.6 Describe the assessment findings associated with spinal injuries. (C-1)
- 4-6.7 Describe the management of spinal injuries. (C-1)
- 4-6.8 Identify the need for rapid intervention and transport of the patient with spinal injuries. (C-1)
- 4-6.9 Integrate the pathophysiological principles to the assessment of a patient with a spinal injury. (C-3)
- 4-6.10 Differentiate between spinal injuries based on the assessment and history. (C-3)
- 4-6.11 Formulate a field impression based on the assessment findings. (C-3)
- 4-6.12 Develop a patient management plan based on the field impression. (C-3)
- 4-6.13 Describe the pathophysiology of traumatic spinal injury related to: (C-1)
- a. Spinal shock
 - b. Spinal neurogenic shock
 - c. Quadriplegia/ paraplegia
 - d. Incomplete cord injury/ cord syndromes:
 - 1. Central cord syndrome
 - 2. Anterior cord syndrome
 - 3. Brown-Sequard syndrome
- 4-6.14 Describe the assessment findings associated with traumatic spinal injuries. (C-1)
- 4-6.15 Describe the management of traumatic spinal injuries. (C-1)
- 4-6.16 Integrate pathophysiological principles to the assessment of a patient with a traumatic spinal injury. (C-3)
- 4-6.17 Differentiate between traumatic and non-traumatic spinal injuries based on the assessment and history. (C-3)
- 4-6.18 Formulate a field impression for traumatic spinal injury

- based on the assessment findings. (C-3)
- 4-6.19 Develop a patient management plan for traumatic spinal injury based on the field impression. (C-3)
- 4-6.20 Describe the pathophysiology of non-traumatic spinal injury, including: (C-1)
- a. Low back pain
 - b. Herniated intervertebral disk
 - c. Spinal cord tumors
- 4-6.21 Describe the assessment findings associated with non-traumatic spinal injuries. (C-1)
- 4-6.22 Describe the management of non-traumatic spinal injuries. (C-1)
- 4-6.23 Integrate pathophysiological principles to the assessment of a patient with non-traumatic spinal injury. (C-3)
- 4-6.24 Differentiate between traumatic and non-traumatic spinal injuries based on the assessment and history. (C-3)
- 4-6.25 Formulate a field impression for non-traumatic spinal injury based on the assessment findings. (C-3)
- 4-6.26 Develop a patient management plan for non-traumatic spinal injury based on the field impression. (C-3)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 4-6.27 Advocate the use of a thorough assessment when determining the proper management modality for spine injuries. (A-3)
- 4-6.28 Value the implications of failing to properly immobilize a spine injured patient. (A-2)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 4-6.29 Demonstrate a clinical assessment to determine the proper management modality for a patient with a suspected traumatic spinal injury. (P-1)
- 4-6.30 Demonstrate a clinical assessment to determine the proper management modality for a patient with a suspected non-traumatic spinal injury. (P-1)
- 4-6.31 Demonstrate immobilization of the urgent and non-urgent patient with assessment findings of spinal injury from the following presentations: (P-1)
1. Supine
 2. Prone

3. Semi-prone
 4. Sitting
 5. Standing
- 4-6.32 Demonstrate documentation of suspected spinal cord injury to include: (P-1)
- a. General area of spinal cord involved
 - b. Sensation
 3. Dermatomes
 4. Motor function
 5. Area(s) of weakness
- 4-6.33 Demonstrate preferred methods for stabilization of a helmet from a potentially spine injured patient. (P-1)
- 4-6.34 Demonstrate helmet removal techniques. (P-1)
- 4-6.35 Demonstrate alternative methods for stabilization of a helmet from a potentially spine injured patient. (P-1)
- 4-6.36 Demonstrate documentation of assessment before spinal immobilization. (P-1)
- 4-6.37 Demonstrate documentation of assessment during spinal immobilization. (P-1)
- 4-6.38 Demonstrate documentation of assessment after spinal immobilization. (P-1)

DECLARATIVE

- I. Introduction
 - A. Spinal cord injury (SCI) impacts
 - 1. Human physiology
 - 2. Lifestyle
 - 3. Financial
 - 4. 1.25 million to care for a single victim with permanent SCI (overall life span)

- II. Incidences
 - A. 15,000 - 20,000 SCI per year
 - B. Higher in men between ages 16 - 30 years
 - C. Common causes
 - 1. Motor vehicle crashes - 2.1 million per year (48%)
 - 2. Falls (21%)
 - 3. Penetrating injuries (15%)
 - 4. Sports injuries (14%)

- III. Morbidity and mortality
 - A. 40% of trauma patients with neurological deficit will have temporary or permanent SCI
 - B. 25% of SCI may be caused by improper handling
 - C. Education in proper handling and transportation can decrease SCI

- IV. Traditional spinal assessments/ criteria
 - A. Based upon mechanism of injury (MOI)
 - B. Past emphasis for spinal immobilization considerations
 - 1. Unconscious accident victims
 - 2. Conscious accident victims checked for SCI prior to movement
 - 3. Any patient with a "motion" injury
 - C. Lack of clear clinical guidelines or specific criteria to evaluate for SCI
 - D. Signs which may indicate SCI
 - 1. Pain
 - 2. Tenderness
 - 3. Painful movement
 - 4. Deformity
 - 5. Cuts/ bruises (over spinal area)
 - 6. Paralysis
 - 7. Paresthesias

8. Paresis (weakness)
 9. Shock
 10. Priapism
 - E. Not always practical to immobilize every "motion" injury
 - F. Most suspected injuries were moved to a normal anatomical position
 1. Lying flat on a spine board
 2. No exclusion criteria used for moving patients to an anatomical position
 - G. Need to have clear criteria to assess for the presence of SCI
- V. General spinal anatomy and physiology review
- A. Spinal column
 1. Long bone
 2. 33 vertebrae
 3. Head balances at top of spine
 4. Spine supported by pelvis
 5. Ligaments and muscles connect head to pelvis
 - a. Anterior longitudinal ligament
 - (1) Runs on anterior portion of the body
 - (2) Major source of stability
 - (3) Protects against hyperextension
 - b. Posterior longitudinal ligament
 - (1) Runs along posterior body within the vertebral canal
 - (2) Prevents hyperflexion
 - (3) Can be a major source of injury
 - c. Other ligaments
 - (1) Cruciform ligament
 - (2) Accessory atlantoaxial ligament
 - (3) Add to strength, stability, and articulation
 6. Injury to ligaments may cause excess movement of vertebrae
 - B. Cervical spine
 1. 7 vertebrae
 2. Supports head (16 - 25 lbs)
 3. Considered "joint above" in splinting
 4. Very flexible
 5. C1 (atlas)
 6. C2 (axis)
 - C. Thoracic spine
 1. 12 vertebrae

- 2. Ribs connected
- 3. Provides rigid framework of thorax
- D. Lumbar spine
 - 1. 5 vertebrae
 - 2. Largest vertebral body
 - 3. Flexible
 - 4. Carries most of body weight
 - 5. Torso balances on sacrum
- E. Sacrum
 - 1. 5 fused vertebrae
 - 2. Common to spine and pelvis
 - 3. Forms "joint below" with pelvis for splinting
- F. Coccyx
 - 1. 4 fused vertebrae
 - 2. Tailbone
- G. Vertebral structure
 - 1. Body
 - a. Constructed of cancellous bone
 - b. Posterior portion forms part of the vertebral foramen
 - c. Increase in size when moving from cervical to sacral region for support of the trunk
- H. Vertebral foramen
 - 1. When all vertebrae are in place forms opening for spinal cord (vertebral canal)
 - 2. Formed by
 - a. Posterior portion of vertebral body
 - b. Pedicles
 - (1) Projecting posteriorly from vertebral body
 - c. Laminae
 - (1) Arise from pedicles and fuse into spinous process
 - (2) Failure of the laminae to unite during fetal development causes spina bifida
 - (a) Most commonly in the lumbosacral region
- I. Transverse process
 - 1. Runs from between the pedicles and laminae in most vertebrae
 - 2. Projects laterally and posteriorly
 - 3. Attachment site for various muscles and ligaments
- J. Spinous process
 - 1. Posterior aspect

2. Formed by the laminae
3. Attachment site for muscles and ligaments
- K. Intervertebral foramen
 1. Formed by the lower surfaces of the vertebrae
 2. Creates a "notch" for spinal nerves
 - a. Allows nerves to connect to the spinal cord
- L. Intervertebral disk
 1. Mass of fibrocartilage separating each vertebrae
 2. Connecting together by ligaments
 3. Acts as a shock absorber
 - a. Reducing bone wear
 - b. Compression protection
- M. Brain and spinal cord (central nervous system)
 1. Brain
 - a. Largest and most complex portion of the nervous system
 - b. Continuous with spinal cord
 - c. Responsible for all sensory and motor functions
 2. Spinal cord
 - a. Located within the vertebral canal
 - (1) Begins at foramen magnum
 - (2) Ending near L-2
 - b. Dural sheath
 - (1) Sheathed, tube-like sac
 - (2) Filled with cerebrospinal fluid (CSF)
 3. Blood supplied by
 - a. Vertebral arteries
 - b. Spinal arteries
 4. Gray matter
 - a. Core pattern in cord resembling butterfly with outspread wings
 - b. Most neurons in gray matter are interneurons
 5. White matter
 - a. Anatomical spinal tracts
 - (1) Longitudinal bundles of myelinated nerve fibers
 6. Ascending nerve tracts
 - a. Carries impulses from body parts and sensory information to the brain
 - b. Fasciculus gracilis and cuneatus
 - (1) Part of the posterior funiculi of cord
 - (2) Conduct sensory impulse from skin, muscle tendons, and joints to the brain for

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- interpretation as sensations of touch, pressure, and body movement
- (3) Cross over at the medulla oblongata from one side to the other, therefore impulses originating from the left side ascend to the right side of the brain and vice versa
- c. Spinothalamic tracts
- (1) Lateral and anterior tracts located in the lateral and anterior funiculi
- (2) Lateral tracts conduct impulses of pain and temperature to the brain
- (3) Impulses cross over in the spinal cord
- (4) Anterior tracts carry impulses of touch and pressure to the brain
- (5) Spinocerebellar tracts (anterior and posterior) are found near the lateral funiculi and function to coordinate impulses necessary for muscular movements by carrying impulses from muscles in legs and trunk to cerebellum
7. Descending nerve tracts
- a. Carries motor impulses from the brain to the body
- b. Corticospinal tracts (pyramidal tracts)
- (1) Lateral tract crosses over at medulla oblongata
- (a) Anterior tract descend uncrossed
- (b) (b) Functions to conduct motor impulses from the brain to spinal nerves and out to the body for voluntary movements
- (2) Reticulospinal tracts
- (a) Lateral, anterior, and medial tracts
- (b) (b) Mix of crossed and uncrossed fibers
- i) Some lateral fibers cross over while others do not
- ii) Anterior and medial tracts remain uncrossed
- (c) Motor impulses originate in the brain to control muscle tone and sweat gland activity
- (3) (3) Rubrospinal tracts
- (a) Fibers cross over in brain at pass through the lateral funiculi
- (b) (b) Motor impulses from the brain

controlling muscle coordination and control of posture

8. Spinal nerves
 - a. 31 pairs
 - (1) Originates from the spinal cord
 - b. Mixed nerves
 - (1) Carries both sensation and motor function
 - (2) Provides two-way communication between spinal cord and body parts
 - c. Named according to level of spine from which they arise
 - (1) Cervical 1-8
 - (2) Thoracic 1-12
 - (3) Lumbar 1-5
 - (4) Sacral 1-5
 - (5) Coccygeal 1 set of nerves
 - d. Spinal nerve
 - (1) Emerges from the cord
 - (2) Two short branches or roots
 - (3) Dorsal root
 - (a) Carries sensory impulses to the cord
 - (4) Ventral root
 - (a) Carries motor impulses from the cord to the body
9. Motor and sensory dermatomes
 - a. Dermatome is the particular area in which the spinal nerves travels or controls
 - b. Mapped out by level of the spinal nerve
 - c. Useful for assessment for a specific level of SCI
 - d. Table for common nerve root and motor/ sensory correlation

<u>Nerve Root</u>	<u>Motor</u>	<u>Sensory</u>	
C-3, 4	Trapezius (shoulder shrug)	Top of shoulder	Top o
C-3, 4, 5	Diaphragm	Top of shoulder	
C-5, 6	Biceps (elbow flexion)	Middle finger	Thumb
C-7	Triceps (elbow extension)	wrist/ finger extension	
C-8/ T-1	Finger abduction/ adduction		

		Little finger
T-4	Nipple	
T-10	Umbilicus	
L-1,2	Hip flexion	
		Inguinal crease
L-3,4	Quadriceps	
		Medial thigh/ calf
L-5	Great toe/ foot dorsiflexion	
		Lateral calf
S-1	Knee flexion	
		Lateral foot
S-1,2	Foot plantar flexion	
S-2,3,4	Anal sphincter tone	
		Perianal

VI. General assessment of spinal injuries

A. Determine mechanism of injury/ nature or injury

1. Positive MOI

a. Always requires full spinal immobilization

- (1) High speed motor vehicle crash(es)
- (2) Falls greater than three times patient's height
- (3) Violent situations occurring near the spine
 - (a) Stabbings
 - (b) Gun shots
 - (c) Others
- (4) Sports injuries
- (5) Other high impact situations

b. Some medical directors may allow field personnel to not immobilize patients with MOI but without signs and/ or symptoms of a SCI

- (1) Based on assessment
 - (a) Patient reliability
 - (b) No distracting injuries
 - (c) Lack of signs or symptoms

2. Negative MOI

- a. Forces or impact involved does not suggest a potential spinal injury
- b. Does not require spinal immobilization

- (1) Examples
 - (a) Dropping a rock on foot
 - (b) Twisted ankle while running
 - (c) Isolated soft tissue injury
3. Uncertain MOI
 - a. Unclear or uncertainty regarding the impact or forces
 - b. Clinical criteria used for a basis of whether to employ spinal immobilization
 - (1) Examples
 - (a) Person trips over garden hose, falling to the ground and hitting their head
 - (b) Fall from 2-4 feet
 - (c) Low speed motor vehicle crash (fender bender)
4. Clinical criteria versus mechanism of injury
 - a. Initial management
 - (1) Based solely upon MOI
 - b. Positive MOI
 - (1) Spine immobilization
 - c. Negative MOI
 - (1) Without signs or symptoms
 - (a) No spine immobilization
 - d. Uncertain MOI
 - (1) Need for further clinical assessment and evaluation
 - e. In some non-traumatic spinal conditions immobilization may be necessary/ indicated
 - f. Altered LOC or unconsciousness requires spine stabilization

VII. Assessment of uncertain MOIs

- A. Specific clinical criteria
 1. Necessary to assess when electing not to immobilize a trauma patient
 2. Begins with patient reliability
 - a. Continually reassessed during specific exam
 3. If specific criteria cannot be clearly satisfied; complete spine immobilization undertaken
 4. Positive MOI always equals spine immobilization
 - a. This specific assessment may still be used to determine level of injury
- B. Specific criteria

1. Prevent motion of the spine by assistant maintaining stabilization throughout the exam
2. Reliable patients/ exam
 - a. In order for assessments of pain, tenderness, motor, and sensory function to be accurate the patient must be reliable
 - b. Patient must be
 - (1) Calm
 - (2) Cooperative
 - (3) Sober
 - (a) Alcohol
 - (b) Drugs
 - (4) Alert and oriented
 - c. Unreliable patient defined
 - (1) Acute stress reaction
 - (a) Sudden stress of any type
 - (2) Brain injury
 - (a) Any temporary change in consciousness or altered level of consciousness
 - (b) Uncooperative or belligerent behavior
 - (3) Intoxication
 - (4) Abnormal mental status
 - (5) Distracting injuries
 - (6) Communication problems
 - d. Unreliable indicators present
 - (1) Full spinal immobilization indicated
3. Assess for spinal pain
 - a. Patient is asked about
 - (1) Any related spinal pain
 - (2) Signs
 - (3) Symptoms
 - b. May be poorly localized
 - c. Might not feel directly over the spinous process
 - d. Pain with active movement of head and neck
 - (1) Patient is asked to slowly move their head and neck
 - (2) If any pain occurs
 - i) Full immobilization is indicated
 - ii) May not be able to splint in normal anatomical position
4. Assess for spine tenderness
 - a. Palpate over each of the spinous processes of the vertebra

- b. Begin at the neck and work towards the pelvis
 - c. May be beneficial to palpate back up from the pelvis to the neck
5. Upper extremity neurological function assessment
- a. Motor function
 - (1) Finger abduction/ adduction
 - (a) Test interosseous muscle function controlled by T-1 nerve roots
 - (b) Have patient spread fingers of both hands and keep them apart while you squeeze the 2nd and 4th fingers
 - (c) Normal resistance should be spring-like and equal on both sides
 - (2) Finger/ hand extension
 - (a) Test the extensors of the hand and fingers controlled by C-7 nerve roots
 - (b) Have patient hold wrist or fingers straight out and keep them out while you press down on their fingers
 - (c) Support the arm at the wrist to avoid testing arm function and other nerve roots
 - (d) Normal resistance should be felt to moderate pressure
 - (e) Both right and left sides should be checked
 - (f) Can still check if isolated, e.g., finger fracture, push on hand only not fingers; if wrist injury support MP joints and push on fingers only
 - b. Sensory function
 - (1) Pain sensation
 - (a) Abnormal sensation - ask patient about weakness, numbness, paresthesia, or radicular pain
 - (b) Pain or pinprick controlled by spinothalamic tracts
 - (c) Need to separate from light touch (remember light touch carried by more than one tract)
 - (d) Use end of pen or broken Q-tip (avoid sharp objects which may damage or cause bleeding)

- (e) Have patient close eyes and hold out hands; ask the patient to compare between sharp and dull pain
 - (f) Compare on both sides of the body; equal on both sides
6. Lower extremity neurological function assessment
- a. Motor function
 - (1) Foot plantar flexion
 - (a) Tests plantar flexors of the foot controlled by S-1,2 nerve root
 - (b) Place your hands at the sole of each foot and have the patient push against your hands
 - (c) Both sides should feel equal and strong
 - (2) Foot/ great toe dorsiflexion
 - (a) Tests the dorsal flexors of the foot and great toe controlled by the L-5 nerve roots
 - (b) Hold foot with fingers on toes and instruct patient to pull foot back or towards their nose
 - b. Sensory function
 - (1) Pain sensation
 - (a) Abnormal sensation - ask patient about weakness, numbness, paresthesia, or radicular pain
 - (b) Pain or pinprick controlled by spinothalamic tracts
 - (c) Need to separate from light touch (remember light touch carried by more than one tract)
 - (d) Use end of pen or broken Q-tip (avoid sharp objects which may damage or cause bleeding)
 - (e) Have patient close eyes and hold out hands; ask the patient to compare between sharp and dull pain
 - (f) Compare on both sides of the body; equal on both sides
7. General motor function assessment
- a. Tests nerve roots at both cervical and lumbar/sacral spine levels
 - b. Check two sets of nerve roots at each level as

- well as left and right sides
- c. Able to determine most clinical patterns of SCI
- d. Motor exams can to be completed even if local injury exists
 - (1) If exam cannot be completed due to local injury entire exam is unreliable
 - (a) Spinal immobilization indicated
- 8. Sensory function assessment
 - a. Test (exam) sensory
 - (1) At cervical and lumbar/ sacral spine levels
 - (a) On both right and left sides
 - b. Sensory exam will detect clinical patterns of SCI
 - c. Any signs or symptoms of abnormal sensation
 - (1) Spinal immobilization indicated

VIII. General management of spinal injuries

- A. Principles of spinal immobilization
 - 1. Primary goal is to prevent further injury
 - 2. Treat spine as a long bone with a joint at either end (head and pelvis)
 - 3. 15% of secondary spinal injuries are preventable with proper immobilization
 - 4. Always use "complete" spine immobilization
 - a. Impossible to isolate and splint specific injury site
 - 5. Spine stabilization begins in the initial assessment
 - a. Continues until the spine is completely immobilized on a long backboard
 - 6. Head and neck should be placed in a neutral, in-line position unless contraindicated
 - a. Neutral positioning allows for the most space for the cord
 - (1) Reducing cord hypoxia
 - (2) Reducing excess pressure
 - b. Most stable position for the spinal column
 - (1) Reduces instability
- B. Spinal stabilization/ immobilization
 - 1. Systematic approach
 - a. Cervical immobilization
 - (1) Manual
 - (2) Rigid collar
 - b. Interim immobilization device
 - (1) When indicated (vest type mobilization)

- device, short backboard)
- (2) Movement of a stable patient from a seated position to a long backboard
- c. Long backboard
- d. Full body vacuum splints
- e. Padding (body shims)
 - (1) Use to maintain anatomical position
 - (2) Limits movement of patient
 - (3) Fill all voids
 - (4) Pillows
 - (5) Towels
 - (6) Blankets
- f. Straps
 - (1) Sufficient to immobilize to the long backboard
 - (a) Upper torso
 - (b) Pelvis
 - (c) Legs
 - (d) Feet
- g. Cervical immobilization device
 - (1) Commercial
 - (2) Tape
 - (3) Blanket roll
 - (4) Pillows
- h. Helmeted patients
 - (1) Special assessment needs for patients wearing helmets
 - (a) Airway and breathing
 - (b) Fit of helmet and movement within the helmet
 - (c) Ability to gain access to airway and breathing
 - (2) Indications for leaving the helmet in place
 - (a) Good fit with little or no head movement within helmet
 - (b) No impending airway or breathing problems
 - (c) Removal may cause further injury
 - (d) Proper spinal immobilization could be performed with helmet in place
 - (e) No interference with ability to assess and reassess airway
 - (3) Indications for helmet removal

- (a) Inability to assess or reassess airway and breathing
- (b) Restriction of adequate management of the airway or breathing
- (c) Improperly fitted helmet with excessive head movement within helmet
- (d) Proper spinal immobilization cannot be performed with helmet in place
- (e) Cardiac arrest
- (4) Types of helmets
 - (a) Sports
 - i) Typically worn anteriorly
 - ii) Easier access to airway
 - (b) Motorcycle
 - i) Full face
 - ii) Shield
 - (c) Other
- (5) General guidelines for helmet removal
 - (a) Type of helmet worn by the patient will influence the technique used for removal
 - (b) First person stabilizes the head and neck by placing hands on the side of the helmet with fingers extended under lower face piece (or chin)
 - (c) Second person removes face shield (if present) and/or eye wear before helmet removal
 - (d) Second person removes chin strap
 - (e) Second person places one hand on mandible and the other posteriorly on the occipital region (posterior caudal edge of helmet)
 - (f) First person then begins to remove the helmet by pulling the sides apart, sliding the helmet a short distance (approximately 4-6 cm) and then stops
 - (g) First person again stabilizes the head and neck with hands holding the sides of the helmet
 - (h) Second person slides hands cephalad (towards the top of the head) until the head is stabilized between the posterior or hand (now cupped under the inferior

occiput) and the anterior hand now inserted under the lower part of the face piece - if the helmet has one (thumb and first finger now holding the unmovable maxilla)

- (i) First person again pulls the sides of the helmet apart and continues to withdraw the helmet - rotating the helmet as necessary so any lower face piece clears the nose and then an opposite movement so the posterior caudal end of the helmet is removed following the posterior curvature of the patient's head
- (j) Once the helmet has been completely removed, the first person regains stabilization of the patient's head and neck by placing their hands along the sides of the patient's head with their fingers spread apart for maximum support - second person can now let go of the anterior/posterior support
- (k) Second person can now continue with the assessment, measurement and application of a cervical collar, further immobilization and care of the patient

C. Use of steroids for traumatic spine injuries

IX. Traumatic injuries

A. Causes

- 1. Direct trauma
- 2. Excessive movement
 - a. Acceleration
 - b. Deceleration
 - c. Deformation
- 3. Directions of force
 - a. Flexion or hyperflexion
 - (1) Excessive forward motion of the head

- (2) May cause
 - (a) Wedge fracture of anterior vertebrae
 - (b) Stretching or rupturing of interspinous ligaments
 - (c) Compressed injury to spinal cord
 - (d) Disruption of disk with forward dislocation of vertebrae
 - (e) Fracture of pedicle and disruption of interspinous ligament
- (3) Cervical area common injury site
- b. Extension or hyperextension
 - (1) Excessive backward movement of the head
 - (2) May cause
 - (a) Disruption of the intervertebral disks
 - (b) Osteophytes and compression of the spinal cord
 - (c) Compression of the interspinous ligament
 - (d) Fracture
 - (3) Cervical area common injury site
- c. Rotational
 - (1) Usually from acceleration forces
 - (2) May cause
 - (a) Flexion-rotation dislocation
 - (b) Fracture or dislocation of vertebrae
 - (c) Rupture of supporting ligaments
 - (3) Cervical area common injury site
- d. Lateral bending
 - (1) Often caused by direct blow to the side of the body
 - (2) May cause
 - (a) May cause lateral compression of the vertebral body
 - (b) may cause lateral displacement of the vertebra
 - (c) May stretch the ligaments
- e. Vertical compression
 - (1) Force applied along spinal axis
 - (a) Usually from top of cranium to vertebral body from sudden deceleration, e.g., diving accident
 - (2) May cause
 - (a) Compression fracture without SCI
 - (b) Crushed vertebral body with SCI

- (3) Most common injury site(s)
 - (a) T-12 to L-2
- f. Distraction
 - (1) Force applied to spinal axis to distract or pull apart, e.g., hanging injury
 - (2) May cause
 - (a) Stretching of spinal cord
 - (b) Stretching of supporting ligaments
 - (3) Cervical area most common injury site
- 4. Can have "spinal column injury" (bony injury) with or without "SCI"
- 5. Can have "SCI" with or without "spinal injury"
- B. Types of spinal cord injuries (SCI)
 - 1. Primary injury
 - a. Occurs at time of impact/ injury
 - b. Causes
 - (1) Cord compression
 - (2) Direct cord injury
 - (a) Sharp or unstable bony structures
 - (3) Interruption in the cord's blood supply
 - 2. Secondary injury
 - a. Occurs after initial injury
 - b. Causes
 - (1) Swelling
 - (2) Ischemia
 - (3) Movement of bony fragments
 - 3. Cord concussion
 - a. Results from temporary disruption of cord-mediated functions
 - 4. Cord contusion
 - a. Bruising of the cord's tissues
 - b. Causes
 - (1) Swelling
 - c. Temporary loss of cord-mediated function
 - 5. Cord compression
 - a. Pressure on the cord
 - b. Causes tissue ischemia
 - c. Must be decompressed to avoid permanent loss/ damage to cord
 - 6. Laceration
 - a. Tearing of the cord tissue
 - b. May be reversed if only slight damage
 - c. May result in permanent loss if spinal tracts are

- disrupted
- 7. Hemorrhage
 - a. Bleeding into the cord's tissue
 - b. Caused by damage to blood vessels
 - (1) Injury related to amount of hemorrhage
 - c. Damage or obstruction to spinal blood supply results in local ischemia
- 8. Cord transection
 - a. Complete
 - (1) All tracts of the spinal cord completely disrupted
 - (2) Cord-mediated functions below transection are permanently lost
 - (3) Accurately determined after at least 24 hours post-injury
 - (4) Results in
 - (a) Quadriplegia
 - i) Injury at the cervical level
 - ii) Loss of all function below injury site
 - (b) Paraplegia
 - i) Injury at the thoracic or lumbar level
 - ii) Loss of lower trunk only
 - b. Incomplete
 - (1) Some tracts of the spinal cord remain intact
 - (2) Some cord-mediated functions intact
 - (3) Has potential for recovery
 - (a) Function may only be temporarily lost
 - (4) Types
 - (a) Anterior cord syndrome
 - i) Caused by bony fragments or pressure on spinal arteries
 - ii) Involves loss of motor function and sensation to pain, temperature and light touch
 - iii) Sensation to light touch, motion, position, and vibration are spared
 - (b) Central cord syndrome
 - i) Usually occurs with a hyperextension of the cervical region
 - ii) Weakness or paresthesias in upper

- extremities but normal strength in lower extremities.
- iii) May have varying degrees of bladder dysfunction
- (c) Brown-Sequard syndrome
 - i) Caused by penetrating injury
 - ii) Hemisection of the cord
 - iii) Involves only one side of the cord
 - iv) Complete damage to all spinal tract on involved side
 - v) Isolated loss of all types of functions, e.g., motor pain, temperature, motion, position, etc.
 - vi) Pain and temperature lost on opposite side of the body
 - vii) Motor function, motion, position, vibration, and light touch on the same side as injury
- 9. Chemical and metabolic changes due to SCI
- 10. Spinal shock
 - a. Refers to temporary loss of all types of spinal cord function distal to injury
 - b. Flaccid paralysis distal to injury site
 - c. Loss of autonomic function
 - (1) Hypotension
 - (2) Vasodilatation
 - (3) Loss of bladder and bowel control
 - (4) Priapism
 - (5) Loss of thermoregulation
 - d. Does not always involve permanent primary injury
 - (1) Usually will resolve in a period of hours to weeks
 - (2) Manage carefully to avoid secondary injury
- 11. Spinal neurogenic shock
 - a. Also called spinal vascular shock
 - b. Temporary loss of the autonomic function of the cord at the level of injury which
 - c. Presentation includes
 - (1) Loss of sympathetic tone
 - (2) Relative hypotension
 - (a) Systolic pressure 80 - 100 mmHg
 - (3) Skin pink, warm and dry
 - (a) Due to cutaneous vasodilation

- (4) Relative bradycardia
- d. Rare in occurrence
- e. Shock presentation is usually the result of hidden volume loss
 - (1) Chest injuries
 - (2) Abdominal injuries
 - (3) Other violent injuries
- f. Treatment
 - (1) Focus primarily on volume replacement
- 12. Autonomic hyperreflexia syndrome
 - a. Associated after resolution of spinal shock
 - (1) Chronic SCI patients
 - b. Massive, uncompensated cardiovascular response
 - (1) Stimulation of the sympathetic nervous system
 - c. Life-threatening condition usually seen with injuries at T-6 or above
 - d. Characteristics are
 - (1) Paroxysmal hypertension (up to 300 mmHg systolic)
 - (2) Headache (pounding)
 - (3) Blurred vision
 - (4) Sweating
 - (a) Above level of injury with flushing of the skin
 - (5) Increased nasal congestion
 - (6) Nausea
 - (7) Bradycardia
 - (8) Associate distended bladder or rectum
 - e. Stimulation of the sensory receptors below the level of the cord injury
 - (1) Autonomic nervous system reflexively responds with arteriolar spasm
 - (a) Increases blood pressure
 - (2) Cerebral, carotid, and aorta baroreceptors sense hypertension
 - (a) Stimulates the parasympathetic nervous system
 - (b) Heart rate decreases
 - (c) Peripheral and visceral vessels unable to dilate due to cord damage
 - (3) May be treated with an antihypertensive medication

- X. Non-traumatic spinal conditions
 - A. Low back pain (LBP)
 - 1. Affected area
 - a. Between lower rib cage and gluteal muscles
 - b. May radiate to thighs
 - 2. 1% of acute low back pain is sciatica
 - a. Usual cause is in the lumbar nerve root
 - b. Pain accompanied by motor and sensory deficits, e.g., weakness
 - 3. 60% - 90% of population experience some form of low back pain
 - a. Affects men and women equally
 - b. Women over 60 years old report low back pain symptoms more often
 - 4. Most cases of LBP are idiopathic
 - a. Precise diagnosis difficult
 - 5. Causes
 - a. Tension from tumors
 - b. Disk prolapsed
 - c. Bursitis
 - d. Synovitis
 - e. Rising venous pressure
 - f. Tissue pressure due to degenerative joint disease
 - g. Abnormal bone pressure
 - h. Problems with spinal mobility
 - i. Inflammation caused by infection
 - (1) Osteomyelitis
 - j. Fractures
 - k. Ligament strains
 - 6. Risk factors
 - a. Occupations requiring repetitious lifting
 - b. Exposure to vibrations from vehicles or industrial machinery
 - c. Osteoporosis
 - 7. Anatomical considerations
 - a. Pain from innervated structures
 - (1) Varies from person-to-person
 - b. Disk has no specific innervation
 - (1) Compresses cord if herniated
 - c. Source of pain in L-3,4,5, and S-1 may be interspinous bursae
 - d. Anterior and posterior longitudinal ligaments, and other ligaments are richly

- supplied with pain receptors
- e. Muscles of spine vulnerable to sprains/ strains
- 8. Degenerative disk disease
 - a. Common for patients over 50 years of age
 - b. Causes
 - (1) Degeneration of disk
 - (a) Biomechanical alterations of intervertebral disk
 - c. Narrowing of the disk
 - (1) Results in variable segment stability
- 9. Spondylolysis
 - a. Structural defect of spine
 - (1) Involves the lamina or vertebral arch
 - b. Usually occurs between superior and inferior articulating facets
 - c. Heredity a significant factor
 - d. Rotational fractures common at affected site
- 10. Herniated intervertebral disk
 - a. Also called herniated nucleus pulposus
 - b. Tear in the posterior rim of capsule enclosing the gelatinous center of the disk
 - c. Causes
 - (1) Trauma
 - (2) Degenerative disk disease
 - (3) Improper lifting
 - (a) Most common cause
 - d. Men ages 30 - 50 years are more prone than women
 - e. Commonly affects L-5, S-1 and L-4, L-5 disks
 - f. May also occur in C-5, C-6, and C-7
- 11. Spinal cord tumors
 - a. Causes
 - (1) Compression of the cord
 - (2) Degenerative changes in the bone/ joints
 - (3) Interrupted the blood supply
 - b. Manifestations are dependent upon
 - (1) Tumor type and location

- XI. Assessment and management of non-traumatic spinal conditions
- A. Assessment - based mainly upon the patient's chief complaint and physical exam
 - 1. Low back pain
 - a. Based mainly upon history and chief complaint
 - (1) Risk factors include

- (a) Occupations requiring repetitive lifting
 - (b) Exposure to vibrations from vehicles or industrial machinery
 - (c) Osteoporosis
 - b. Precise diagnosis difficult
 - (1) Based primarily on physical exam and other in-hospital testing
 - (a) CT scan
 - (b) Electromyography
 - (c) MRI
 - (d) Others
 - 2. Herniated intervertebral disk
 - a. Tear in the posterior rim of capsule enclosing the gelatinous center of the disk
 - (1) Causes
 - (a) Trauma
 - (b) Degenerative disk disease
 - (c) Improper lifting
 - i) Most common cause
 - (2) Pain usually occurs with straining
 - (a) Coughing or sneezing
 - (3) May have limited range of motion in lumbar spine
 - (4) Tenderness upon palpation
 - (5) Alternations in sensation, pain, and temperature
 - (6) Due to nerve root pressure
 - (7) Cervical herniations may include
 - (a) Upper extremity pain or paresthesia
 - i) Increasing with neck motion
 - (b) Slight motor weakness may also occur in biceps and triceps
 - 3. Spinal cord tumors
 - a. Tumors of the spine which cause
 - (1) Compression of the cord
 - (2) Degenerative changes in the bone/ joints
 - (3) Interruption in the blood supply
 - b. Manifestations are dependent upon
 - (1) Tumor type
 - (2) Location
- B. Management
- 1. Primarily palliative to decrease any pain or discomfort from movement

2. May elect to immobilize to aid in comfort
 - a. Long back board
 - b. Vacuum type stretcher
3. Full spinal immobilization is not required unless condition is a result of trauma

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UNIT TERMINAL OBJECTIVE

- 4-7 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for a patient with a thoracic injury.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 4-7.1 Describe the incidence, morbidity, and mortality of thoracic injuries in the trauma patient. (C-1)
- 4-7.2 Discuss the anatomy and physiology of the organs and structures related to thoracic injuries. (C-1)
- 4-7.3 Predict thoracic injuries based on mechanism of injury. (C-2)
- 4-7.4 Discuss the types of thoracic injuries. (C-1)
- 4-7.5 Discuss the pathophysiology of thoracic injuries. (C-1)
- 4-7.6 Discuss the assessment findings associated with thoracic injuries. (C-1)
- 4-7.7 Discuss the management of thoracic injuries. (C-1)
- 4-7.8 Identify the need for rapid intervention and transport of the patient with thoracic injuries. (C-1)
- 4-7.9 Discuss the pathophysiology of specific chest wall injuries, including: (C-1)
 - a. Rib fracture
 - 2. Flail segment
 - 3. Sternal fracture
- 4-7.10 Discuss the assessment findings associated with chest wall injuries. (C-1)
- 4-7.11 Identify the need for rapid intervention and transport of the patient with chest wall injuries. (C-1)
- 4-7.12 Discuss the management of chest wall injuries. (C-1)
- 4-7.13 Discuss the pathophysiology of injury to the lung, including: (C-1)
 - 1. Simple pneumothorax
 - 2. Open pneumothorax
 - 3. Tension pneumothorax
 - 4. Hemothorax
 - 5. Hemopneumothorax
 - 6. Pulmonary contusion
- 4-7.14 Discuss the assessment findings associated with lung injuries. (C-1)
- 4-7.15 Discuss the management of lung injuries. (C-1)
- 4-7.16 Identify the need for rapid intervention and transport of the patient with lung injuries. (C-1)
- 4-7.17 Discuss the pathophysiology of myocardial injuries, including: (C-1)
 - a. Pericardial tamponade
 - 2. Myocardial contusion
 - 3. Myocardial rupture
- 4-7.18 Discuss the assessment findings associated with myocardial injuries. (C-1)
- 4-7.19 Discuss the management of myocardial injuries. (C-1)
- 4-7.20 Identify the need for rapid intervention and transport of the patient with myocardial injuries. (C-1)
- 4-7.21 Discuss the pathophysiology of vascular injuries, including injuries to: (C-1)

- a. Aorta
 2. Vena cava
 3. Pulmonary arteries/ veins
- 4-7.22 Discuss the assessment findings associated with vascular injuries. (C-1)
- 4-7.23 Discuss the management of vascular injuries. (C-1)
- 4-7.24 Identify the need for rapid intervention and transport of the patient with vascular injuries. (C-1)
- 4-7.25 Discuss the pathophysiology of diaphragmatic injuries. (C-1)
- 4-7.26 Discuss the assessment findings associated with diaphragmatic injuries. (C-1)
- 4-7.27 Discuss the management of diaphragmatic injuries. (C-1)
- 4-7.28 Identify the need for rapid intervention and transport of the patient with diaphragmatic injuries. (C-1)
- 4-7.29 Discuss the pathophysiology of esophageal injuries. (C-1)
- 4-7.30 Discuss the assessment findings associated with esophageal injuries. (C-1)
- 4-7.31 Discuss the management of esophageal injuries. (C-1)
- 4-7.32 Identify the need for rapid intervention and transport of the patient with esophageal injuries. (C-1)
- 4-7.33 Discuss the pathophysiology of tracheo-bronchial injuries. (C-1)
- 4-7.34 Discuss the assessment findings associated with tracheo-bronchial injuries. (C-1)
- 4-7.35 Discuss the management of tracheo-bronchial injuries. (C-1)
- 4-7.36 Identify the need for rapid intervention and transport of the patient with tracheo-bronchial injuries. (C-1)
- 4-7.37 Discuss the pathophysiology of traumatic asphyxia. (C-1)
- 4-7.38 Discuss the assessment findings associated with traumatic asphyxia. (C-1)
- 4-7.39 Discuss the management of traumatic asphyxia. (C-1)
- 4-7.40 Identify the need for rapid intervention and transport of the patient with traumatic asphyxia. (C-1)
- 4-7.41 Integrate the pathophysiological principles to the assessment of a patient with thoracic injury. (C-1)
- 4-7.42 Differentiate between thoracic injuries based on the assessment and history. (C-3)
- 4-7.43 Formulate a field impression based on the assessment findings. (C-3)
- 4-7.44 Develop a patient management plan based on the field impression. (C-3)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 4-7.45 Advocate the use of a thorough assessment to determine a differential diagnosis and treatment plan for thoracic trauma. (A-3)
- 4-7.46 Advocate the use of a thorough scene survey to determine the forces involved in thoracic trauma. (A-3)

4-7.47 Value the implications of failing to properly diagnose thoracic trauma. (A-2)

4-7.48 Value the implications of failing to initiate timely interventions to patients with thoracic trauma. (A-2)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

4-7.49 Demonstrate a clinical assessment for a patient with suspected thoracic trauma. (P-1)

4-7.50 Demonstrate the following techniques of management for thoracic injuries: (P-1)

- a. Needle decompression
2. Fracture stabilization
3. Elective intubation
4. ECG monitoring
5. Oxygenation and ventilation

DECLARATIVE

- I. Introduction
 - A. Epidemiology
 - 1. Incidence
 - 2. Morbidity and mortality of thoracic injuries
 - 3. Risk factors
 - 4. Prevention strategies
 - a. Gun safety education
 - b. Sports training
 - c. Seat belts
 - d. Other
 - B. Mechanism of injury
 - 1. Classification
 - a. Blunt thoracic injuries
 - (1) Deceleration
 - (2) Compression
 - b. Penetrating thoracic injuries
 - 2. Injury patterns
 - a. General Types
 - (1) Open injuries
 - (2) Closed Injuries
 - b. Thoracic cage
 - c. Cardiovascular
 - d. Pleural and pulmonary
 - e. Mediastinal
 - f. Diaphragmatic
 - g. Esophageal
 - h. Penetrating cardiac trauma
 - 3. Blast injury
 - a. Confined spaces
 - b. Shock wave
 - C. Anatomy and physiology review of the thorax
 - 1. Anatomy
 - a. Skin
 - b. Bones
 - (1) Thoracic cage
 - (2) Sternum
 - (3) Thoracic spine
 - c. Muscles
 - (1) Intercostal
 - (2) Trapezius
 - (3) Latissimus dorsi

- (4) Rhomboids
 - (5) Pectoralis major
 - (6) Diaphragm
 - (7) Sternocleidomastoid
 - d. Trachea
 - e. Bronchi
 - f. Lungs
 - (1) Parenchyma
 - (2) Alveoli
 - (3) Alveolar - capillary interface
 - (4) Pleura
 - (a) Visceral
 - (b) Parietal
 - (c) Serous fluid
 - (5) Lobes
 - g. Vessels
 - (1) Arteries
 - (a) Aorta
 - (b) Carotid
 - (c) Subclavian
 - (d) Intercostal arteries
 - (e) Innominate
 - (f) Internal mammary
 - (2) Veins
 - (a) Superior vena cava
 - (b) Inferior vena cava
 - (c) Subclavian
 - (d) Internal jugular
 - (3) Pulmonary
 - (a) Arteries
 - (b) Veins
 - h. Heart
 - (1) Ventricles
 - (2) Atria
 - (3) Valves
 - (4) Pericardium
 - i. Esophagus
 - (1) Thoracic inlet
 - (2) Course through chest
 - (3) Esophageal foramen through diaphragm
 - j. Mediastinum
 - (1) Structures located in mediastinum
 - (a) Heart
 - (b) Trachea
 - (c) Vena cava
 - (d) Aorta
 - (e) Esophagus
2. Physiology
-

- a. Ventilation
 - (1) Expansion and contraction of thoracic cage
 - (a) Bellows system
 - (b) Musculoskeletal structure
 - (c) Intercostal muscles
 - (d) Diaphragm
 - (e) Accessory muscles
 - (f) Changes in intrathoracic pressure
- b. Respiration
 - (1) Neurochemical control
 - (2) Gas exchange
 - (a) Alveolar-capillary interface
 - (b) Capillary-cellular interface
 - (c) Pulmonary circulation
 - (d) Cardiac circulation
 - (e) Acid-base balance
 - i) Henderson-Hasselbach equation
 - ii) Respiratory alkalosis
 - iii) Respiratory acidosis
 - iv) Compensation for metabolic acidosis and alkalosis

II. General system pathophysiology, assessment and management of thoracic trauma

A. Pathophysiology

- 1. Impairments in cardiac output
 - a. Blood loss
 - b. Increased intrapleural pressures
 - c. Blood in pericardial sac
 - d. Myocardial valve damage
 - e. Vascular disruption
- 2. Impairments in ventilatory efficiency
 - a. Chest bellow action compromise
 - (1) Pain restricting chest excursion
 - (2) Air entering pleural space
 - (3) Chest wall fails to move in unison
 - b. Bleeding in pleural space
 - c. Ineffective diaphragmatic contraction
- 3. Impairments in gas exchange
 - a. Atelectasis
 - b. Contused lung tissue
 - c. Disruption of respiratory tract

B. Assessment findings

- 1. Pulse
 - a. Deficit
 - b. Tachycardia
 - c. Bradycardia
- 2. Blood pressure
 - a. Narrow pulse pressure
 - b. Hypertension

- c. Hypotension
- d. Pulsus paradoxus
- 3. Respiratory rate and effort
 - a. Tachypnea
 - b. Bradypnea
 - c. Labored
 - d. Retractions
 - e. Other evidence of respiratory distress
- 4. Possible hypothermia
- 5. Skin
 - a. Diaphoresis
 - b. Pallor
 - c. Cyanosis
 - d. Open wounds
 - e. Ecchymosis
 - f. Other evidence of trauma
- 6. Hemoptysis
- 7. Neck
 - a. Position of trachea
 - b. Subcutaneous emphysema
 - c. Jugular venous distention
 - d. Penetrating wounds
- 8. Chest
 - a. Contusions
 - b. Tenderness
 - c. Asymmetry
 - d. Lung sounds
 - (1) Absent or decreased
 - (a) Unilateral
 - (b) Bilateral
 - (2) Location
 - (3) Bowel sounds in hemithorax
 - e. Abnormal percussion finding
 - (1) Hyperresonance
 - (2) Hyporesonance
 - f. Heart sounds
 - (1) Muffled
 - (2) Distant
 - (3) Regurgitant murmur
 - g. Shift of apical impulse
 - h. Open wounds
 - i. Impaled object or penetration
 - j. Crepitation
 - k. Paradoxical movement of chest wall segment
- 9. Scaphoid abdomen
- 10. Decreased level of consciousness
- 11. ECG
 - a. ST - T wave elevation or depression

- b. Conduction disturbances
- c. Rhythm disturbances
- 12. History
 - a. Dyspnea
 - b. Chest pain
 - c. Associated symptoms
 - (1) Other areas of pain or discomfort
 - (2) Symptoms prior to incident
 - d. Past history of cardiorespiratory disease
 - e. Use of restraint in motor vehicle crash
- C. Management
 - 1. Airway and ventilation
 - a. Oxygen therapy
 - b. Endotracheal intubation
 - c. Needle cricothyrotomy
 - d. Surgical cricothyrotomy
 - e. Positive pressure ventilation
 - f. Occlude open wounds
 - g. Stabilize chest wall
 - 2. Circulation
 - a. Manage cardiac dysrhythmias
 - b. Intravenous access
 - 3. Pharmacologic
 - a. Analgesics
 - b. Antiarrhythmics
 - 4. Non-pharmacologic
 - a. Needle thoracostomy
 - b. Tube thoracostomy - in hospital management
 - c. Pericardiocentesis - in hospital management
 - 5. Transport considerations
 - a. Appropriate mode
 - b. Appropriate facility
- III. Chest wall injuries
 - A. Rib fractures
 - 1. Epidemiology
 - a. Incidence
 - (1) Infrequent until adult life
 - (2) Most often elderly patients
 - (3) Significant force required
 - b. Morbidity/ mortality
 - (1) Can lead to serious consequences
 - (2) Older ribs more brittle and rigid
 - (3) Associated underlying pulmonary or cardiovascular injury
 - (4) Increases with
 - (a) Age
 - (b) Number of fractures
 - (c) Location of fractures

2. Anatomy and physiology review
3. Pathophysiology
 - a. Most often caused by blunt trauma, bowing effect with midshaft fracture
 - b. Ribs 4 to 9 are most often fractured (thin and poorly protected)
 - c. Respiratory restriction due to pain and splinting
 - (1) Atelectasis
 - (2) Ventilation/ perfusion mismatch
 - d. May be associated with underlying lung or cardiac contusion
 - e. Intercostal vessel injury
 - f. Associated complications
 - (1) First and second ribs are injured by severe trauma
 - (a) Rupture of aorta
 - (b) Tracheobronchial tree injury
 - (c) Vascular injury
 - (2) Left lower rib injury associated with splenic rupture
 - (3) Right lower rib injury associated with hepatic injury
 - (4) Multiple rib fractures
 - (a) Atelectasis
 - (b) Hypoventilation
 - (c) Inadequate cough
 - (d) Pneumonia
 - (5) Open rib fracture associated with visceral injury
 - (6) Posterior rib fracture
 - (a) Fifth through ninth ribs most frequently injured
 - (b) Lower ribs associated with spleen and kidney injury
4. Assessment findings
 - a. Localized pain
 - b. Pain that worsens
 - (1) Movement
 - (2) Deep breathing
 - (3) Coughing
 - c. Point tenderness
 - d. Crepitus or audible crunch
 - e. Splinting on respiration
 - f. Anteroposterior pressure elicits pain
5. Management
 - a. Airway and ventilation
 - (1) Oxygen therapy
 - (2) Positive pressure ventilation
 - (3) Encourage coughing and deep breathing
 - b. Pharmacological
 - (1) Analgesics
 - c. Non-pharmacological
 - (1) Splint - but avoid circumferential splinting
 - d. Transport consideration
 - (1) Appropriate mode
 - (2) Appropriate facility
 - e. Psychological support/ communication strategies

- B. Flail segment
 - 1. Epidemiology
 - a. Incidence
 - (1) Most common cause is vehicular crash
 - (2) Falls from heights
 - (3) Industrial accidents
 - (4) Assault
 - (5) Birth trauma
 - b. Morbidity/ mortality
 - (1) Significant chest trauma
 - (2) Mortality rates 20-40% due to associated injuries
 - (3) Mortality increased with
 - (a) Advanced age
 - (b) Seven or more rib fractures
 - (c) Three or more associated injuries
 - (d) Shock
 - (e) Head injuries
 - 2. Pathophysiology
 - a. Three or more ribs fractured in two or more places producing a free floating segment of chest wall
 - b. Respiratory failure due to
 - (1) Underlying pulmonary contusion
 - (2) Associated intrathoracic injury
 - (3) Inadequate bellows action of chest
 - c. Paradoxical movement of the chest
 - (1) Minimal because of muscle spasm
 - (2) Must be large to compromise ventilation
 - d. Pain
 - (1) Reduces thoracic expansion
 - (2) Decreases ventilation
 - e. Pulmonary contusion
 - (1) Decreased lung compliance
 - (2) Intra alveolar-capillary hemorrhage
 - (3) Alveolar hemorrhage
 - f. Decreased ventilation
 - g. Impaired venous return with resultant ventilation-perfusion mismatch
 - h. Hypercapnia
 - i. Hypoxia
 - 3. Assessment findings
 - a. Chest wall contusion
 - b. Respiratory distress
 - c. Paradoxical chest wall movement
 - d. Pleuritic chest pain
 - e. Crepitus
 - f. Pain and splinting of affected side
 - g. Tachypnea
 - h. Tachycardia
 - i. Possible bundle branch block on ECG

- 4. Management
 - a. Airway and ventilation
 - (1) Positive pressure ventilation may be needed
 - (2) Oxygen (high concentration)
 - (3) Evaluate the need for endotracheal intubation
 - (4) Stabilize flail segment (may be controversial locally)
 - (5) Positive end expiratory pressure (PEEP)
 - b. Circulation
 - (1) Restrict fluids
 - c. Pharmacologic
 - (1) Analgesics
 - d. Non-pharmacologic
 - (1) Positioning
 - (2) Endotracheal intubation and positive pressure ventilation for internal splinting effect
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological support/ communication strategies
- C. Sternal fracture
 - 1. Epidemiology
 - a. Incidence
 - (1) 5-8% in blunt chest trauma
 - (2) Deceleration compression injury
 - (a) Steering wheel
 - (b) Dashboard
 - (3) Blow to chest
 - (4) Severe hyperflexion of thoracic cage
 - (5) Occur at or below the manubriosternal junction
 - b. Morbidity/ mortality
 - (1) 25-45% mortality
 - (2) High association with myocardial or lung injury
 - (a) Myocardial contusion
 - (b) Myocardial rupture
 - (c) Pulmonary contusion
 - 2. Pathophysiology
 - a. Associated injuries cause morbidity and mortality
 - (1) Pulmonary and myocardial contusion
 - (2) Flail chest
 - (3) Vascular disruption of thoracic vessels
 - (4) Intraabdominal injuries
 - (5) Head injuries
 - b. Rarely is fracture displaced posteriorly to directly impinge on heart or vessels
 - 3. Assessment findings
 - a. Localized pain
 - b. Tenderness over sternum
 - c. Crepitus
 - d. Tachypnea

- e. ECG changes associated with myocardial contusion
 - f. History of blunt trauma
 - 4. Management
 - a. Airway and ventilation
 - b. Circulation
 - (1) Restrict fluids if pulmonary contusion is suspected
 - 5. Pharmacologic
 - a. Analgesics
 - 6. Non-pharmacologic
 - a. Allow chest wall self-splinting
 - 7. Transport considerations
 - a. Appropriate mode
 - b. Appropriate facility
 - 8. Psychological support/ communication strategies
- IV. Injury to the lung
- A. Simple pneumothorax
 - 1. Epidemiology
 - a. Incidence
 - (1) 10-30% in blunt chest trauma
 - (2) Almost 100% with penetrating chest trauma
 - b. Morbidity/ mortality
 - (1) Extent of atelectasis
 - (2) Associated injuries
 - 2. Pathophysiology
 - a. Lung 1-3 cm away from the chest wall
 - b. May have stable amount of accumulation of air
 - c. Pulmonary function may be good
 - d. Internal wound allows air to enter the pleural space
 - e. Small tears self-seal, larger one may progress
 - f. Paper bag syndrome
 - g. If standing air will accumulate in the apices, check there first for diminished breath sounds otherwise, if supine it accumulates in the anterior chest
 - h. Trachea may tug towards the effected side
 - i. Ventilation/ perfusion mismatch
 - 3. Assessment findings
 - a. Tachypnea
 - b. Tachycardia
 - c. Respiratory distress
 - d. Absent or decreased breath sounds on affected side
 - e. Hyperresonance
 - f. Decreased chest wall movement
 - g. Dyspnea
 - h. Chest pain referred to shoulder or arm on affected side
 - i. Slight pleuritic chest pain
 - 4. Management
 - a. Airway and ventilation
 - (1) Positive pressure ventilation if necessary

- (2) Monitor for development of tension pneumothorax
 - b. Non-pharmacologic
 - (1) Needle thorocostomy
 - c. Transport consideration
 - (1) Appropriate mode
 - (2) Appropriate facility
 - 5. Psychological support/ communication strategies
- B. Open pneumothorax
 - 1. Epidemiology
 - a. Incidence
 - (1) Penetrating trauma
 - b. Morbidity/ mortality
 - (1) Profound hypoventilation could result
 - (2) Death related to delayed management
 - 2. Pathophysiology
 - a. Open defect in the chest wall
 - (1) Allows communication between pleural space and atmosphere
 - (2) Prevents development of negative intrapleural pressure
 - (3) Produces collapse of ipsilateral lung
 - (4) Inability to ventilate affected lung
 - (5) Ventilation/ perfusion mismatch
 - (a) Shunting
 - (b) Hypoventilation
 - (c) Hypoxia
 - (d) Large functional dead space
 - b. Air will enter pleural space during inspiratory phase
 - c. Air may exit during exhalation phase
 - d. Resistance to air flow through respiratory tract may be greater than through open wound resulting in ineffective respiratory effort
 - e. One way flap valve may let air in but not out resulting in built up pressure in pleural space
 - f. Direct lung injury may be present
 - g. Vena cava kinked from swaying of mediastinum
 - h. Preload decreased from knifing of inferior vena cava
 - 3. Assessment findings
 - a. To and fro air motion out of defect
 - b. Defect in the chest wall
 - c. Penetrating injury to the chest which does not seal itself
 - d. Sucking sound on inhalation
 - e. Tachycardia
 - f. Tachypnea
 - g. Respiratory distress
 - h. Subcutaneous emphysema
 - i. Decreases breath sounds on affected side
 - 4. Management
 - a. Airway and ventilation
 - (1) Positive pressure ventilation if necessary
 - (2) Monitor for development of tension pneumothorax

- b. Non-pharmacologic
 - (1) Occlude open wound
 - (2) Tube thoracostomy - in hospital management
 - c. Transport consideration
 - (1) Appropriate mode
 - (2) Appropriate facility
 - 5. Psychological support/ communication strategies
- C. Tension pneumothorax
- 1. Epidemiology
 - a. Incidence
 - (1) Penetrating trauma
 - (2) Blunt trauma
 - b. Morbidity/ mortality
 - (1) Profound hypoventilation could result
 - (2) Death related to delayed management
 - (3) Immediate life-threatening chest injury
 - 2. Pathophysiology
 - a. Defect in airway allowing communication with pleural space
 - b. Blunt trauma
 - (1) Penetration by rib fracture
 - (2) Sudden increase in intrapulmonary pressure
 - (3) Bronchial disruption from shear forces
 - c. Air trapped in pleural space with build up of pressure
 - d. Lung collapse on affected side with mediastinal shift to contralateral side
 - e. Lung collapse leads to right-to-left intrapulmonary shunting and hypoxia
 - f. Reduction in cardiac output
 - (1) Increased intrathoracic pressure
 - (2) Deformation of vena cava reducing preload (decreased venous return to heart)
 - 3. Assessment findings
 - a. Unilateral decreased or absent breath sounds
 - b. Dyspnea
 - c. Tachypnea
 - d. Respiratory distress
 - e. Extreme anxiety
 - f. Cyanosis
 - g. Bulging of intercostal muscles
 - h. Tachycardia
 - i. Hypotension
 - j. Narrow pulse pressure
 - k. Subcutaneous emphysema
 - l. Jugular venous distention
 - m. Tracheal deviation
 - n. Hyperresonance
 - 4. Management
 - a. Airway and ventilation
 - (1) Positive pressure ventilation if necessary
 - b. Circulation

- (1) Relieve tension pneumothorax to improve cardiac output
 - c. Non-pharmacologic
 - (1) Occlude open wound
 - (2) Needle thoracentesis
 - (a) Equipment
 - (b) Technique
 - (c) Assess the need for a second or third needle insertion
 - (3) Tube thoracostomy - in hospital management
 - d. Transport consideration
 - (1) Appropriate mode
 - (2) Appropriate facility
 - e. Psychological support/ communication strategies
- D. Hemothorax
 - 1. Epidemiology
 - a. Incidence
 - (1) Associated with pneumothorax
 - (2) Blunt or penetrating trauma
 - (3) Rib fractures are frequent cause
 - b. Morbidity/ mortality
 - (1) Life-threatening injury that frequently requires urgent chest tube and/ or surgery
 - (2) Hemothorax associated with great vessel or cardiac injury
 - (a) 50% will die immediately
 - (b) 25% live five to ten minutes
 - (c) 25% may live 30 minutes or longer
 - 2. Pathophysiology
 - a. Accumulation of blood in the pleural space
 - b. Bleeding from
 - (1) Penetrating or blunt lung injury
 - (2) Chest wall vessels
 - (3) Intercostal vessels
 - (4) Myocardium
 - c. Pulmonary parenchyma is low-pressure vascular system
 - d. Bleeding from pulmonary contusion generally causes 1000 to 1500 cc blood loss
 - e. Massive hemothorax indicates great vessel or cardiac injury
 - f. Collapse of ipsilateral lung
 - g. Respiratory insufficiency dependent on amount of blood
 - h. Hypoxia
 - i. Hypotension and inadequate perfusion may result from blood loss
 - j. Chest cavity can hold 2,000 to 3,000 ml of blood
 - k. Classified by amount of blood loss
 - l. Tissue pressure effects of legs, arms and abdomen versus thorax
 - (1) La Place law
 - (2) Extraluminal pressure in legs
 - (3) Extraluminal pressure in thorax
 - m. An intercostal artery can easily bleed 50 ccs per minute
 - n. Intrapulmonary hemorrhage
 - (1) Bronchus

- (2) Parenchyma
- 3. Assessment findings
 - a. Tachypnea
 - b. Tachycardia
 - c. Dyspnea
 - d. Respiratory distress
 - e. Hypotension
 - f. Narrow pulse pressure
 - g. Pleuritic chest pain
 - h. Pale, cool, moist skin
 - i. Dullness on percussion
 - j. Decreased breath sounds
- 4. Management
 - a. Airway and ventilation
 - (1) Positive pressure ventilation if necessary
 - b. Circulation
 - (1) Re-expand the affected lung to reduce bleeding
 - c. Non-pharmacological
 - (1) Needle chest decompression
 - (2) Tube thoracostomy - in hospital management
 - d. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - e. Psychological support/ communication strategies
- E. Hemopneumothorax
 - 1. Pathophysiology
 - a. Pneumothorax with bleeding in pleural space
 - 2. Assessment
 - a. Findings and management same as hemothorax
 - 3. Management
 - a. Management is the same as a hemothorax
- F. Pulmonary contusion
 - 1. Epidemiology
 - a. Incidence
 - (1) Blunt trauma to chest
 - (a) Most common injury from blunt thoracic trauma
 - (b) 30-75% with blunt trauma have pulmonary contusion
 - (2) Associated commonly with rib fracture
 - (3) High energy shock waves from explosion
 - (4) High velocity missile wounds
 - (5) Rapid deceleration
 - (6) High incidence of extrathoracic injuries
 - (7) Low velocity - ice pick
 - b. Morbidity/ mortality
 - (1) Missed due to high incidence of other associated injuries
 - (2) Mortality between 14-20%
 - 2. Pathophysiology
 - a. Three physical mechanisms

- (1) Implosion effect
 - (a) Overexpansion of air in lungs secondary to positive-pressure concussive wave
 - (b) Rapid excessive stretching and tearing of alveoli
- (2) Inertial effect
 - (a) Strips alveoli from heavier bronchial structures when accelerated at varying rates by concussive wave
- (3) Spalding effect
 - (a) Liquid-gas interface is disrupted by shock-wave
 - (b) Wave releases energy
 - (c) Differential transmission of energy causes disruption of tissue
- b. Alveolar and capillary damage with interstitial and intraalveolar extravasation of blood
- c. Interstitial edema
- d. Increased capillary membrane permeability
- e. Gas exchange disturbances
- f. Hypoxemia and carbon dioxide retention
- g. Hypoxia causes reflex thickening of mucous secretions
 - (1) Bronchiolar obstruction
 - (2) Atelectasis
- h. Blood is shunted away from unventilated alveoli leading to further hypoxemia
- 3. Assessment findings
 - a. Tachypnea
 - b. Tachycardia
 - c. Cough
 - d. Hemoptysis
 - e. Apprehension
 - f. Respiratory distress
 - g. Dyspnea
 - h. Evidence of blunt chest trauma
 - i. Cyanosis
- 4. Management
 - a. Airway and ventilation
 - (1) Positive pressure ventilation if necessary
 - b. Circulation
 - (1) Restrict intravenous fluids (use caution restricting fluids in hypovolemic patients)
 - c. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - d. Psychological support/ communication strategies

- V. Myocardial injuries
 - A. Pericardial tamponade
 - 1. Epidemiology
 - a. Incidence
 - (1) Rare in blunt trauma
 - (2) Penetrating trauma

- (3) Occurs in less than 2% of chest trauma
- b. Morbidity/ mortality
 - (1) Gunshot wounds carry higher mortality than stab wounds
 - (2) Lower mortality rate if isolated tamponade is present
- 2. Anatomy and physiology
 - a. Pericardium
 - (1) Tough fibrous sac
 - (2) Encloses heart
 - (3) Attaches to great vessels at the base of heart
 - (4) Two layers
 - (a) Visceral forms epicardium
 - (b) Parietal regarded as sac itself
 - (5) Purposes
 - (a) Anchor heart
 - (b) Restricts excess movement
 - (c) Prevents kinking of great vessels
 - (6) Parietal layer is acutely nondispensable but can chronically distend by as much as 1,000 to 1,500 ml
 - (7) Space between visceral and parietal layer is "potential space"
 - (8) Space normally filled with 30-50 ml of straw-colored fluid secreted by visceral layer
 - (a) Lubrication
 - (b) Lymphatic drainage
 - (c) Immunologic protection for heart
- 3. Pathophysiology
 - a. Rapid accumulation of fluid over a period of minutes to hours leads to increases in intrapericardial pressure
 - b. Increased intrapericardial pressure
 - (1) Compresses heart and decreases cardiac output due to restricted diastolic expansion and filling
 - (2) Hampers venous return
 - c. Myocardial perfusion decreases due to pressure effects on walls of heart and decreased diastolic pressures
 - d. Ischemic dysfunction may result in infarction
 - e. Removal of as little as 20 ml of blood may drastically improve cardiac output
- 4. Assessment findings
 - a. Tachycardia
 - b. Respiratory distress
 - c. Narrow pulse pressure
 - d. Pulsus paradoxus
 - e. Cyanosis
 - (1) Head
 - (2) Neck
 - (3) Upper extremities
 - f. Beck's triad - advanced stage seen in only 30% of patients
 - (1) Hypotension
 - (2) Neck vein distention
 - (3) Muffled heart tones

- g. Kussmaul's sign
- h. ECG changes
- 5. Management
 - a. Airway and ventilation
 - b. Circulation
 - (1) Fluid challenge
 - c. Non-pharmacological
 - (1) Pericardiocentesis - in hospital management
 - d. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - e. Psychological support/ communication strategies
- B. Myocardial contusion (blunt myocardial injury)
 - 1. Epidemiology
 - a. Incidence
 - (1) 16-76% of blunt trauma
 - b. Morbidity/ mortality
 - (1) Significant cause of morbidity and mortality in the blunt trauma patient
 - 2. Pathophysiology
 - a. Hemorrhage with edema and fragmented myocardial fibers
 - b. Cellular injury
 - c. Vascular damage may occur
 - d. Hemopericardium may occur from lacerated epicardium or endocardium
 - e. Fibrinous reaction at contusion site may lead to
 - (1) Delayed rupture
 - (2) Ventricular aneurysm
 - f. Areas of damage are well demarcated
 - g. Conduction defects
 - 3. Assessment findings
 - a. Associated injuries
 - (1) One to three rib fractures
 - (2) Sternal fracture
 - b. Retrosternal chest pain
 - c. ECG changes
 - (1) Persistent tachycardia
 - (2) ST elevation, T wave inversion
 - (3) Right bundle branch block
 - (4) Atrial flutter, fibrillation
 - (5) Premature ventricular contractions
 - (6) Premature atrial contractions
 - d. New cardiac murmur
 - e. Pericardial friction rub (late)
 - 4. Management
 - a. Airway and ventilation
 - (1) Oxygen therapy
 - b. Circulation
 - (1) Intravenous fluid volume
 - c. Pharmacological

- (1) Antiarrhythmics
 - (2) Vasopressors
 - d. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - e. Psychological support/ communication strategies
 - C. Myocardial rupture
 - 1. Associated with immediate trauma or delayed for 2-3 weeks
 - 2. Associates with blunt trauma
 - a. Compression between sternum and vertebrae
 - 3. Penetrating trauma
 - a. Rib
 - b. Missile
 - c. Sternal bone
 - 4. History of trauma with a presentation of
 - a. Congestive heart failure
 - b. Cardiac tamponade
 - 5. Immediate onset of congestive heart failure following trauma
 - a. Rupture of cardiac valves
 - b. Intraventricular septal rupture
 - 6. Management is supportive
- VI. Vascular injuries
 - A. Aortic dissection/ rupture
 - 1. Epidemiology
 - a. Incidence
 - (1) Blunt trauma
 - (a) Motor vehicle crash
 - (b) Falls
 - (2) 15% of all blunt trauma deaths
 - 2. Morbidity/ mortality
 - a. 85-95% die instantaneously
 - b. 10-15% survive to arrive at hospital
 - (1) 33% of survivors die within six hours
 - (2) 33% of survivors die within twenty-four hours
 - (3) 33% survive three days or longer
 - 3. Pathophysiology
 - a. Shear injury
 - b. Separation of the aortic intima and media
 - c. Blood enters media through a small intima tear
 - d. Tear due to effect of high speed deceleration on portions of the aorta at points of relative fixation
 - e. Increased intraluminal pressure results from impact
 - f. Thinned out layer may rupture
 - g. Descending aorta at the isthmus just distal to left subclavian artery is most common site of rupture (ligamentum arteriosum)
 - h. Ruptures of ascending aorta much less common
 - 4. Assessment findings
 - a. Retrosternal or interscapular pain

- b. Dyspnea
- c. Dysphagia
- d. Ischemic pain of the extremities
- e. Upper extremity hypertension with absent or decreased amplitude of femoral pulses
- f. Harsh systolic murmur over precordium or interscapular region
- 5. Management
 - a. Airway and ventilation
 - b. Circulation
 - (1) Do not over hydrate
 - c. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - d. Psychological support/ communication strategies
- B. Penetrating wounds of the great vessels
 - 1. Usually involve
 - a. Chest
 - b. Abdomen
 - c. Neck
 - 2. Wounds are accompanied by
 - a. Massive hemothorax
 - b. Hypovolemic shock
 - c. Cardiac tamponade
 - d. Enlarging hematomas
 - 3. Hematomas may cause compression of any structure
 - a. Vena cava
 - b. Trachea
 - c. Esophagus
 - d. Great vessels
 - e. Heart
 - 4. Management
 - a. Manage hypovolemia
 - (1) PASG not recommended
 - b. Relief of tamponade if present
 - c. Expeditious transport
- VII. Other thorax injuries
 - A. Diaphragmatic injury
 - 1. Epidemiology
 - a. Incidence
 - (1) Blunt trauma
 - (2) Penetrating trauma
 - (3) Frequently encountered injury
 - b. Morbidity/ mortality
 - (1) Could be life-threatening
 - 2. Pathophysiology
 - a. High-pressure compression to abdomen with resultant intra-abdominal pressure increase

- b. Can produce very subtle signs and symptoms
- c. Bowel obstruction and strangulation
- d. Restriction of lung expansion
 - (1) Hypoventilation
 - (2) Hypoxia
- e. Mediastinal shift
 - (1) Cardiac compromise
 - (2) Respiratory compromise
- 3. Assessment findings
 - a. Tachypnea
 - b. Tachycardia
 - c. Respiratory distress
 - d. Dullness to percussion
 - e. Scaphoid abdomen
 - f. Bowel sounds in affected hemithorax
 - g. Decreased breath sounds
- 4. Management
 - a. Airway and ventilation
 - (1) Positive pressure ventilation if necessary
 - (2) Caution IPPB may worsen the injury
 - b. Non-pharmacologic
 - (1) Do not place patient in Trendelenburg position
 - c. Transport consideration
 - (1) Appropriate mode
 - (2) Appropriate facility
 - d. Psychological support/ communication strategies
- B. Esophageal injury
 - 1. Epidemiology
 - a. Incidence
 - (1) Penetrating trauma most frequent cause
 - (2) Rare in blunt trauma
 - b. Morbidity/ mortality
 - (1) Could be life-threatening if missed
 - 2. Pathophysiology
 - a. Missile and knife wounds penetrate esophagus
 - b. Can perforate spontaneously
 - (1) Violent emesis
 - (2) Carcinoma
 - (3) Anatomic distortions produced by diverticulae or gastric reflux
 - 3. Assessment findings
 - a. Pain
 - b. Fever
 - c. Hoarseness
 - d. Dysphagia
 - e. Respiratory distress
 - f. Cervical esophageal perforation
 - (1) Local tenderness
 - (2) Subcutaneous emphysema

- (3) Resistance of neck on passive motion
 - g. Intrathoracic esophageal perforation
 - (1) Mediastinal emphysema
 - (2) Mediastinitis
 - (3) Subcutaneous emphysema
 - (4) Mediastinal crunch
 - (5) Splinting of chest wall
 - h. Respiratory distress
 - i. Shock
 - 4. Management
 - a. Airway and ventilation
 - b. Transport consideration
 - (1) Appropriate mode
 - (2) Appropriate facility
 - c. Psychological support/ communication strategies
- C. Tracheo-bronchial injuries
 - 1. Epidemiology
 - a. Incidence
 - (1) Rare injury - less than 3% of chest trauma
 - (2) Penetrating trauma
 - (3) Blunt trauma
 - b. Morbidity/ mortality
 - (1) High mortality rate - greater than 30%
 - 2. Pathophysiology
 - a. Majority occur within 3 cm of carina
 - b. Tear can occur anywhere along tracheal/ bronchial tree
 - c. Rapid movement of air into pleural space
 - d. Tension pneumothorax refractory to needle decompression
 - e. Continuous flow of air from needle of decompressed chest
 - f. Severe hypoxia
 - 3. Assessment
 - a. Tachypnea
 - b. Tachycardia
 - c. Massive subcutaneous emphysema
 - d. Dyspnea
 - e. Respiratory distress
 - f. Hemoptysis
 - g. Signs of tension pneumothorax that doesn't respond to needle decompression
 - 4. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Transport consideration
 - (1) Appropriate mode
 - (2) Appropriate facility
- D. Traumatic asphyxia
 - 1. Epidemiology
 - a. Incidence
 - b. Morbidity/ mortality

2. Pathophysiology
 - a. Sudden compressional force squeezes the chest
 - b. Blood backs up into the head and neck
 - c. Jugular veins engorge, capillaries rupture
3. Assessment
 - a. Cyanosis to the face and upper neck
 - b. Jugular venous distention
 - c. Swelling or hemorrhage of the conjunctiva
 - d. Skin below area remains pink
 - e. Hypotension when pressure released
4. Management
 - a. Airway and ventilation
 - b. Circulation
 - (1) Expect hypotension once compression is released
 - c. Pharmacological
 - (1) Sodium bicarbonate should be guided by ABGs in hospital
 - d. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility

VIII. Integration

UNIT TERMINAL OBJECTIVE

4-9 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and the assessment findings to formulate a field impression and implement the treatment plan for the patient with a musculoskeletal injury.

COGNITIVE OBJECTIVE

At the completion of this unit, the paramedic student will be able to:

- 4-9.1 Describe the incidence, morbidity, and mortality of musculoskeletal injuries. (C-1)
- 4-9.2 Discuss the anatomy and physiology of the musculoskeletal system. (C-1)
- 4-9.3 Predict injuries based on the mechanism of injury, including: (C-3)
 - 1. Direct
 - 2. Indirect
 - 3. Pathologic
- 4-9.4 Discuss the types of musculoskeletal injuries: (C-1)
 - a. Fracture (open and closed)
 - 2. Dislocation/ fracture
 - 3. Sprain
 - 4. Strain
- 4-9.5 Discuss the pathophysiology of musculoskeletal injuries. (C-1)
- 4-9.6 Discuss the assessment findings associated with musculoskeletal injuries. (C-1)
- 4-9.7 List the six "P"s of musculoskeletal injury assessment. (C-1)
- 4-9.8 List the primary signs and symptoms of extremity trauma. (C-1)
- 4-9.9 List other signs and symptoms that can indicate less obvious extremity injury. (C-1)
- 4-9.10 Discuss the need for assessment of pulses, motor and sensation before and after splinting. (C-1)
- 4-9.11 Identify the need for rapid intervention and transport when dealing with musculoskeletal injuries. (C-1)
- 4-9.12 Discuss the management of musculoskeletal injuries. (C-1)
- 4-9.13 Discuss the general guidelines for splinting. (C-1)
- 4-9.14 Explain the benefits of cold application for musculoskeletal injury. (C-1)
- 4-9.15 Explain the benefits of heat application for musculoskeletal injury. (C-1)
- 4-9.16 Describe age associated changes in the bones. (C-1)
- 4-9.17 Discuss the pathophysiology of open and closed fractures. (C-1)
- 4-9.18 Discuss the relationship between volume of hemorrhage and open or closed fractures. (C-3)
- 4-9.19 Discuss the assessment findings associated with fractures. (C-1)
- 4-9.20 Discuss the management of fractures. (C-1)
- 4-9.21 Discuss the usefulness of the pneumatic anti-shock garment (PASG) in the management of fractures. (C-1)
- 4-9.22 Describe the special considerations involved in femur fracture management. (C-1)
- 4-9.23 Discuss the pathophysiology of dislocations. (C-1)
- 4-9.24 Discuss the assessment findings of dislocations. (C-1)
- 4-9.25 Discuss the out-of-hospital management of dislocation/ fractures, including splinting and realignment. (C-1)
- 4-9.26 Explain the importance of manipulating a knee dislocation/ fracture with an absent distal pulse. (C-1)
- 4-9.27 Describe the procedure for reduction of a shoulder, finger or ankle dislocation/ fracture. (C-1)

- 4-9.28 Discuss the pathophysiology of sprains. (C-1)
- 4-9.29 Discuss the assessment findings of sprains. (C-1)
- 4-9.30 Discuss the management of sprains. (C-1)
- 4-9.31 Discuss the pathophysiology of strains. (C-1)
- 4-9.32 Discuss the assessment findings of strains. (C-1)
- 4-9.33 Discuss the management of strains. (C-1)
- 4-9.34 Discuss the pathophysiology of a tendon injury. (C-1)
- 4-9.35 Discuss the assessment findings of tendon injury. (C-1)
- 4-9.36 Discuss the management of a tendon injury. (C-1)
- 4-9.37 Integrate the pathophysiological principles to the assessment of a patient with a musculoskeletal injury. (C-3)
- 4-9.38 Differentiate between musculoskeletal injuries based on the assessment findings and history. (C-3)
- 4-9.39 Formulate a field impression of a musculoskeletal injury based on the assessment findings. (C-3)
- 4-9.40 Develop a patient management plan for the musculoskeletal injury based on the field impression. (C-3)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 4-9.41 Advocate the use of a thorough assessment to determine a working diagnosis and treatment plan for musculoskeletal injuries. (A-3)
- 4-9.42 Advocate for the use of pain management in the treatment of musculoskeletal injuries. (A-3)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 4-9.43 Demonstrate a clinical assessment to determine the proper treatment plan for a patient with a suspected musculoskeletal injury. (P-1)
- 4-9.44 Demonstrate the proper use of fixation, soft and traction splints for a patient with a suspected fracture. (P-1)

DECLARATIVE

- I. Introduction
 - A. Epidemiology
 1. Incidence
 - a. 70-80% of polytrauma patients suffer musculoskeletal injuries
 - b. Blunt trauma
 - c. Penetrating trauma
 2. Mortality/ morbidity
 - a. Upper extremity injury
 - (1) Contribute to long-term impairment
 - (2) Rarely life-threatening
 - b. Lower extremity injury
 - (1) Associated with higher magnitudes of injury
 - (2) More significant blood loss
 - (3) More difficult to manage in polytrauma patient
 - (4) Femur and pelvic injuries may constitute life threats
 3. Risk factors
 4. Prevention strategies
 - a. Proper sports training
 - b. Wearing seat belts
 - c. Child safety seats
 - d. Airbags
 - e. Gun safety and education
 - f. Motorcycle driver education
 - g. Fall prevention
 - h. Highrise window guards
 - i. Other means of preventing musculoskeletal trauma
 5. Review of musculoskeletal anatomy
 - a. Skin
 - (1) Layer
 - (2) Thickness
 - b. Subcutaneous
 - (1) Fat
 - (2) Fascia
 - c. General breakdown of the skeletal system
 - (1) Axial skeleton
 - (a) Forms the central (longitudinal) axis of the body, includes the following bones
 - i) Skull
 - ii) Vertebral column
 - iii) Bony thorax
 - (b) Appendicular skeleton
 - (c) Pectoral girdle - bones that attach the upper limbs to the axial skeleton

- i) Clavicle
 - ii) Scapula
 - (d) Pelvic girdle - consists of the paired bones of the pelvis that attach the lower limbs to the axial skeleton, and the sacrum
 - (2) Vessels
 - (a) Arteries
 - i) Axillary
 - ii) Brachial
 - iii) Radial
 - iv) Ulnar
 - v) Hand arcade
 - vi) Digital
 - vii) Femoral
 - viii) Popliteal
 - ix) Dorsalis pedis
 - x) Posterior tibial
 - xi) Anterior tibial
 - xii) Foot arcade
 - xiii) Digital
 - (3) Muscles
 - (a) Latissimus dorsi
 - (b) Trapezius
 - (c) Rhomboids
 - (d) Deltoid
 - (e) Triceps
 - (f) Biceps
 - (g) Forearm extensors
 - (h) Intrinsic muscles of hand
 - (i) Hamstring group
 - (j) Quadriceps group
 - (k) Adductor group
 - (l) Gastrocnemius solius
 - (m) Intraosseous
 - (4) Tendons
 - (a) Extensors
 - (b) Flexors
 - (5) Bones
 - (a) Components of a longbone
 - i) Diaphysis
 - a) Long, narrow shaft
 - b) Very dense, compact bone
 - c) Yellow bone marrow that stores fat
 - ii) Periosteum
 - a) Outer covering for long bones
 - b) Vascular and full of nerves

- c) Haversian canals allow circulation of blood
 - iii) Epiphysis
 - a) Articulated, widened end
 - b) Cancellous bone filled with red blood marrow
 - c) Responsible for growth in the infant and child
 - d) Weakest point in a child's bone and weaker than a child's ligaments
 - iv) Metaphysis
 - a) Area between the epiphysis and diaphysis
- (6) Scapulae
 - (a) Upper division
 - (b) Lower division
 - (c) Glenoid fossa
- (7) Clavicle
 - (a) Claviculo-sternal joint
 - (b) Acromio-clavicular joint
- (8) Humerus
 - (a) Head
 - i) Anatomical neck
 - ii) Surgical neck
 - (b) Tuberosities
 - (c) Shoulder joint
 - (d) Neck
 - (e) Shaft
 - (f) Medial condyle
 - (g) Lateral condyle
 - (h) Elbow
- (9) Radius
 - (a) Elbow
 - (b) Head
 - (c) Shaft
 - (d) Wrist
- (10) Ulna
 - (a) Elbow
 - (b) Olecranon
 - (c) Shaft
 - (d) Wrist
- (11) Carpals
 - (a) Articulation
 - (b) Wrist
 - (c) Metacarpal joint
- (12) Metacarpals
 - (a) Articulations
 - (b) Shaft
- (13) Phalanges

- (a) Metacarpal-phalange joint
- (b) Proximal intraphalange joint
- (c) Distal intraphalange joint
- (14) Pelvis
 - (a) Ilium
 - (b) Ischium
 - (c) Pubis
 - (d) Acetabulum
- (15) Femur
 - (a) Hip joint
 - (b) Head
 - (c) Neck
 - (d) Trochanters
 - i) Greater trochanter
 - ii) Lesser trochanter
 - (e) Shaft
 - (f) Medial and lateral condyles
- (16) Tibia
 - (a) Knee joint
 - (b) Articular surfaces/ plateaus
 - (c) Shaft
 - (d) Medial malleolus
- (17) Fibula
 - (a) Head
 - (b) Shaft
 - (c) Lateral malleolus
- (18) Talus
 - (a) Ankle joint
 - (b) Articulation
- (19) Calcaneus
 - (a) Heel
 - (b) Articulation
- (20) Tarsals
 - (a) Articulations
 - (b) Arch
- (21) Metatarsal
 - (a) Arch
 - (b) Articulations
- (22) Phalanges
 - (a) Shaft
 - (b) Joints
- d. Function
 - (1) Flexion
 - (2) Extension
 - (3) Rotation

- e. Age associated changes in bones
 - (1) Morphological changes
 - (a) Water content of intervertebral disks decreases
 - (b) Increased risk of disk herniation
 - (c) Loss of 1/2 to 3/4 inch in stature is common
 - (d) Bone tissue disorders shorten the trunk
 - (e) Vertebral column gradually assumes an arc shape
 - (f) Costal cartilages ossify making the thorax more rigid
 - (g) Shallow breathing due to rigid thoracic cage
 - (h) Facial contours change
 - (2) Fractures
 - (a) Bones are more prone to fracture since they are more porous and brittle
 - (b) Vertebral and femoral neck fractures are most common
 - (c) Degree of bone disorder (osteoporosis) is related to incidence of fracture
- 6. Physiology
 - a. Purpose of the muscles
 - (1) Cardiac muscle
 - (a) Contracts rhythmically on its own
 - (b) Generates electrical impulses
 - i) Automaticity
 - ii) Excitability
 - iii) Conductivity
 - (2) Smooth muscle
 - (a) Found in lower airways, blood vessels, intestines
 - (b) Under control of automatic nervous system
 - (c) Can relax or contract to alter the inner lumen diameter
 - (3) Skeletal muscle
 - (a) Under conscious control
 - (b) Major muscle mass of the body, allows mobility
 - b. Muscular support of skeleton
 - (1) Tendons
 - (a) Bands of connective tissue binding muscles to bones (M-T-B)
 - (b) Allows for power of movement across the joints
 - (2) Cartilage
 - (a) Connective tissue covering the epiphysis
 - (b) Act as surface for articulation
 - (c) Allow for smooth movement at joints
 - (3) Ligaments
 - (a) Connective tissue which support joints
 - (b) Attach to bone ends
 - (c) Allow for stable range of motion
 - c. Purpose of the bones
 - (1) Acts as a structural form, protects vital organs

- (2) Acts as point of attachment for tendons, cartilage, and ligaments
- (3) Structure for muscles to allow movement
- (4) Stores salts and metabolic materials
- (5) Produces red blood cells
- d. Structural classifications of joints
 - (1) Fibrous
 - (a) Sutures - immovable
 - i) An immovable joint with one exception
 - ii) All bones of the skull are united by sutures
 - (b) Syndesmoses
 - (c) Gomphoses
 - (2) Cartilaginous
 - (a) Defined
 - (b) Synchondroses
 - (c) Symphysis
 - (3) Synovial
 - (a) Defined - fluid filled chamber which lubricates articulated surfaces
 - (b) Types of synovial joints
 - i) Plane
 - ii) Hinge
 - iii) Pivot
 - iv) Condylloid
 - v) Saddle
 - vi) Ball and socket
- e. Movements allowed by synovial joints
 - (1) Gliding
 - (2) Angular movements
 - (a) Flexion
 - (b) Extension
 - (c) Abduction
 - (d) Adduction
 - (e) Circumduction
 - (3) Rotation
- f. The interrelationship of the musculoskeletal system working together to move a complex joint (e.g., the knee)

- II. Musculoskeletal pathophysiology-adult
 - A. Problems associated with musculoskeletal injuries
 - 1. Hemorrhage
 - 2. Instability
 - 3. Loss of tissue
 - 4. Simple lacerations and contamination
 - 5. Interruption of blood supply
 - 6. Long term disability

- B. Fractures
 - 1. Types
 - a. Open (compound)
 - b. Closed (simple)
 - 2. Location
 - a. Humerus
 - b. Radius
 - (1) Silver fork deformity
 - c. Ulna
 - d. Metacarpal
 - e. Phalange
 - f. Pelvis
 - (1) Complications
 - (a) Hemorrhage
 - (b) Associated organs
 - (c) Pregnancy complications
 - (d) Associated dislocations
 - g. Femur
 - (1) Head
 - (2) Neck
 - (3) Intertrochanteric
 - (4) Subtrochanteric
 - (5) Shaft
 - (6) Condylar
 - (7) Supra condylar
 - h. Tibia
 - (1) Plateau
 - (2) Shaft
 - (3) Ankle
 - i. Fibula
 - (1) Shaft
 - (2) Isolated
 - (3) Ankle
 - j. Ankle
 - (1) Dislocation/ fracture
 - (2) Malleal fracture
 - (3) Tri malleolar
 - k. Foot
 - (1) Calcanei
 - (2) March fracture
 - (3) Meta tarsal dislocation
 - (4) Phalanges
 - 3. X-ray descriptions of fractures
 - a. Greenstick
 - b. Oblique

- c. Transverse
 - d. Comminuted
 - e. Spiral
 - f. Impacted
 - g. Epiphyseal fractures (in children)
- C. Relate kinematics to the following injuries
- 1. Open fractures - break where protruding bone causes a soft tissue injury
 - a. Some bones are very close to the surface - reach down and touch your shin
 - b. EMS objective not to turn a closed fracture into an open fracture
 - 2. Closed fractures - break in the bone which has not yet penetrated the soft tissue
 - a. May not be as obvious, yet serious potential for other injuries
 - 3. Comminuted fractures - a break which involves several breaks in the bone causing bone fragment damage; consider the combined blood loss and potential for other injuries
 - 4. Greenstick fractures - a bone break in which the bone is bent but only broken on the outside of the bend; children are most likely to have these
 - 5. Spiral fracture - a bone break caused by a twisting motion
 - 6. Oblique fracture - a bone break at a slanting angle across the bone
 - 7. Transverse fracture - a broken bone that occurs at right angles to the long part of the bone involved
 - 8. Dislocations - a bone moved from its normal position at a joint and may have associated fractures
 - 9. Sprains - an injury to the tendons, muscles or ligaments around a joint, marked by pain, swelling, and dislocation of the skin over the joint
 - 10. Strains - damage, usually muscular, that results from excessive physical effort
 - 11. Joint injury - may be a fracture, dislocation or sprain
 - 12. Stress fracture - a bone break, especially one or more of the foot bones, caused by repeated, long-term, or abnormal stress
- D. Pathological fractures
- E. Vascular injuries
- F. Dislocations and subluxations
- 1. Subluxation
 - a. Partial dislocation of a joint with great damage and instability
 - 2. Luxation
 - a. Complete dislocation of a joint
 - 3. Dislocation
 - a. Frank displacement of bone ends at the joint
 - 4. Specific injuries
 - a. Acromio clavicular
 - b. Shoulder
 - c. Elbow
 - d. Wrist
 - e. Metacarpal-phalange
 - f. Phalange
 - g. Hip
 - (1) Posterior

- (2) Anterior
 - (3) Associated with fracture
 - h. Knee
 - (1) Posterior
 - (2) Anterior
 - (3) Patella
 - i. Ankle
 - (1) Posterior
 - (2) Fracture association
 - j. Foot
 - k. Hand
- G. Lacerations
 - 1. Protection
 - 2. Hemostasis
 - 3. Dressing
- H. Hematoma
- I. Sprains and strains
 - 1. Sprain
 - a. Tearing of the ligaments surrounding a joint
 - b. Grades
 - (1) Grade I
 - (2) Grade II
 - (3) Grade III
 - (4) Repeated Grade I sprains can result in ligamentous stretching
 - (5) Grade III sprains can present the same as a fracture
 - 2. Strain
 - a. Overstretching of a muscle or tendon
 - b. Examples
- J. Typical blood loss in an uncomplicated fracture during the first two hours
 - 1. Tibia/ fibula - 550 ml
 - 2. Femur - 1000 ml
 - 3. Pelvis - 2000 ml
- K. Complications associated with fractures
 - 1. Can exsanguinate from a fracture involving an artery laceration (e.g., femoral)
 - 2. Major blood loss can occur at the break point
 - 3. Decreased distal pulse
 - 4. Diminished distal sensory or motor function
 - 5. Crushing injury
 - 6. Amputation/ avulsion
- L. Inflammatory and degenerative conditions
 - 1. Bursitis and tendinitis
 - 2. Arthritis
 - a. Osteoarthritis
 - b. Rheumatoid arthritis
 - c. Gouty arthritis

- III. Musculoskeletal assessment
 - A. Four classes of patients with musculoskeletal trauma
 - 1. Patients with life/ limb-threatening injuries or conditions, including life/ limb-threatening musculoskeletal trauma
 - 2. Patients with other life/ limb-threatening injuries and only simple musculoskeletal trauma
 - 3. Patients with life/ limb-threatening musculoskeletal trauma and no other life/ limb-threatening injuries
 - 4. Patients with only isolated, non-life/ limb-threatening injuries
 - B. Conduct the initial survey first to determine if there are any life-threats
 - 1. Care for life-threatening conditions first
 - 2. Never overlook life/ limb-threatening musculoskeletal trauma
 - 3. Never allow a horrible looking, but noncritical musculoskeletal injury to distract you
 - C. The six "p"s of musculoskeletal assessment
 - 1. Pain
 - a. Pain on palpation (tenderness)
 - b. Pain upon movement
 - 2. Pallor - pale skin or poor capillary refill
 - 3. Paresthesia - pins and needles sensation
 - 4. Pulses - diminished or absent
 - 5. Paralysis - inability to move
 - 6. Pressure
 - D. Assessment of musculoskeletal injury
 - 1. General findings - inspect and palpate DCAP-BTLS
 - a. Deformity
 - b. Contusions
 - c. Abrasions
 - d. Penetrations or punctures
 - e. Burns
 - f. Tenderness
 - g. Lacerations
 - h. Swelling
 - 2. Specific findings - inspect and palpate
 - a. Position found
 - b. Hematoma
 - c. Dislocation
 - d. Cyanosis
 - e. Motion - reduced or abnormally enlarged range
 - f. Bleeding
 - g. Guarding or self-splinting
 - h. Crepitus
 - E. Assessment findings - palpation
 - 1. Tenderness or pain
 - 2. Deformation
 - 3. Crepitation

4. Swelling/ skin tension
 5. Pulses
 6. Capillary refilling
 7. Innervation
 - F. Special sports considerations
 1. Mechanism of injury
 - a. Football
 - b. Basketball
 - c. In-line skating
 - d. Skiing or snow boarding
 - e. Wrestling
 - f. Soccer
 - g. Rock climbing
 2. Special sports injuries
 - a. Shoulder
 - b. Elbow
 - c. Wrist
 - d. Clavicle
 - e. Knee
 - f. Ankle
 - g. Foot
 - h. Tibia/ fibula
 3. Interfacing with athletic trainers
- IV. Management
- A. General principles
 1. Splint joint above and below as well as bone ends
 2. Immobilize open and closed fracture the same
 3. Cover open fracture to minimize contamination
 4. Check pulses, sensation, and motor function before and after splinting
 5. Stabilize with gentle in-line traction to position of normal alignment
 6. Immobilize where they are found not in the exact position the limb is found
 - a. It makes most sense to move a long bone injury into a “splintable” straight position
 - b. Joint injuries are only moved if there is no distal pulse
 7. Immobilize dislocation/ fractures in position of comfort and good vascular supply
 8. Immobilize joints as found
 9. Application of cold
 - a. Reduce swelling
 - b. Reduce pain
 10. Compression
 11. Elevation of extremities
 - B. Splints - rigid, formable, traction
 1. Cardboard
 2. Wood

3. Air
 4. Traction
 - a. History
 - b. Principle
 - c. Types
 - (1) Unipolar
 - (2) Bipolar
 5. Vacuum
 6. Pillow/ blanket
 7. Short spinal immobilization devices
 - a. Refer to spinal injury section
 8. Long spinal immobilization devices
 - a. Ultimate body splint
 - b. Refer to spinal injury section
- C. Dislocation/ fractures
1. Realignment
 - a. Typically dislocated joints should be immobilized in the position of injury and transported for reduction
 - b. Delayed or prolonged transport requires a different approach
 - c. An attempt to reposition any dislocated joint into anatomical position should be made if distal circulation is impaired and if transportation is long or prolonged
 - d. Check circulation and nerve function before and after any manipulation of any injured bone or joint
 - e. Discontinue an attempt at repositioning if
 - (1) Pain is increased significantly by manipulation, and/ or
 - (2) Resistance to movement is encountered
 2. Limb-threatening injuries
 - a. Knee dislocation/ fracture
 - b. Dislocation/ fracture of the ankle
 - c. Subcondular fractures of the elbow
 3. Always assess pulses, sensation, and motor function before and after manipulating the injury
 4. Specific techniques for specific joints
 - a. Finger realignment
 - b. Hip realignment
 - (1) One attempt if there is severe neurovascular compromise
 - (2) As soon as possible after the injury
 - (3) Do not attempt if associated with other severe injuries
 - (4) Analgesics
 - (5) Procedure
 - (a) Traction
 - (b) Hip 90 degrees
 - (c) Knee 90 degrees
 - (d) Along shaft of femur
 - (e) Steady and slow to relax muscle spasm

- (f) Success
 - i) "Pop" into joint
 - ii) Sudden relief of pain
 - iii) Leg can easily and painlessly be returned to full extension
 - (g) Immobilization, full extension, long backboard, reevaluation of pulses and innervation
 - (h) Immobilization, comfortable flexion not to exceed 90 degrees, pillows, chair, cardboard, supine position of patient
- c. Knee realignment - do not confuse with a patella dislocation, this is a limb-threatening injury
- (1) One attempt if there is severe neurovascular compromise
 - (2) As soon as possible after the injury
 - (3) An attempt to reposition a dislocation of the knee into anatomical position should be made if transport time is delayed or prolonged greater than two hours, even if distal circulation is normal
 - (4) Do not attempt if associated with other severe injuries
 - (5) Analgesics
 - (6) Procedure
 - (a) Apply gentle and steady traction and then move the injured joint into normal position
 - (b) Full extension
 - (c) Steady pull to relax muscle spasm
 - (d) Success
 - i) "Pop" into joint
 - ii) Loss of deformity
 - iii) Relief of pain
 - iv) Knee is now more mobile
 - (e) Immobilization, full extension, backboard, long board splints, no traction, assess pulses, position of greatest comfort, slight flexion
- d. Ankle realignment
- (1) One attempt if there is severe neurovascular compromise
 - (2) As soon as possible after the injury
 - (3) Do not attempt if associated with other severe injuries
 - (4) Analgesic
 - (5) Procedure
 - (a) Pull traction on the talus while stabilizing the tibia
 - (b) Slow and steady to relax spasm
 - (c) Success, sudden rotation to normal position
 - (d) Immobilization, as per fracture, check distal pulse
- e. Shoulder realignment
- (1) One attempt if there is severe neurovascular compromise
 - (2) As soon as possible after the injury
 - (3) Do not attempt if associated with other severe injuries or back injuries
 - (4) Analgesic

- (5) Procedure
 - (a) Pull traction in the anatomical position only
- D. Specific fracture pointers and immobilization techniques
 - 1. Pelvis
 - a. Backboard and PASG
 - b. Treat the hypoperfusion as pelvic fractures cause severe hemorrhage, losing greater than 2 liters of blood into the pelvic cavity
 - 2. Femur
 - a. Traction splinting procedure
 - (1) Direct manual stabilization of the injured leg
 - (2) Assess distal motor ability, sensory response, and circulation
 - (3) Rule out any contraindication to traction splinting
 - (4) Direct application of manual traction if elevating the leg from the ground
 - (5) Adjust and position splint at the injured leg
 - (6) Apply proximal securing device (e.g., ischial strap)
 - (7) Apply distal securing device (e.g., ankle hitch)
 - (8) Apply mechanical traction
 - (9) Position and secure support straps
 - (10) Re-evaluate the proximal/ distal circulation
 - (11) Reassess distal motor ability, sensory response, and circulation
 - (12) Secure patient's torso and traction splint to long backboard for transport
 - b. PASG and long backboard
 - c. Long backboard and long board splints
 - d. Opposite extremity and long backboard
 - e. Fractures of the proximal femur present similar to the anterior hip dislocation
 - f. Midshaft or distal femur fractures can have soft tissue, vascular and nerve damage
 - 3. Tibia/ fibula
 - a. Pneumatic splint
 - b. Long board splint procedure
 - (1) Take body substance isolation
 - (2) Direct application of manual stabilization
 - (3) Assess distal motor ability, sensory response, and circulation
 - (4) Measure splint
 - (5) Apply splint
 - (6) Immobilize joints above and below the injury site
 - (7) Secure the entire injured extremity in a distal to proximal direction
 - (8) Immobilize hand/ foot in the position of function
 - (9) Reassess distal motor ability, sensory response, and circulation
 - c. Splinting to the opposite leg
 - d. Cardboard
 - 4. Ankle - same as tibia/ fibula fractures, generally involves the distal tibia and fibula
 - a. Pillow splint and leg immobilization
 - b. Air splint
 - 5. Foot

- a. Pneumatic
 - b. Cardboard
 - c. Ladder splint
6. Shoulder dislocation/ fracture
- a. Anterior - arm close to the chest and hollow shoulder
 - b. Posterior - arm may be over the head
 - c. Splinting - be creative, improvise to hold the injury in place (e.g., blanket roll)
 - (1) Use a rolled blanket with a cravat through the center
 - (2) Position the roll under the elevated arm and secure it like a sling with the cravat through the blanket
 - (3) Swathe the arm to prevent upward movement
 - (4) If the arm is over the head - splint in position, or pull traction along the long axis of the arm
7. Knee
- a. High incidence of vascular and nerve damage
 - b. Any fracture within three inches of a joint should be treated similar to a dislocation
 - c. Use triangulation with cravats and two long padded splints
 - d. SAM splints are not strong enough for the knee while some ladder splints if properly padded will be effective with immobilization of the hip and ankle
 - e. Do not use a traction splint
 - f. If found straight use two board splints or cardboard splint
8. Humerus
- a. Difficult to stabilize
 - b. Potential for severe circulatory problems
 - c. If the patient has a potential neck injury do not tie a sling around the neck
 - d. Use a sling and swathe with splints surrounding the humerus or splint with the extremity extended
9. Elbow
- a. High probability for blood vessel and nerve damage
 - b. Especially dangerous in children (supracondylar fractures)
 - c. Volkman's contracture may result
 - d. Padded wire splint and sling and swathe
10. Forearm fracture
- a. May involve radius, ulna, or both
 - b. Colle's fracture of the wrist presents with the wrist in a "silver fork" position
 - c. Splint like a lower leg fracture described above
11. Hand and wrist fractures
- a. Common with direct trauma
 - b. Noticeable deformity
 - c. Significant pain
 - d. High incidence for nerve and vessel damage
 - e. Splint on a padded board splint with the hand in position of function
12. Epiphyseal fractures
- a. Weakest part a child's joint
 - b. Presents as a sprain in an adult

- c. May result in a permanent angulation or deformed extremities
 - d. May cause premature arthritis
 - E. Application of cold/ heat
 - 1. Cold in the first 48 hours to reduce swelling
 - 2. Heat after 48 hour to increase circulation
 - F. Referral of minor musculoskeletal injuries
 - 1. Evaluate the need for immobilization
 - 2. Evaluate the need for an x-ray
 - 3. Evaluate the need for a physician follow-up visit versus ED visit
 - 4. Contact medical control for advisement
- V. Integration

UNIT TERMINAL OBJECTIVE

- 5-1 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement the treatment plan for the patient with respiratory problems.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 5-1.1 Discuss the epidemiology of pulmonary diseases and conditions. (C-1)
- 5-1.2 Identify and describe the function of the structures located in the upper and lower airway. (C-1)
- 5-1.3 Discuss the physiology of ventilation and respiration. (C-1)
- 5-1.4 Identify common pathological events that affect the pulmonary system. (C-1)
- 5-1.5 Discuss abnormal assessment findings associated with pulmonary diseases and conditions. (C-1)
- 5-1.6 Compare various airway and ventilation techniques used in the management of pulmonary diseases. (C-3)
- 5-1.7 Review the pharmacological preparations that paramedics use for management of respiratory diseases and conditions. (C-1)
- 5-1.8 Review the pharmacological preparations used in managing patients with respiratory diseases that may be prescribed by physicians. (C-1)
- 5-1.9 Review the use of equipment used during the physical examination of patients with complaints associated with respiratory diseases and conditions. (C-1)
- 5-1.10 Identify the epidemiology, anatomy, physiology, pathophysiology, assessment findings, and management for the following respiratory diseases and conditions: (C-1)
 - a. Adult respiratory distress syndrome
 - b. Bronchial asthma
 - c. Chronic bronchitis
 - 4. Emphysema
 - 5. Pneumonia
 - 6. Pulmonary edema
 - 7. Pulmonary thromboembolism
 - 8. Neoplasms of the lung
 - 9. Upper respiratory infections
 - 10. Spontaneous pneumothorax
 - 11. Hyperventilation syndrome

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 5-1.11 Recognize and value the assessment and treatment of patients with respiratory diseases. (A-2)
- 5-1.12 Indicate appreciation for the critical nature of accurate field impressions of patients with respiratory diseases and conditions. (A-2)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 5-1.13 Demonstrate proper use of airway and ventilation devices.
(P-1)
- 5-1.14 Conduct a history and patient assessment for patients with
pulmonary diseases and conditions. (P-1)
- 5-1.15 Demonstrate the application of a CPAP/ BiPAP unit. (P-1)

DECLARATIVE

- I. Introduction
 - A. Epidemiology
 - 1. Incidence
 - a) Respiratory complaints are a major aspect of EMS, resulting in 28% of all EMS chief complaints according to a US study of over 2.5 million EMS calls
 - 2. Mortality/ morbidity
 - a) Over 200,000 persons die from respiratory emergencies each year
 - 3. Risk factors
 - a) Intrinsic factors which increase the risk of developing respiratory disease
 - (1) Genetic predisposition
 - (a) Influences development of
 - (i) Asthma
 - (ii) COPD
 - (iii) Carcinomas
 - (2) Associated cardiac or circulatory pathologies
 - (a) Influences development of
 - (i) Pulmonary edema
 - (ii) Pulmonary emboli
 - (3) Stress
 - (a) Increases the severity of respiratory complaints
 - (b) May be associated with the frequency of exacerbations of asthma and COPD
 - b) Extrinsic factors which increase the risk of developing respiratory disease
 - (1) Smoking
 - (a) Increases the prevalence of COPD and carcinomas
 - (b) Increases the severity of virtually all respiratory disorders
 - (2) Environmental pollutants
 - (a) Increases the prevalence of COPD
 - (b) Increases the severity of all obstructive disorders
 - B. Anatomy and physiology review
 - 1. Global physiology of the pulmonary system
 - a) Function

- (1) The respiratory system functions as a gas exchange system
 - (2) 10,000 liters of air are filtered, warmed, humidified, and exchanged daily in adults
 - (3) Oxygen is diffused into the bloodstream for use in cellular metabolism by the body's 100 trillion cells
 - (4) Wastes, including carbon dioxide, are excreted from the body via the respiratory system
- b) Physiology
- (1) Ventilation
 - (a) Ventilation refers to the process of air movement in and out of the lungs
 - (b) In order for ventilation to occur, the following functions must be intact
 - (i) Neurologic control (brainstem) needs to initiate inspiration
 - (ii) Nerves between the brainstem and the muscles of respiration (diaphragm & intercostals) need to be intact and undamaged
 - (iii) Diaphragm and intercostal muscles must be functional and non-traumatized
 - (iv) Upper airways must be intact and patent
 - (v) Lower airways must be intact and patent
 - (vi) The alveoli must be intact and non-collapsed
 - (c) Emergent intervention for ventilation problems includes
 - (i) Opening the upper and lower airways
 - (ii) Providing assisted ventilation
 - (2) Diffusion
 - (a) Diffusion refers to the process of gas exchange between the air-filled alveoli and the pulmonary capillary bed
 - (b) Gas exchange is driven by simple diffusion - gases from areas of high concentration to areas of low concentration (gas exchange continues

- until the concentrations are equal)
 - (c) In order for diffusion to occur, the following functions must be intact
 - (i) The alveolar walls must be intact and not thickened
 - (ii) The interstitial space (between the alveoli and capillary wall) must not be enlarged or filled with fluid
 - (iii) The capillary walls must be intact and not thickened
 - (d) Emergent intervention for diffusion problems includes
 - (i) Provision of high flow oxygen
 - (ii) Taking measures to reduce inflammation in the interstitial space
- (3) Perfusion
- (a) Perfusion refers to the process of circulating blood through the pulmonary capillary bed
 - (b) In order for perfusion to occur, the following functions must be intact
 - (i) There must be adequate blood volume (and adequate hemoglobin within the blood)
 - (ii) The pulmonary capillaries must be intact and not occluded
 - (iii) The left heart must be functioning properly to assure a smooth flow of blood through the pulmonary capillary bed
 - (c) Emergent intervention for perfusion problems includes
 - (i) Ensuring adequate circulating volume and hemoglobin levels
 - (ii) Optimizing left heart function as necessary
- c) Rationale behind learning physiology
- (1) There are many, many different pulmonary diseases
 - (2) Many diseases act in a variety of different ways on a number of body systems

- (3) Learning the pathophysiology of every respiratory disease is impossible at the paramedic level, and is not a useful exercise because of the dynamic nature of newly developing or identified pulmonary pathologies
 - (4) However, all respiratory problems, old or new, can be categorized as impacting ventilation, diffusion, or perfusion
 - (5) Treatment can be initiated rapidly and effectively once the problem has been identified as ventilation, diffusion, perfusion or a combination
2. Anatomy of the pulmonary system
- a) The upper airway
 - (1) Functions
 - (a) Conduit for air
 - (b) Filtration
 - (c) Warming
 - (d) Humidification
 - (e) Protection of lower airway
 - (2) Structures
 - (a) Nose
 - (b) Pharynx
 - (c) Larynx
 - b) The lower airway
 - (1) Functions
 - (a) Conduit for air
 - (b) Filtration
 - (c) Warming
 - (d) Humidification
 - (e) Removal of foreign particles
 - (2) Structures
 - (a) Trachea
 - (b) Bronchi
 - (c) Bronchioles
 - (d) Cilia
 - c) The gas exchange interface
 - (1) Functions
 - (a) Facilitate gas exchange
 - (b) Transfer gases
 - (c) Mechanism and normals
 - (d) Diffusion

- (e) Venous partial pressures of gases
- (f) Arterial partial pressures of gases
- (g) Oxygen saturation
- (h) Oxyhemoglobin dissociation curve
- (2) Structures
 - (a) Alveoli
 - (b) Interstitial space
 - (c) Pulmonary capillary bed
- d) The chest wall
 - (1) Functions
 - (a) Ventilation
 - (b) Protection of lungs and airways
 - (c) Mechanism and normals
 - (d) The process of inspiration and expiration
 - (e) Normal respiratory volumes (total lung capacity, tidal volume)
 - (2) Structures
 - (a) Diaphragm is the major muscle of respiration
 - (b) Intercostal muscles
 - (c) Accessory muscles
 - (d) Pleural space
- e) The neurologic control of breathing
 - (1) Functions
 - (a) To control ventilation in coordination with physiologic needs
 - (b) Mechanism and normals
 - (c) Driven primarily by the pH of the cerebrospinal fluid - which is influenced by the PaCO₂
 - (d) Secondary drive is the partial pressure of CO₂ (PaCO₂)
 - (e) Tertiary drive (typically only utilized in a small number of individuals with severe pulmonary disease) is the PaO₂ as measured by peripheral baroreceptors located in the aortic arch and carotid artery
 - (2) Structures
 - (a) Medulla
 - (b) Phrenic nerve innervate the diaphragm
 - (c) Spinal nerves (thoracic levels)

- innervate the intercostal
- (d) Hering-Breuer reflex prevents overinflation

II. General system pathophysiology, assessment and management

A. Pathophysiology

1. A variety of problems can impact the pulmonary system's ability to achieve its goal of gas exchange to provide for cellular needs and excretion of wastes
2. Understanding these problems globally can enable the paramedic to quickly and effectively pinpoint probable causes and necessary interventions
3. Specific pathophysiologies
 - a) Ventilation
 - (1) Upper airway obstruction
 - (a) Trauma
 - (b) Epiglottitis
 - (c) Foreign body obstruction
 - (d) Inflammation of the tonsils
 - (2) Lower airway obstruction
 - (a) Trauma
 - (b) Obstructive lung disease
 - (c) Mucous accumulation
 - (d) Smooth muscle spasm
 - (e) Airway edema
 - (3) Chest wall impairment
 - (a) Trauma
 - (b) Hemothorax
 - (c) Pneumothorax
 - (d) Empyema
 - (e) Pleural inflammation
 - (f) Neuromuscular diseases (such as multiple sclerosis or muscular dystrophy)
 - (4) Problems in neurologic control
 - (a) Brainstem malfunction
 - (i) CNS depressant drugs
 - (ii) CVA or other medical neurologic condition
 - (iii) Trauma
 - (b) Phrenic/ spinal nerve dysfunction
 - (i) Trauma
 - (ii) Neuromuscular diseases

- b) Diffusion
 - (1) Inadequate oxygen concentration in ambient air
 - (2) Alveolar pathology
 - (a) Asbestosis, other environmental lung diseases
 - (b) Blebs/ bullae associated with chronic obstructive lung disease
 - (c) Inhalation injuries
 - (3) Interstitial space pathology
 - (a) Pulmonary edema
 - (i) High pressure (also known as cardiogenic)
 - (a) Left heart failure
 - (b) Idiopathic pulmonary hypertension
 - (ii) High permeability (also known as non-cardiogenic)
 - (a) ARDS
 - (b) Asbestosis, environmental lung diseases
 - (c) Near-drowning
 - (d) Post-hypoxia
 - (e) Inhalation injuries
 - (4) Capillary bed pathology
 - (a) Severe atherosclerosis
 - c) Perfusion
 - (1) Inadequate blood volume/ hemoglobin levels
 - (a) Hypovolemia
 - (b) Anemia
 - (2) Impaired circulatory blood flow
 - (a) Pulmonary embolus
 - (3) Capillary wall pathology
 - (a) Trauma
- B. Assessment findings
- 1. Scene size-up
 - a) Pulmonary complaints may be associated with exposure to a wide variety of toxins, including carbon monoxide, toxic products of combustion, or environments which have deficient ambient oxygen (such as silos, enclosed storage spaces etc.)
 - b) It is critical to assure a safe environment for all EMS personnel before initiating patient

- contact
- c) If necessary, individuals with specialized training and equipment should be utilized to remove the patient from a hazardous environment
- 2. Initial assessment
 - a) A major focus of the initial assessment is the recognition of life-threat; there are a variety of pulmonary conditions which may offer a very real risk for patient death
 - b) Recognition of life threat and the initiation of resuscitation takes priority over detailed assessment
 - c) Signs of life-threatening respiratory distress in adults, listed from most ominous to least severe
 - (1) Alterations in mental status
 - (2) Severe cyanosis
 - (3) Absent breath sounds
 - (4) Audible stridor
 - (5) 1-2 word dyspnea
 - (6) Tachycardia > 130 beats/ minute
 - (7) Pallor and diaphoresis
 - (8) The presence of retractions/ use of the accessory muscles
- 3. Focused history and physical examination
 - a) Chief complaint
 - (1) Dyspnea
 - (2) Chest pain
 - (3) Cough
 - (a) Productive
 - (b) Non-productive
 - (c) Hemoptysis
 - (4) Wheezing
 - (5) Signs of infection
 - (a) Fever/ chills
 - (b) Increased sputum production
 - b) History
 - (1) Previous experiences with similar/ identical symptoms
 - (a) The patient's subjective description of acuity is an accurate indicator of the acuity of this episode if the pathology is chronic
 - (b) Asking the patient "what happened the

last time you had an attack this bad" is an extremely useful predictor of this episode's course

- (2) Known pulmonary diagnosis
 - (a) If the diagnosis is not known to the paramedic, an effort should be made to learn whether it is primarily related to ventilation, diffusion, perfusion, or a combination
 - (3) History of previous intubation is an accurate indicator of severe pulmonary disease, and suggests that intubation may be required again
 - (4) Medication history
 - (a) Current medications
 - (b) Medication allergies
 - (c) Pulmonary medications
 - (i) Sympathomimetic
 - (a) Inhaled
 - (b) Oral
 - (c) Parenteral
 - (ii) Corticosteroid
 - (a) Inhaled
 - (b) Oral (daily versus during exacerbations only)
 - (iii) Chromolyn sodium
 - (iv) Methylxanthines (theophyllin preparations)
 - (v) Antibiotics
 - (d) Cardiac-related drugs
 - (5) History of the present episode
 - (6) Exposure/ smoking history
- c) Physical exam
- (1) General impression
 - (a) Position
 - (i) Sitting
 - (ii) "Tripod" position
 - (iii) Feet dangling
 - (b) Mentation
 - (i) Confusion is a sign of hypoxemia or hypercarbia
 - (ii) Restlessness and irritability may be signs of fear and hypoxemia

- (iii) Severe lethargy or coma is a sign of hypercarbia
- (c) Ability to speak
 - (i) 1-2 word dyspnea versus ability to speak freely
 - (ii) Rapid, rambling speech as a sign of anxiety and fear
- (d) Respiratory effort
 - (i) Hard work indicates obstruction
 - (ii) Retractions
 - (iii) Use of accessory muscles
- (e) Color
 - (i) Pallor
 - (ii) Diaphoresis
 - (iii) Cyanosis
 - (a) Central
 - (b) Peripheral
- (2) Vital signs
 - (a) Pulse
 - (i) Tachycardia is a sign of hypoxemia and the use of sympathomimetic medications
 - (ii) In the face of a pulmonary etiology, bradycardia is an ominous sign of severe hypoxemia and imminent cardiac arrest
 - (b) Blood pressure
 - (i) Hypertension may be associated with sympathomimetic medication use
 - (c) Respiratory rate
 - (i) The respiratory rate is not a very accurate indicator of respiratory status unless it is very slow
 - (ii) Trends are essential in evaluating the chronic patient
 - (a) Slowing rate in the face of an unimproved condition suggests exhaustion and impending respiratory insufficiency
 - (d) Respiratory patterns
 - (i) Eupnea
 - (ii) Tachypnea
 - (iii) Cheyne-Stokes

- (iv) Central neurogenic hyperventilation
 - (v) Kussmaul
 - (vi) Ataxic (Biot's)
 - (vii) Apneustic
 - (viii) Apnea
- (3) Head/ neck
- (a) Pursed lip breathing
 - (b) Use of accessory muscles
 - (c) Sputum
 - (i) Increasing amounts suggests infection
 - (ii) Thick, green or brown sputum suggests infection and/ or pneumonia
 - (iii) Yellow or pale gray sputum may be related to allergic or inflammatory etiologies
 - (iv) Frank hemoptysis often accompanies severe tuberculosis or carcinomas
 - (v) Pink, frothy sputum is associated with severe, late stages of pulmonary edema
 - (d) Jugular venous distention may accompany right sided heart failure, which may be caused by severe pulmonary obstruction
- (4) Chest
- (a) Signs of trauma
 - (b) Barrel chest demonstrates the presence of long-standing chronic obstructive lung disease
 - (c) Retractions
 - (d) Symmetry
 - (e) Breath sounds
 - (i) Normal
 - (a) Bronchial
 - (b) Bronchovesicular
 - (c) Vesicular
 - (ii) Abnormals
 - (a) Stridor
 - (b) Wheezing
 - (c) Ronchi (low wheezes)
 - (d) Rales (crackles)
 - (e) Pleural friction rub

- (5) Extremities
 - (a) Peripheral cyanosis
 - (b) Clubbing is indicative of long-standing chronic hypoxemia
 - (c) Carpopedal spasm may be associated with hypocapnia resulting from periods of rapid, deep respiration
 - d) Diagnostic testing
 - (1) Pulse oximetry
 - (a) Used to evaluate or confirm the adequacy of oxygen saturation
 - (b) May be inaccurate in the presence of conditions which abnormally bind hemoglobin, including carbon monoxide poisoning or methemoglobinemia
 - (2) Peak flow
 - (a) Provides a baseline assessment of airflow for patients with obstructive lung disease
 - (3) Capnometry
 - (a) Provides ongoing assessment of endotracheal tube position. End-tidal CO₂ drops immediately when the tube is displaced from the trachea
 - (b) Quantitative versus qualitative
- C. Management
- 1. Airway and ventilation
 - a) Head-tilt/ chin-lift
 - b) Jaw thrust without head-tilt
 - c) Head-tilt/ jaw thrust
 - d) Oropharyngeal airway
 - e) Nasopharyngeal airway
 - f) Nasal cannula
 - g) Simple oxygen mask
 - h) Nonrebreather mask
 - i) Pharyngeal tracheal double-lumen airway
 - j) Pharyngeal tracheal lumen airway
 - k) Bag-valve-mask
 - l) Bag-valve-mask with PEEP
 - m) CPAP
 - n) Orotracheal intubation
 - o) Nasotracheal intubation
 - p) Suctioning

- q) Endotracheal tube
- r) Oxygen powered manually triggered ventilators
- s) Automatic transport ventilator
- t) Needle cricothyroidotomy
- u) Surgical cricothyroidotomy
- 2. Circulation
- 3. Pharmacological
 - a) Oxygen
 - b) Sympathomimetic
 - c) Albuterol
 - d) Epinephrine
 - e) Isoetharine
 - f) Metaproterenol sulfate
 - g) Racemic epinephrine
 - h) Terbutaline sulfate
 - i) Corticosteroid
 - j) Methylxanthines
 - k) Theophylline ethylenediamine - aminophylline
 - l) Antibiotics
 - m) Mucokinetic drugs
 - n) Mucolytic drugs
 - o) Bronchomucotropic drugs
 - p) Prophylactic asthma drugs
 - q) Cough suppressants - antitussive agents
 - r) "Street" drugs
- 4. Non-pharmacological
 - a) Positioning - sitting up
 - b) Back blows
- 5. Monitoring and devices used in pulmonary care
 - a) Pulse oximetry
 - b) Peak flow
 - c) Capnometry
- 6. Transport considerations
 - a) Appropriate mode
 - b) Appropriate facility

III. Specific illness

- A. Acute/ adult respiratory distress syndrome
 - 1. Respiratory syndrome characterized by respiratory insufficiency and hypoxia
 - a. Triggers
 - (1) Aspiration
 - (2) Cardio-pulmonary bypass surgery
 - (3) Gram-negative sepsis
 - (4) Multiple blood transfusions

- (5) Oxygen toxicity
 - (6) Trauma
 - (7) Pneumonia
 - (8) Respiratory Infection
2. Findings
- a) Shortness of breath
 - b) Rapid breathing
 - c) Inadequate oxygenation
 - d) Decreased lung compliance
3. Interventions
- a) Airway management
 - b) Oxygen administration
 - (1) Mechanical ventilation
 - (2) PEEP
 - c) Improving underlying condition
 - d) Removing the cause
 - e) Suction prn
- B. Obstructive airway diseases
1. A spectrum of diseases which affect a substantial number of individuals worldwide
 2. Diseases include asthma and COPD (which includes emphysema and chronic bronchitis)
 3. Epidemiology
 - a) Morbidity/ mortality
 - (1) Overall
 - (2) Asthma - 4-5% of US population
 - (3) 20% of adult males have chronic bronchitis
 - b) Causative factors
 - (1) Cigarette smoking
 - (2) Exposure to environmental toxins
 - (3) Genetic predisposition
 - c) Factors which may exacerbate underlying conditions
 - (1) Intrinsic
 - (a) Stress is a significant exacerbating factor, particularly in adults
 - (b) Upper respiratory infection
 - (c) Exercise
 - (2) Extrinsic
 - (a) Tobacco smoke
 - (b) Allergens (including foods, animal danders, dusts, molds, pollens)
 - (c) Drugs
 - (d) Occupational hazards
 - d) Prevention strategies
 - (1) Smoking prevention, particularly for youth
 - (2) Stop smoking for existing smokers
 - (3) Control of air pollution
 - (4) Provision of smoke-free workplaces and public locations
 4. Anatomy and physiology review
 - a) Ventilation disorders
 - b) Obstruction occurs in the bronchioles, and may be the result of

- (1) Smooth muscle spasm
 - (a) Beta receptors
- (2) Mucous
 - (a) Goblet cells
 - (b) Cilia
- (3) Inflammation
- c) Obstruction may be reversible or irreversible
- d) Obstruction causes air trapping through the following mechanism
 - (1) Bronchioles dilate naturally on inspiration
 - (2) Dilation enables air to enter the alveoli despite the presence of obstruction
 - (3) Bronchioles naturally constrict on expiration
 - (4) Air becomes trapped distal to obstruction on exhalation
- 5. Pathophysiology varies slightly by disease
 - a) Asthma
 - (1) Reversible obstruction
 - (2) Obstruction caused by a combination of smooth muscle spasm, mucous, and edema
 - (3) Exacerbating factors tend to be extrinsic in children, intrinsic in adults
 - (4) Status asthmaticus - prolonged exacerbation which doesn't respond to therapy
 - b) Chronic bronchitis
 - (1) Reversible and irreversible obstruction
 - (2) Characterized by hyperplasia and hypertrophy of mucous-producing glands
 - (3) Clinical definition - productive cough for at least 3 months per year for 2 or more consecutive years
 - (4) Typically associated with cigarette smoking, but may also occur in non-smokers
 - c) Emphysema
 - (1) Irreversible airway obstruction
 - (2) Diffusion defect also exists because of the presence of blebs
 - (3) Because blebs have extremely thin walls, they are prone to collapse
 - (4) To prevent collapse, the patient often exhales through pursed lips, effectively maintaining a positive airway pressure
 - (5) Almost always associated with cigarette smoking or significant exposure to environmental toxins
- 6. Assessment findings
 - a) Signs of severe respiratory impairment
 - (1) Altered mentation
 - (2) 1-2 word dyspnea
 - (3) Absent breath sounds
 - b) Chief complaint
 - (1) Dyspnea
 - (2) Cough
 - (3) Nocturnal awakening with dyspnea and wheezing
 - c) History
 - (1) Personal or family history of asthma and/ or allergies
 - (2) History of acute exposure to pulmonary irritant

- (3) History of prior similar episodes
- d) Physical findings
 - (1) Wheezing may be present in ALL types of obstructive lung disease
 - (2) Retractions and/ or use of accessory muscles
- e) Diagnostic testing
 - (1) Pulse oximeter to document degree of hypoxemia and response to therapy
 - (2) Peak flow to establish baseline airflow
- 7. Management
 - a) Airway and ventilation
 - (1) Intubation as required
 - (2) Assisted ventilation may be necessary
 - (3) High flow oxygen
 - b) Circulation
 - (1) Intravenous therapy may be necessary to
 - (a) Improve hydration
 - (b) Thin and loosen mucous
 - (2) Pharmacologic
 - (a) Adrenergic stimulants
 - (b) Albuterol
 - (c) Metaproterenol
 - (d) Terbutaline
 - (e) Atropine sulfate
 - (f) Magnesium
 - (g) Methylxanthines
 - (h) Corticosteroid
 - c) Supportive care
 - d) Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - (3) Continue monitoring
 - (4) Contact medical direction
 - e) Psychological support/ communication strategies
- C. Pneumonia
 - 1. Epidemiology
 - a) Incidence
 - (1) Fifth leading cause of death in the US
 - (2) Not a single disease, but a group of specific infections
 - b) Risk factors
 - (1) Cigarette smoking
 - (2) Alcoholism
 - (3) Exposure to cold
 - (4) Extremes of age (old or young)
 - c) Anatomy and physiology review
 - (1) Cilia
 - (2) Causes and process of mucous production
 - 2. Pathophysiology
 - a) Ventilation disorder
 - b) Infection of lung parenchyma

- (1) Most commonly bacterial
 - (2) May also be viral or fungal
 - c) May cause alveolar collapse (atelectasis)
 - d) Localized inflammation/ infection may become systemic, leading to sepsis and septic shock
 - e) Community acquired versus hospital acquired
 - 3. Assessment findings
 - a) Typical pneumonia
 - (1) Acute onset of fever and chills
 - (2) Cough productive of purulent sputum
 - (3) Pleuritic chest pain (in some cases)
 - (4) Pulmonary consolidation on auscultation
 - (5) Location of bronchial breath sounds
 - (6) Rales
 - (7) Egophony
 - b) Atypical pneumonia
 - (1) Non-productive cough
 - (2) Extra-pulmonary symptoms
 - (3) Headache
 - (4) Myalgias
 - (5) Fatigue
 - (6) Sore throat
 - (7) Nausea, vomiting, diarrhea
 - (8) Fever and chills
 - 4. Management
 - a) Airway and ventilation
 - (1) Intubation may be required
 - (2) Assisted ventilation as necessary
 - (3) High flow oxygen
 - b) Circulation
 - (1) Intravenous access
 - (2) Administration of IV fluids
 - (3) Improve hydration
 - (4) Thin and mobilize mucous
 - c) Pharmacological
 - (1) Bronchodilators may be required if airway obstruction is severe or if the patient has accompanying obstructive lung disease
 - (2) Antibiotic therapy by prescription
 - (3) Antipyretics
 - d) Non-pharmacological
 - (1) Cool if high fever
 - e) Transport considerations
 - (1) Elderly, over 65 years
 - (a) Significant co-morbidity
 - (b) Inability to take oral medications
 - (c) Support complications
 - (d) Appropriate facility
 - f) Psychological support/ communication strategies
- D. Pulmonary edema

1. Not a disease but a pathophysiological condition
 - a) High pressure (cardiogenic)
 - b) High permeability (non-cardiogenic)
2. Epidemiology
 - a) Risk factors vary based on type
 - (1) High pressure (cardiogenic)
 - (a) Acute myocardial infarction
 - (b) Chronic hypertension
 - (c) Myocarditis
 - (2) High permeability (non-cardiogenic)
 - (a) Acute hypoxemia
 - (b) Near-drowning
 - (c) Post-cardiac arrest
 - (d) Post shock
 - (e) High altitude exposure
 - (f) Inhalation of pulmonary irritants
 - (g) Adult respiratory distress syndrome (ARDS)
3. Anatomy and physiology review
 - a) Alveoli
 - b) Pulmonary capillaries
 - c) Interstitial space and fluid
 - d) Pulmonary circulation
 - e) Role of surfactant
 - f) Hydrostatic pressure
 - g) Colloid osmotic pressure
 - h) Capillary wall damage
 - i) Left sided heart failure
 - j) Lymphatic drainage
 - k) Pulmonary blood pressures
 - l) Starling's law of the heart
 - m) Hypoalbuminemic states (liver disease)
4. Pathophysiology
 - a) Diffusion disorder
 - b) High pressure (cardiogenic)
 - (1) Left sided heart failure
 - (2) Increase in pulmonary venous pressure
 - (3) Increase in hydrostatic pressure
 - (4) Engorgement of pulmonary vasculature
 - (5) Failure of cough and lymphatics to drain fluids
 - (6) Excessive accumulation of fluid in the interstitial space
 - (7) Widening interstitial space impairs diffusion
 - (8) In severe cases, fluid may accumulate in the alveoli
 - c) High permeability (non-cardiogenic)
 - (1) Disruption of the alveolar-capillary membranes caused by
 - (a) Severe hypotension
 - (b) Severe hypoxemia (post-drowning, post-cardiac arrest, severe seizure, prolonged hypoventilation)
 - (c) High altitude
 - (d) Environmental toxins

- (e) Septic shock
 - (2) Disrupted membranes leak fluid into the interstitial space
 - (3) Widened interstitial space impairs diffusion
 - 5. Assessment findings
 - a) High pressure (cardiogenic)
 - (1) Refer to cardiology unit
 - b) High permeability (non-cardiogenic)
 - (1) History of associated factors
 - (a) Hypoxic episode
 - (b) Shock (hypovolemic, septic, or neurogenic)
 - (c) Chest trauma
 - (d) Recent acute inhalation of toxic gases or particles
 - (e) Recent ascent to high altitude without climatizing
 - (2) Dyspnea
 - (3) Orthopnea
 - (4) Fatigue
 - (5) Reduced exercise capacity
 - (6) Pulmonary rales, particularly in severe cases
 - c) Diagnostic testing
 - (1) Pulse oximetry
 - 6. Management
 - a) High pressure (cardiogenic)
 - (1) Refer to cardiology unit
 - b) High permeability (non-cardiogenic)
 - (1) Airway and ventilation
 - (2) Intubation as necessary
 - (a) Assisted ventilation may be required
 - (b) High flow oxygen
 - c) Circulation
 - (1) Avoid fluid excess
 - (2) Monitor IV flow rates carefully
 - d) Pharmacological
 - (1) Diuretics may be considered in severe cases, but are not usually appropriate since the etiology is NOT high pressure in the pulmonary capillary bed
 - (2) Corticosteroid to stabilize pulmonary capillary and alveolar walls
 - e) Non-pharmacological
 - (1) Position the patient in an upright position with legs dangling
 - (2) Rapid removal from any environmental toxins
 - (3) Rapid descent in altitude if high altitude pulmonary edema (HAPE) is suspected
 - f) Transport decisions
 - (1) Appropriate mode
 - (2) Appropriate facility
 - g) Psychological support/ communication strategies
- E. Pulmonary thromboembolism
 - 1. Epidemiology
 - a) Incidence
 - (1) Responsible for 50,000 death annually

- (2) 5% of sudden deaths
- b) Mortality/ morbidity
 - (1) Less than 10% of pulmonary emboli result in death
- c) Risk factors
 - (1) Recent surgery
 - (2) Pregnancy
 - (3) Oral contraceptives
 - (4) Infection
 - (5) Cancer
 - (6) Sickle cell anemia
 - (7) Long bone fractures
 - (8) Prolonged inactivity
 - (9) Bedridden patients
- d) Prevention strategies
- 2. Anatomy and physiology review
 - a) Deep veins in lower legs
 - b) Venous system
 - c) Coagulation of blood
 - d) Role of venous stasis
 - e) Venous wall injury
 - f) Venous valves
 - g) Pulmonary vasculature
 - h) Ventilation-perfusion mismatch
- 3. Pathophysiology
 - a) Perfusion disorder
 - b) Deep vein stasis
 - c) Injury to vein wall
 - d) Hypercoagulability
 - e) Platelet aggregation
 - f) Embolism size
 - g) Embolism location in the legs
 - h) Embolism location in the lungs
 - i) Complete loss of perfusion in some area of lungs
 - j) Other causes of pulmonary circulation obstruction
 - (1) Air
 - (2) Fat
 - (3) Foreign objects
 - (4) Venous catheters
 - (5) Amniotic fluid
- 4. Assessment findings - depend on size of the clot
 - a) Evidence of significant life-threatening embolus in a proximal location
 - (1) Altered mentation
 - (2) Severe cyanosis
 - (3) Profound hypotension
 - (4) Cardiac arrest
 - b) Chief complaint
 - (1) Chest pain
 - (2) Dyspnea
 - (3) Cough (typically non-productive)

- c) History
 - (1) Sudden onset
 - (2) Identification of risk factors
- d) Physical findings
 - (1) Normal breath sounds or, in severe cases, rales
 - (2) Pleural friction rub
 - (3) Tachycardia
 - (4) Clinical evidence of thrombophlebitis (found in less than 50%)
 - (5) Tachypnea
 - (6) Hemoptysis (fairly rare)
 - (7) Petechiae on upper thorax and arms
- 5. Management - prevention has major role in management
 - a) Depends on the size of the embolism
 - b) Airway and ventilation
 - (1) Intubation if necessary
 - (2) Positive pressure ventilation if required
 - (3) High flow oxygen
 - c) Circulation
 - (1) CPR if required
 - (2) IV therapy; hydration based on clinical symptoms
 - d) Pharmacological
 - (1) Thrombolytic therapy may be appropriate if the diagnosis of pulmonary embolus is confirmed, however, this is rare - especially in the out-of-hospital setting
 - e) Non-pharmacological therapy
 - (1) Support body systems
 - (2) Most severe cases will be managed as a cardiac arrest of unknown origin
 - f) Transport considerations
 - (1) Rapid transport
 - (2) Appropriate mode
 - (3) Appropriate facility
 - g) Psychological support/ communication strategies
- F. Neoplasms of the lung
 - 1. Epidemiology
 - a) Incidence
 - (1) 150,000 have cancer
 - (2) Typical age between 55 to 65
 - (3) Morbidity/ mortality
 - (a) Most die within one year
 - (b) 20% local lung involvement
 - (c) 25% spread to lymph
 - (d) 55% distant metastatic cancer
 - b) Prevention
 - (1) Prevent starting smoking in youth
 - (2) Smoking cessation in smokers
 - (3) Avoidance of environmental hazards, particularly asbestos
 - (4) Cancer screening programs
 - 2. Anatomy and physiology review
 - 3. Pathophysiology

- a) Significant variety in the cell types, and the growth rates associated with each type
- 4. Assessment findings
 - a) Signs of severe distress
 - (1) Altered mentation
 - (2) 1-2 word dyspnea
 - (3) Severe or uncontrollable hemoptysis
 - b) Chief complaints
 - (1) Cough
 - (2) Hemoptysis
 - (3) Dyspnea
 - (4) Hoarseness or voice change
 - (5) Dysphagia
 - c) History
 - (1) Diagnosed history of cancer
 - d) Physical findings
 - (1) Signs and symptoms vary according to location of the tumor
- 5. Management
 - a) Airway and ventilation
 - (1) Intubation if required
 - (2) Assisted ventilation if necessary
 - (3) Oxygen - flow rate based on symptoms and pulse oximetry
 - (4) Supportive care
 - b) Circulation
 - (1) Many patients with diagnosed lung cancer with have an indwelling catheter in place. Local protocols vary regarding whether this catheter may be used for IV infusion in the field.
 - (2) IV infusion may be required to improve hydration or thin/ mobilize sputum
 - c) Pharmacological
 - (1) Out-of-hospital therapy for lung cancer patients is symptomatic, and may include the following
 - (a) Bronchodilators
 - (b) Corticosteroid
 - (c) Continuation of hospital-initiated antibiotics
 - d) Transport considerations
 - (1) End stage patients may have advance directives or DNR
 - (2) Supportive care
 - e) Psychological support/ communication strategies
 - (1) If diagnosed end stage
 - (a) Death and dying patient
 - (b) Family support
- G. Upper respiratory infection
 - 1. Epidemiology
 - a) Incidence
 - (1) 80 million cases in 1975
 - b) Morbidity/ mortality
 - (1) Rarely life threatening
 - (2) Often exacerbates underlying pulmonary conditions
 - (3) Often become significant infections in patients with suppressed immune

- function (such as HIV)
- c) Risk factors
 - (1) Avoidance of exposure is nearly impossible because of the prevalence of causative agents
 - (2) Severity increases in patients with underlying pulmonary conditions
- d) Prevention strategies
 - (1) Handwashing and covering the mouth during sneezing and coughing are essential in preventing spread
- 2. Anatomy and physiology review
 - a) Nasopharynx
 - b) Oropharynx
 - c) Paranasal sinus
 - d) Inner ear
 - e) Middle ear
 - f) Outer ear
 - g) Eustachian tubes
 - h) Epiglottis
 - i) Respiratory epithelium
 - j) Lymphatic system
 - k) Secretory antibody IgA
- 3. Pathophysiology
 - a) A variety of bacteria and virus cause URI
 - b) 20-30% are Group A streptococci
 - c) 50% of pharyngitis have no demonstrated bacterial or viral cause
 - d) Most are self-limiting diseases
- 4. Assessment findings
 - a) Chief complaints
 - (1) Sore throat
 - (2) Fever
 - (3) Chills
 - (4) Headache
 - b) Physical findings
 - (1) Cervical adenopathy
 - (2) Erythematous pharynx
 - (3) Positive throat culture
- 5. Management
 - a) Airway and ventilation
 - (1) Typically no intervention required
 - (2) Oxygen administration may be appropriate in patients with underlying pulmonary conditions (administer based on symptoms and pulse oximetry)
 - b) Pharmacological
 - (1) Out-of-hospital care is symptomatic, and based in part on the presence of underlying pulmonary conditions
 - (2) Interventions which may be appropriate include
 - (a) Bronchodilators
 - (b) Continuation of prescribed antibiotics
 - (c) Corticosteroid
 - c) Non-pharmacological

- d) Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - e) Psychological support/ communication strategies
 - (1) Collected throat cultures require family notification of results and follow-up care
- H. Spontaneous pneumothorax
- 1. Epidemiology
 - a) Incidence
 - (1) 18 per 100,000
 - b) Morbidity/ mortality
 - (1) 15-20% partial pneumothorax may be well tolerated
 - c) Risk factors
 - (1) Males
 - (2) Younger age
 - (3) Thin body mass
 - (4) History of COPD (secondary spontaneous pneumothorax)
 - 2. Assessment findings
 - a) Chief complaint
 - (1) Shortness of breath
 - (2) Chest pain
 - (3) Sudden onset
 - b) Physical findings
 - (1) Typically minor
 - (a) Pallor
 - (b) Diaphoresis
 - (c) Tachypnea
 - (2) Severe
 - (a) Altered mentation
 - (b) Cyanosis
 - (c) Tachycardia
 - (d) Decreased breath sounds
 - (e) Local hyperresonance to percussion
 - (f) Subcutaneous emphysema
 - 3. Management
 - a) Airway and ventilation
 - (1) Intubation as required
 - (2) Assisted ventilation if necessary
 - (3) Oxygen - administration levels based on symptoms and pulse oximetry
 - b) Circulation
 - (1) IV initiation if severe symptoms present
 - c) Pharmacological
 - (1) Not typically necessary; treat symptomatically
 - d) Non-pharmacological
 - (1) Position of comfort/ best ventilation
 - e) Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f) Psychological support/ communication strategies

- I. Hyperventilation syndrome
 1. Multiple causes
 - a) Hypoxia
 - b) High altitude
 - c) Pulmonary disease
 - d) Pulmonary disorders
 - e) Pneumonia
 - f) Interstitial pneumonitis, fibrosis, edema
 - g) Pulmonary emboli, vascular disease
 - h) Bronchial asthma
 - i) Cardiovascular disorders
 - j) Congestive heart failure
 - k) Hypotension
 - l) Metabolic disorders
 - m) Acidosis
 - n) Hepatic failure
 - o) Neurologic disorders
 - p) Psychogenic or anxiety hypertension
 - q) Central nervous system infection, tumors
 - r) Drug-induced
 - s) Salicylate
 - t) Methylxanthine derivatives
 - u) Beta-adrenergic agonists
 - v) Progesterone
 - w) Fever, sepsis
 - x) Pain
 - y) Pregnancy
 2. Assessment findings
 - a) Chief complaint
 - (1) Dyspnea
 - (2) Chest pain
 - (3) Other symptoms based on etiology
 - (4) Carpopedal spasm
 - b) Physical findings
 - (1) Rapid breath with high minute volume
 - (2) Varying depending on cause of syndrome
 - (3) Carpopedal spasms
 3. Pathophysiology
 - a) Depends on cause of syndrome
 4. Management
 - a) Depends on cause of syndrome, discussed elsewhere
 - (1) Airway and ventilation
 - (a) Oxygen - rate of administration based on symptoms and pulse oximetry
 - (2) If anxiety hyperventilation is confirmed (especially based on patient's prior history) coached ventilation/ rebreathing techniques might be considered
 - b) Circulation
 - (1) Intervention rarely required

- c) Pharmacological
 - (1) Intervention rarely required
- d) Non-pharmacological
 - (1) Intervention rarely required
 - (2) Patients with anxiety hyperventilation will require psychological approaches to calm them
 - (3) Have them mimic your respiratory rate and volume
 - (4) Do not place bag over mouth and nose
- e) Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
- f) Psychological support/ communication strategies
 - (1) Depend on cause of hyperventilation

UNIT TERMINAL OBJECTIVE

- 5-2 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement the treatment plan for the patient with cardiovascular disease.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 5-2.1 Describe the incidence, morbidity and mortality of cardiovascular disease. (C-1)
- 5-2.2 Discuss prevention strategies that may reduce the morbidity and mortality of cardiovascular disease. (C-1)
- 5-2.3 Identify the risk factors most predisposing to coronary artery disease. (C-1)
- 5-2.4 Describe the anatomy of the heart, including the position in the thoracic cavity, layers of the heart, chambers of the heart, and location and function of cardiac valves. (C-1)
- 5-2.5 Identify the major structures of the vascular system. (C-1)
- 5-2.6 Identify the factors affecting venous return. (C-1)
- 5-2.7 Identify and define the components of cardiac output. (C-1)
- 5-2.8 Identify phases of the cardiac cycle. (C-1)
- 5-2.9 Identify the arterial blood supply to any given area of the myocardium. (C-1)
- 5-2.10 Compare and contrast the coronary arterial distribution to the major portions of the cardiac conduction system. (C-3)
- 5-2.11 Identify the structure and course of all divisions and subdivisions of the cardiac conduction system. (C-1)
- 5-2.12 Identify and describe how the heart's pacemaking control, rate, and rhythm are determined. (C-2)
- 5-2.13 Explain the physiological basis of conduction delay in the AV node. (C-3)
- 5-2.14 Define the functional properties of cardiac muscle. (C-1)
- 5-2.15 Define the events comprising electrical potential. (C-1)
- 5-2.16 List the most important ions involved in myocardial action potential and their primary function in this process. (C-2)
- 5-2.17 Describe the events involved in the steps from excitation to contraction of cardiac muscle fibers. (C-1)
- 5-2.18 Describe the clinical significance of Starling's law. (C-3)
- 5-2.19 Identify the structures of the autonomic nervous system (ANS). (C-1)
- 5-2.20 Identify the effect of the ANS on heart rate, rhythm and contractility. (C-1)
- 5-2.21 Define and give examples of positive and negative inotropism, chronotropism and dromotropism. (C-2)
- 5-2.22 Discuss the pathophysiology of cardiac disease and injury. (C-1)
- 5-2.23 Identify and describe the details of inspection, auscultation and palpation specific to the cardiovascular system. (C-1)
- 5-2.24 Define pulse deficit, pulsus paradoxus and pulsus alternans. (C-1)
- 5-2.25 Identify the normal characteristics of the point of maximal impulse (PMI). (C-1)
- 5-2.26 Identify and define the heart sounds. (C-1)
- 5-2.27 Relate heart sounds to hemodynamic events in the cardiac cycle. (C-2)
- 5-2.28 Describe the differences between normal and abnormal heart sounds. (C-2)
- 5-2.29 Identify and describe the components of the focused history as it relates to the patient with cardiovascular compromise. (C-1)
- 5-2.30 Explain the purpose of ECG monitoring. (C-1)
- 5-2.31 Describe how ECG wave forms are produced. (C-2)
- 5-2.32 Correlate the electrophysiological and hemodynamic events occurring throughout the entire cardiac cycle with the various ECG wave forms, segments and intervals. (C-2)
- 5-2.33 Identify how heart rates, durations, and amplitudes may be determined from ECG recordings. (C-3)
- 5-2.34 Relate the cardiac surfaces or areas represented by the ECG leads. (C-2)

- 5-2.35 Given an ECG, identify the arrhythmia. (C-3)
- 5-2.36 Identify the limitations to the ECG. (C-1)
- 5-2.37 Differentiate among the primary mechanisms responsible for producing cardiac arrhythmias. (C-1)
- 5-2.38 Describe a systematic approach to the analysis and interpretation of cardiac arrhythmias. (C-2)
- 5-2.39 Describe the arrhythmias originating in the sinus node, the AV junction, the atria, and the ventricles. (C-3)
- 5-2.40 Describe the arrhythmias originating or sustained in the AV junction. (C-3)
- 5-2.41 Describe the abnormalities originating within the bundle branch system. (C-3)
- 5-2.42 Describe the process of differentiating wide QRS complex tachycardias. (C-3)
- 5-2.43 Recognize the pitfalls in the differentiation of wide QRS complex tachycardias. (C-1)
- 5-2.44 Describe the conditions of pulseless electrical activity. (C-3)
- 5-2.45 Describe the phenomena of reentry, aberration and accessory pathways. (C-1)
- 5-2.46 Identify the ECG changes characteristically produced by electrolyte imbalances and specify the clinical implications. (C-2)
- 5-2.47 Identify patient situations where ECG rhythm analysis is indicated. (C-1)
- 5-2.48 Recognize the changes on the ECG that may reflect evidence of myocardial ischemia and injury. (C-1)
- 5-2.49 Recognize the limitations of the ECG in reflecting evidence of myocardial ischemia and injury. (C-1)
- 5-2.50 Correlate abnormal ECG findings with clinical interpretation. (C-2)
- 5-2.51 Identify the major therapeutic objectives in the treatment of the patient with any arrhythmia. (C-1)
- 5-2.52 Identify the major mechanical, pharmacological and electrical therapeutic interventions. (C-3)
- 5-2.53 Based on field impressions, identify the need for rapid intervention for the patient in cardiovascular compromise. (C-3)
- 5-2.54 Describe the incidence, morbidity and mortality associated with myocardial conduction defects. (C-1)
- 5-2.55 Identify the clinical indications for transcutaneous and permanent artificial cardiac pacing. (C-1)
- 5-2.56 Describe the components and the functions of a transcutaneous pacing system. (C-1)
- 5-2.57 Explain what each setting and indicator on a transcutaneous pacing system represents and how the settings may be adjusted. (C-2)
- 5-2.58 Describe the techniques of applying a transcutaneous pacing system. (C-1)
- 5-2.59 Describe the characteristics of an implanted pacemaking system. (C-1)
- 5-2.60 Describe artifacts that may cause confusion when evaluating the ECG of a patient with a pacemaker. (C-2)
- 5-2.61 List the possible complications of pacing. (C-3)
- 5-2.62 List the causes and implications of pacemaker failure. (C-2)
- 5-2.63 Identify additional hazards that interfere with artificial pacemaker function. (C-1)
- 5-2.64 Recognize the complications of artificial pacemakers as evidenced on ECG. (C-2)
- 5-2.65 Describe the epidemiology, morbidity and mortality, and pathophysiology of angina pectoris. (C-1)
- 5-2.66 List and describe the assessment parameters to be evaluated in a patient with angina pectoris. (C-1)
- 5-2.67 Identify what is meant by the OPQRST of chest pain assessment. (C-3)
- 5-2.68 List other clinical conditions that may mimic signs and symptoms of coronary artery disease and angina pectoris. (C-1)
- 5-2.69 Identify the ECG findings in patients with angina pectoris. (C-3)
- 5-2.70 Identify the paramedic responsibilities associated with management of the patient with angina pectoris. (C-2)
- 5-2.71 Based on the pathophysiology and clinical evaluation of the patient with chest pain, list the anticipated clinical problems according to their life-threatening potential. (C-3)
- 5-2.72 Describe the epidemiology, morbidity and mortality of myocardial infarction. (C-1)
- 5-2.73 List the mechanisms by which an MI may be produced by traumatic and non-traumatic events. (C-2)
- 5-2.74 Identify the primary hemodynamic changes produced in myocardial infarction. (C-1)
- 5-2.75 List and describe the assessment parameters to be evaluated in a patient with a suspected myocardial

- infarction. (C-1)
- 5-2.76 Identify the anticipated clinical presentation of a patient with a suspected acute myocardial infarction. (C-3)
- 5-2.77 Differentiate the characteristics of the pain/ discomfort occurring in angina pectoris and acute myocardial infarction. (C-2)
- 5-2.78 Identify the ECG changes characteristically seen during evolution of an acute myocardial infarction. (C-2)
- 5-2.79 Identify the most common complications of an acute myocardial infarction. (C-3)
- 5-2.80 List the characteristics of a patient eligible for thrombolytic therapy. (C-2)
- 5-2.81 Describe the "window of opportunity" as it pertains to reperfusion of a myocardial injury or infarction. (C-3)
- 5-2.82 Based on the pathophysiology and clinical evaluation of the patient with a suspected acute myocardial infarction, list the anticipated clinical problems according to their life-threatening potential. (C-3)
- 5-2.83 Specify the measures that may be taken to prevent or minimize complications in the patient suspected of myocardial infarction. (C-3)
- 5-2.84 Describe the most commonly used cardiac drugs in terms of therapeutic effect and dosages, routes of administration, side effects and toxic effects. (C-3)
- 5-2.85 Describe the epidemiology, morbidity and mortality of heart failure. (C-1)
- 5-2.86 Define the principle causes and terminology associated with heart failure. (C-1)
- 5-2.87 Identify the factors that may precipitate or aggravate heart failure. (C-3)
- 5-2.88 Describe the physiological effects of heart failure. (C-2)
- 5-2.89 Define the term "acute pulmonary edema" and describe its relationship to left ventricular failure. (C-3)
- 5-2.90 Define preload, afterload and left ventricular end-diastolic pressure and relate each to the pathophysiology of heart failure. (C-3)
- 5-2.91 Differentiate between early and late signs and symptoms of left ventricular failure and those of right ventricular failure. (C-3)
- 5-2.92 Explain the clinical significance of paroxysmal nocturnal dyspnea. (C-1)
- 5-2.93 Explain the clinical significance of edema of the extremities and sacrum. (C-1)
- 5-2.94 List the interventions prescribed for the patient in acute congestive heart failure. (C-2)
- 5-2.95 Describe the most commonly used pharmacological agents in the management of congestive heart failure in terms of therapeutic effect, dosages, routes of administration, side effects and toxic effects. (C-1)
- 5-2.96 Define the term "cardiac tamponade". (C-1)
- 5-2.97 List the mechanisms by which cardiac tamponade may be produced by traumatic and non-traumatic events. (C-2)
- 5-2.98 Identify the limiting factor of pericardial anatomy that determines intrapericardiac pressure. (C-1)
- 5-2.99 Identify the clinical criteria specific to cardiac tamponade. (C-2)
- 5-2.100 Describe how to determine if pulsus paradoxus, pulsus alternans or electrical alternans is present. (C-2)
- 5-2.101 Identify the paramedic responsibilities associated with management of a patient with cardiac tamponade. (C-2)
- 5-2.102 Describe the incidence, morbidity and mortality of hypertensive emergencies. (C-1)
- 5-2.103 Define the term "hypertensive emergency". (C-1)
- 5-2.104 Identify the characteristics of the patient population at risk for developing a hypertensive emergency. (C-1)
- 5-2.105 Explain the essential pathophysiological defect of hypertension in terms of Starling's law of the heart. (C-3)
- 5-2.106 Identify the progressive vascular changes associate with sustained hypertension. (C-1)
- 5-2.107 Describe the clinical features of the patient in a hypertensive emergency. (C-3)
- 5-2.108 Rank the clinical problems of patients in hypertensive emergencies according to their sense of urgency. (C-3)
- 5-2.109 From the priority of clinical problems identified, state the management responsibilities for the patient with a hypertensive emergency. (C-2)
- 5-2.110 Identify the drugs of choice for hypertensive emergencies, rationale for use, clinical precautions and disadvantages of selected antihypertensive agents. (C-3)

- 5-2.111 Correlate abnormal findings with clinical interpretation of the patient with a hypertensive emergency. (C-3)
- 5-2.112 Define the term "cardiogenic shock". (C-1)
- 5-2.113 Describe the major systemic effects of reduced tissue perfusion caused by cardiogenic shock. (C-3)
- 5-2.114 Explain the primary mechanisms by which the heart may compensate for a diminished cardiac output and describe their efficiency in cardiogenic shock. (C-3)
- 5-2.115 Differentiate progressive stages of cardiogenic shock. (C-3)
- 5-2.116 Identify the clinical criteria for cardiogenic shock. (C-1)
- 5-2.117 Describe the characteristics of patients most likely to develop cardiogenic shock. (C-3)
- 5-2.118 Describe the most commonly used pharmacological agents in the management of cardiogenic shock in terms of therapeutic effects, dosages, routes of administration, side effects and toxic effects. (C-2)
- 5-2.119 Correlate abnormal findings with clinical assessment of the patient in cardiogenic shock. (C-3)
- 5-2.120 Identify the paramedic responsibilities associated with management of a patient in cardiogenic shock. (C-2)
- 5-2.121 Define the term "cardiac arrest". (C-1)
- 5-2.122 Identify the characteristics of patient population at risk for developing cardiac arrest from cardiac causes. (C-1)
- 5-2.123 Identify non-cardiac causes of cardiac arrest. (C-1)
- 5-2.124 Describe the arrhythmias seen in cardiac arrest. (C-3)
- 5-2.125 Identify the critical actions necessary in caring for the patient with cardiac arrest. (C-3)
- 5-2.126 Explain how to confirm asystole using the 3-lead ECG. (C-1)
- 5-2.127 Define the terms defibrillation and synchronized cardioversion. (C-1)
- 5-2.128 Specify the methods of supporting the patient with a suspected ineffective implanted defibrillation device. (C-2)
- 5-2.129 Describe the most commonly used pharmacological agents in the managements of cardiac arrest in terms of therapeutic effects. (C-3)
- 5-2.130 Identify resuscitation. (C-1)
- 5-2.131 Identify circumstances and situations where resuscitation efforts would not be initiated. (C-1)
- 5-2.132 Identify and list the inclusion and exclusion criteria for termination of resuscitation efforts. (C-1)
- 5-2.133 Identify communication and documentation protocols with medical direction and law enforcement used for termination of resuscitation efforts. (C-1)
- 5-2.134 Describe the incidence, morbidity and mortality of vascular disorders. (C-1)
- 5-2.135 Describe the pathophysiology of vascular disorders. (C-1)
- 5-2.136 List the traumatic and non-traumatic causes of vascular disorders. (C-1)
- 5-2.137 Define the terms "aneurysm", "claudication" and "phlebitis". (C-1)
- 5-2.138 Identify the peripheral arteries most commonly affected by occlusive disease. (C-1)
- 5-2.139 Identify the major factors involved in the pathophysiology of aortic aneurysm. (C-1)
- 5-2.140 Recognize the usual order of signs and symptoms that develop following peripheral artery occlusion. (C-3)
- 5-2.141 Identify the clinical significance of claudication and presence of arterial bruits in a patient with peripheral vascular disorders. (C-3)
- 5-2.142 Describe the clinical significance of unequal arterial blood pressure readings in the arms. (C-3)
- 5-2.143 Recognize and describe the signs and symptoms of dissecting thoracic or abdominal aneurysm. (C-3)
- 5-2.144 Describe the significant elements of the patient history in a patient with vascular disease. (C-2)
- 5-2.145 Identify the hemodynamic effects of vascular disorders. (C-1)
- 5-2.146 Identify the complications of vascular disorders. (C-1)
- 5-2.147 Identify the Paramedic's responsibilities associated with management of patients with vascular disorders. (C-2)
- 5-2.148 Develop, execute and evaluate a treatment plan based on the field impression for the patient with vascular disorders. (C-3)

- 5-2.149 Differentiate between signs and symptoms of cardiac tamponade, hypertensive emergencies, cardiogenic shock, and cardiac arrest. (C-3)
- 5-2.150 Based on the pathophysiology and clinical evaluation of the patient with chest pain, characterize the clinical problems according to their life-threatening potential. (C-3)
- 5-2.151 Apply knowledge of the epidemiology of cardiovascular disease to develop prevention strategies. (C-3)
- 5-2.152 Integrate pathophysiological principles into the assessment of a patient with cardiovascular disease. (C-3)
- 5-2.153 Apply knowledge of the epidemiology of cardiovascular disease to develop prevention strategies. (C-3)
- 5-2.154 Integrate pathophysiological principles into the assessment of a patient with cardiovascular disease. (C-3)
- 5-2.155 Synthesize patient history, assessment findings and ECG analysis to form a field impression for the patient with cardiovascular disease. (C-3)
- 5-2.156 Integrate pathophysiological principles to the assessment of a patient in need of a pacemaker. (C-1)
- 5-2.157 Synthesize patient history, assessment findings and ECG analysis to form a field impression for the patient in need of a pacemaker. (C-3)
- 5-2.158 Develop, execute, and evaluate a treatment plan based on field impression for the patient in need of a pacemaker. (C-3)
- 5-2.159 Based on the pathophysiology and clinical evaluation of the patient with chest pain, characterize the clinical problems according to their life-threatening potential. (C-3)
- 5-2.160 Integrate pathophysiological principles to the assessment of a patient with chest pain. (C-3)
- 5-2.161 Synthesize patient history, assessment findings and ECG analysis to form a field impression for the patient with angina pectoris. (C-3)
- 5-2.162 Develop, execute and evaluate a treatment plan based on the field impression for the patient with chest pain. (C-3)
- 5-2.163 Integrate pathophysiological principles to the assessment of a patient with a suspected myocardial infarction. (C-3)
- 5-2.164 Synthesize patient history, assessment findings and ECG analysis to form a field impression for the patient with a suspected myocardial infarction. (C-3)
- 5-2.165 Develop, execute and evaluate a treatment plan based on the field impression for the suspected myocardial infarction patient. (C-3)
- 5-2.166 Integrate pathophysiological principles to the assessment of the patient with heart failure. (C-3)
- 5-2.167 Synthesize assessment findings and patient history information to form a field impression of the patient with heart failure. (C-3)
- 5-2.168 Develop, execute, and evaluate a treatment plan based on the field impression for the heart failure patient. (C-3)
- 5-2.169 Integrate pathophysiological principles to the assessment of a patient with cardiac tamponade. (C-3)
- 5-2.170 Synthesize assessment findings and patient history information to form a field impression of the patient with cardiac tamponade. (C-3)
- 5-2.171 Develop, execute and evaluate a treatment plan based on the field impression for the patient with cardiac tamponade. (C-3)
- 5-2.172 Integrate pathophysiological principles to the assessment of the patient with a hypertensive emergency. (C-3)
- 5-2.173 Synthesize assessment findings and patient history information to form a field impression of the patient with a hypertensive emergency. (C-3)
- 5-2.174 Develop, execute and evaluate a treatment plan based on the field impression for the patient with a hypertensive emergency. (C-3)
- 5-2.175 Integrate pathophysiological principles to the assessment of the patient with cardiogenic shock. (C-3)
- 5-2.176 Synthesize assessment findings and patient history information to form a field impression of the patient with cardiogenic shock. (C-3)
- 5-2.177 Develop, execute, and evaluate a treatment plan based on the field impression for the patient with

- cardiogenic shock. (C-3)
- 5-2.178 Integrate the pathophysiological principles to the assessment of the patient with cardiac arrest. (C-3)
- 5-2.179 Synthesize assessment findings to formulate a rapid intervention for a patient in cardiac arrest. (C-3)
- 5-2.180 Synthesize assessment findings to formulate the termination of resuscitative efforts for a patient in cardiac arrest. (C-3)
- 5-2.181 Integrate pathophysiological principles to the assessment of a patient with vascular disorders. (C-3)
- 5-2.182 Synthesize assessment findings and patient history to form a field impression for the patient with vascular disorders. (C-3)
- 5-2.183 Integrate pathophysiological principles to the assessment and field management of a patient with chest pain. (C-3)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 5-2.184 Value the sense of urgency for initial assessment and intervention in the patient with cardiac compromise. (A-3)
- 5-2.185 Value and defend the sense of urgency necessary to protect the window of opportunity for reperfusion in the patient with suspected myocardial infarction. (A-3)
- 5-2.186 Defend patient situations where ECG rhythm analysis is indicated. (A-3)
- 5-2.187 Value and defend the application of transcutaneous pacing system. (A-3)
- 5-2.188 Value and defend the urgency in identifying pacemaker malfunction. (A-3)
- 5-2.189 Based on the pathophysiology and clinical evaluation of the patient with acute myocardial infarction, characterize the clinical problems according to their life-threatening potential. (A-3)
- 5-2.190 Defend the measures that may be taken to prevent or minimize complications in the patient with a suspected myocardial infarction. (A-3)
- 5-2.191 Defend the urgency based on the severity of the patient's clinical problems in a hypertensive emergency. (A-3)
- 5-2.192 From the priority of clinical problems identified, state the management responsibilities for the patient with a hypertensive emergency. (A-3)
- 5-2.193 Value and defend the urgency in rapid determination of and rapid intervention of patients in cardiac arrest. (A-3)
- 5-2.194 Value and defend the possibility of termination of resuscitative efforts in the out-of-hospital setting. (A-3)
- 5-2.195 Based on the pathophysiology and clinical evaluation of the patient with vascular disorders, characterize the clinical problems according to their life-threatening potential. (A-3)
- 5-2.196 Value and defend the sense of urgency in identifying peripheral vascular occlusion. (A-3)
- 5-2.197 Value and defend the sense of urgency in recognizing signs of aortic aneurysm. (A-3)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 5-2.198 Demonstrate how to set and adjust the ECG monitor settings to varying patient situations. (P-3)
- 5-2.199 Demonstrate a working knowledge of various ECG lead systems. (P-3)
- 5-2.200 Demonstrate how to record an ECG. (P-2)
- 5-2.201 Perform, document and communicate a cardiovascular assessment. (P-1)
- 5-2.202 Set up and apply a transcutaneous pacing system. (P-3)
- 5-2.203 Given the model of a patient with signs and symptoms of heart failure, position the patient to afford comfort and relief. (P-2)
- 5-2.204 Demonstrate how to determine if pulsus paradoxus, pulsus alternans or electrical alternans is present. (P-

- 2)
- 5-2.205 Demonstrate satisfactory performance of psychomotor skills of basic and advanced life support techniques according to the current American Heart Association Standards and Guidelines, including: (P-3)
- a. Cardiopulmonary resuscitation
 - b. Defibrillation
 - c. Synchronized cardioversion
 - d. Transcutaneous pacing
- 5-2.206 Complete a communication patch with medical direction and law enforcement used for termination of resuscitation efforts. (P-1)
- 5-2.207 Demonstrate how to evaluate major peripheral arterial pulses. (P-1)

DECLARATIVE

- I. Introduction
 - A. Epidemiology
 1. Incidence
 - a. Prevalence of cardiac death outside of a hospital
(1) Supportive statistics
 - b. Prevalence of prodromal signs and symptoms
(1) Supportive statistics
 - c. Increased recognition of need for early reperfusion
 2. Morbidity/ mortality
 - a. Reduced with early recognition
 - b. Reduced with early access to EMS system
 3. Risk factors
 - a. Age
 - b. Family history
 - c. Hypertension
 - d. Lipids
(1) Hypercholesterolemia
 - e. Male sex
 - f. Smoking
 - g. Carbohydrate intolerance
 4. Possible contributing risks
 - a. Diet
 - b. Female sex
 - c. Obesity
 - d. Oral contraceptives
 - e. Sedentary living
 - f. Personality type
 - g. Psychosocial tensions
 5. Prevention strategies
 - a. Early recognition
 - b. Education
 - c. Alteration of life style
 - B. Cardiovascular anatomy and physiology
 1. Anatomy of the heart
 2. Location
 - a. Layers
 - (1) Myocardium
 - (2) Endocardium
 - (3) Pericardium
 - (a) Visceral (epicardium)
 - (b) Parietal
 - b. Chambers
 - (1) Atria
 - (2) Ventricles
 - c. Valves
 - (1) Atrioventricular (AV) valves

- (a) Tricuspid (right)
 - (b) Mitral (left)
 - (2) Semilunar valves
 - (a) Pulmonary (right)
 - (b) Aortic (left)
 - d. Papillary muscles
 - e. Chordae tendineae
- 3. Cardiac cycle
 - a. Phases
 - (1) Systole
 - (a) Artrial
 - (b) Ventricular
 - (2) Diastole
 - (a) Atrial
 - (b) Ventricular
 - b. Cardiac output
 - (1) Stroke volume
 - (a) Heart rate
 - (b) Contractility
 - (c) Starling's law
- 4. Vascular system
 - a. Aorta
 - (1) Ascending
 - (2) Thoracic
 - (3) Abdominal
 - b. Arteries
 - c. Arterioles
 - d. Capillaries
 - e. Venule
 - f. Veins
 - g. Vena cava
 - (1) Superior
 - (2) Inferior
 - h. Venous return (preload)
 - (1) Skeletal muscle pump
 - (2) Thoracoabdominal pump
 - (3) Respiratory cycle
 - (4) Gravity
 - (5) IPPB, PEEP, CPAP, BiPAP
 - i. Resistance and capacitance (afterload)
 - j. Pulmonary veins
- 5. Coronary circulation
 - a. Arteries
 - (1) Left coronary artery
 - (a) Anterior descending branch (LAD)
 - i) Distribution to the conduction system
 - (b) Circumflex
 - i) Distribution to the conduction system

- (2) Right coronary artery
 - (a) Distribution to the conduction system
- b. Veins
 - (1) Coronary sinus
 - (2) Great cardiac vein
- 6. Electrophysiology
 - a. Conduction system overview
 - (1) Sinoatrial node or sinus node (SA node)
 - (2) Atrioventricular (AV) junction
 - (a) AV node
 - (b) Bundle of His
 - (3) His-Purkinje system
 - (a) Bundle branches
 - i) Right
 - ii) Left anterior fascicle
 - iii) Left posterior fascicle
 - (4) Characteristics of myocardial cells
 - (a) Automaticity
 - (b) Excitability
 - (c) Conductivity
 - (d) Contractility
 - b. Electrical potential
 - (1) Action potential
 - (a) Important electrolytes
 - i) Sodium
 - ii) Potassium
 - iii) Calcium
 - iv) Chloride
 - v) Magnesium
 - (2) Excitability
 - (a) Thresholds
 - (b) Depolarization
 - (c) Repolarization
 - i) Relative refractory period
 - ii) Absolute refractory period
 - (3) Neurotransmitters
 - (a) Acetylcholine
 - i) Effects on myocardium
 - ii) Effects on systemic blood vessels
 - (b) Cholinesterase
 - i) Effects on myocardium
 - ii) Effects on systemic blood vessels
 - c. Autonomic nervous system relationship to cardiovascular system
 - (1) Medulla
 - (2) Carotid sinus and baroreceptor
 - (a) Location
 - (b) Significance
 - (3) Parasympathetic system

- (4) Sympathetic
 - (a) Alpha - vasoconstrictive effect on systemic blood vessels
 - (b) Beta
 - i) Inotropic effect on myocardium
 - ii) Dromotropic effect on myocardium
 - iii) Chronotropic effect on myocardium
- (5) Systemic circulation

II. Initial cardiovascular assessment

- A. Level of responsiveness
- B. Airway
 - 1. Patent
 - 2. Debris, blood
- C. Breathing
 - 1. Absent
 - 2. Present
 - a. Rate and depth
 - (1) Effort
 - (2) Breath sounds
 - (a) Characteristics
 - (b) Significance
- D. Circulation
 - 1. Pulse
 - a. Absent
 - b. Present
 - (1) Rate and quality
 - (a) Pulse deficit
 - (b) Pulsus paradoxus
 - (c) Pulsus alternans
 - 2. Skin
 - a. Color
 - b. Temperature
 - c. Moisture
 - d. Turgor
 - e. Mobility
 - f. Edema
 - 3. Blood pressure

III. Focused history

- A. H and physical/ SAMPLE format
 - 1. Chief complaint
 - 2. Pain
 - a. OPQRST
 - (1) Onset/ origin
 - (a) Pertinent past history
 - (b) Time of onset
 - (2) Provocation
 - (a) Exertional

- (b) Non-exertional
- (3) Quality
 - (a) Patient's narrative description
 - i) For example - sharp, tearing, pressure, heaviness
- (4) Region/ radiation
 - (a) For example - arms, neck, back
- (5) Severity
 - (a) "1-10" scale
- (6) Timing
 - (a) Duration
 - (b) Worsening or improving
 - (c) Continuous or intermittent
 - (d) At rest or with activity
- 3. Dyspnea
 - a. Continuous or intermittent
 - b. Exertional
 - c. Non-exertional
 - d. Orthopneic
- 4. Cough
 - a. Dry
 - b. Productive
- 5. Related signs and symptoms
 - a. Level of consciousness
 - b. Diaphoresis
 - c. Restlessness, anxiety
 - d. Feeling of impending doom
 - e. Nausea/ vomiting
 - f. Fatigue
 - g. Palpitations
 - h. Edema
 - (1) Extremities
 - (2) Sacral
 - i. Headache
 - j. Syncope
 - k. Behavioral change
 - l. Anguished facial expression
 - m. Activity limitations
 - n. Trauma
- 6. Past medical history
 - a. Coronary artery disease (CAD)
 - b. Atherosclerotic heart disease
 - (1) Angina
 - (2) Previous MI
 - (3) Hypertension
 - (4) Congestive heart failure (CHF)
 - c. Valvular disease
 - d. Aneurysm
 - e. Pulmonary disease

- f. Diabetes
- g. Renal disease
- h. Vascular disease
- i. Inflammatory cardiac disease
- j. Previous cardiac surgery
- k. Congenital anomalies
- l. Current/ past medications
 - (1) Prescribed
 - (a) Compliance
 - (b) Non-compliance
 - (2) Borrowed
 - (3) Over-the-counter
 - (4) Recreational
 - (a) For example - cocaine
- m. Allergies
- n. Family history
 - (1) Stroke, heart disease, diabetes, hypertension
 - (2) Age at death
- o. Known cholesterol levels

IV. Detailed physical examination

A. Inspection

- 1. Tracheal position
 - a. Neck veins
 - (1) Appearance
 - (2) Pressure
 - (3) Clinical significance
 - b. Thorax
 - (1) Configuration
 - (a) A-P diameter
 - (b) Movement with respirations
 - (2) Clinical significance
 - c. Epigastrium
 - (a) Pulsation
 - (1) Distention
 - (2) Clinical significance

B. Auscultation

- 1. Neck
 - a. Normal
 - b. Abnormal
 - (1) Bruit
- 2. Breath sounds
 - a. Depth
 - b. Equality
 - c. Adventitious sounds
 - (1) Crackles
 - (2) Wheezes
 - (a) Gurgling

- (b) Frothing (mouth and nose)
 - i) Blood tinged
 - ii) Foamy
 - 3. Heart sounds
 - a. Auscultatory sites
 - b. Identify S₁, S₂
 - C. Palpation
 - 1. Areas of crepitus or tenderness
 - 2. Thorax
 - 3. Epigastrium
 - a. Pulsation
 - b. Distention
- V. Electrocardiographic (ECG) monitoring
 - A. Electrophysiology and wave forms
 - 1. Origination
 - 2. Production
 - 3. Relationship of cardiac events to wave forms
 - 4. Intervals
 - a. Normal
 - b. Clinical significance
 - 5. Segments
 - B. Leads and electrodes
 - 1. Electrode
 - 2. Leads
 - a. Anatomic positions
 - b. Correct placement
 - 3. Surfaces of heart and lead systems
 - a. Inferior
 - b. Left lateral
 - c. Anterior/ posterior
 - 4. Artifact
 - C. Standardization
 - 1. Amplitude
 - 2. Height
 - 3. Rate
 - a. Duration
 - b. Wave form
 - c. Segment
 - d. Complex
 - e. Interval
 - D. Wave form analysis
 - 1. Isoelectric
 - 2. Positive
 - 3. Negative
 - 4. Calculation of ECG heart rate
 - a. Regular rhythm
 - (1) ECG strip method
 - (2) "300" method

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- b. Irregular rhythm
 - (1) ECG strip method
 - (2) "300" method
 - E. Lead systems and heart surfaces
 - 1. ECG rhythm analysis
 - a. Value
 - b. Limitations
 - 2. Heart surfaces
 - a. Inferior
 - b. Left lateral
 - c. Precordial
 - 3. Acute signs of ischemia, injury and necrosis
 - a. Rationale
 - (1) Possible early identification of patients with acute myocardial infarction for intervention (thrombolysis or PTCA)
 - (2) The role of out-of-hospital twelve-lead ECG is still unresolved and may not be appropriate in many EMS settings
 - (3) EMS medical directors will make decisions regarding the application and use of the 12-lead ECG in their specific EMS setting
 - b. Advantages/ disadvantages
 - c. ST segment elevation
 - (1) Height, depth and contour
 - (2) ST (acute changes)
 - (a) Anterior wall
 - i) Significant ST elevation in V_1 - V_4 may indicate anterior involvement
 - (b) Inferior wall
 - i) Significant ST elevation in II, III and aVF may indicate inferior involvement
 - (3) ST segment depression in eight or more leads
 - (4) ST segment elevation in aVR and V_1
 - d. Q waves
 - (1) Depth, duration and significance
 - (a) Greater than 5 mm, greater than .04 seconds
 - (b) May indicate necrosis
 - (c) May indicate extensive transient ischemia
 - F. Cardiac arrhythmias
 - 1. Approach to analysis
 - a. P wave
 - (1) Configuration
 - (2) Duration
 - (3) Atrial rate and rhythm
 - b. P-R (P-Q) interval
 - (1) Duration
 - c. QRS complex
 - (1) Configuration
 - (2) Duration
 - (3) Ventricular rate and rhythm

- d. S-T segment
 - (1) Contour
 - (2) Elevation
 - (3) Depression
- e. Q-T interval
 - (1) Duration
 - (2) Implication of prolongation
- f. Relationship of P waves to QRS complexes
 - (1) Consistent
 - (2) Progressive prolongation
 - (3) No relationship
- g. T waves
- h. U waves
- 2. Interpretation of the ECG
 - a. Origin of complex
 - b. Rate
 - c. Rhythm
 - d. Clinical significance
- 3. Arrhythmia originating in the sinus node
 - a. Sinus bradycardia
 - b. Sinus tachycardia
 - c. Sinus arrhythmia
 - d. Sinus arrest
- 4. Arrhythmias originating in the atria
 - a. Premature atrial complex
 - b. Atrial (ectopic) tachycardia
 - c. Re-entrant tachycardia
 - d. Multifocal atrial tachycardia
 - e. Atrial flutter
 - f. Atrial fibrillation
 - g. Atrial flutter or atrial fibrillation with junctional rhythm
 - h. Atrial flutter or atrial fibrillation with pre-excitation syndromes
- 5. Arrhythmias originating within the AV junction
 - a. First degree AV block
 - b. Second degree AV block
 - (1) Type I
 - (2) Type II/ infranodal
 - c. Complete AV block (third degree block)
- 6. Arrhythmias sustained or originating in the AV junction
 - a. AV nodal re-entrant tachycardia
 - b. AV reciprocating tachycardia
 - (1) Narrow
 - (2) Wide
 - c. Junctional escape rhythm
 - d. Premature junctional complex
 - e. Accelerated junctional rhythm
 - f. Junctional tachycardia
- 7. Arrhythmias originating in the ventricles

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- a. Idioventricular rhythm
 - b. Accelerated idioventricular rhythm
 - c. Premature ventricular complex (ventricular ectopic)
 - (1) R on T phenomenon
 - (2) Paired/ couplets
 - (3) Multifomed
 - (4) Frequent uniform
 - d. "Rule of bigeminy" pertaining to precipitating ventricular arrhythmias
 - e. Ventricular tachycardia
 - (1) Monomorphic
 - (2) Polymorphic (including torsades de pointes)
 - f. Ventricular fibrillation
 - g. Ventricular standstill
 - h. Asystole
8. Abnormalities originating within the bundle branch system
- a. Incomplete or complete
 - b. Right bundle branch block
 - c. Left bundle branch block
9. Differentiation of wide QRS complex tachycardia
- a. Potential causes
 - (1) Supraventricular tachycardia with bundle branch block
 - (2) Accessory pathways
 - b. Differentiation
 - (1) Physical evaluation
 - (a) Cannon "A" waves
 - (b) Vary intensity of first heart tone
 - (c) Beat to beat changes in blood pressure
 - (2) ECG differences
 - (a) Aberration as a result of premature atrial complex
 - i) Identify PAC in previous ST segment or T wave
 - ii) Sudden change in rate with bundle branch aberration
 - iii) Concealed retrograde conduction
 - iv) Right bundle branch refractoriness - may be time dependent
 - v) Compare with previous ECG, when available
 - (b) RBBB aberration - V₁ - positive
 - i) Biphasic lead I with a broad terminal S-wave
 - ii) Triphasic QRS in V₄
 - (c) LBBB aberration - V₁ - negative
 - i) Monophasic notched lead I
 - ii) Slurred, notched or RSr' in lead V₁, V₂, or V₃
 - (d) Concordant precordial pattern
 - i) Totally negative precordial pattern is diagnostic of ventricular tachycardia
 - ii) Totally positive precordial pattern is suggestive of ventricular tachycardia
 - (e) Preexisting BBB prior to onset of tachycardia (by history)
 - (3) Other considerations

- (a) When in doubt
 - i) Cardioversion when hemodynamic state is compromised or changing
 - ii) Never use verapamil
 - iii) If hemodynamic state is stable - consider lidocaine
- (b) Pitfalls
 - i) Age is not a differential
 - ii) Slower rates may present with stable hemodynamic
 - iii) Preexisting BBB prior to onset of the tachycardia
- (c) Regularity
 - i) Monomorphic V-tach and SVT are usually very regular and SVT frequently is faster
 - ii) Polymorphic V-tach is irregular
- 10. Pulseless electrical activity
 - a. Electrical mechanical dissociation
 - b. Mechanical impairments to pulsations/ cardiac output
 - c. Other possible causes
- 11. Other ECG phenomena
 - a. Accessory pathways
 - b. Preexcitation phenomenon
 - c. Aberration versus ectopy
- 12. ECG changes due to electrolyte imbalances
 - a. Hyperkalemia
 - b. Hypokalemia
- 13. ECG changes in hypothermia

VI. Management of the patient with arrhythmias

A. Assessment

- 1. Symptomatic
- 2. Hypotensive
- 3. Hypoperfusion
- 4. Mechanical
- 5. Vagal maneuvers - if the heart rate is too fast
- 6. Stimulation - If heart rate is too slow
- 7. Precordial thump
- 8. Cough

B. Pharmacological

- 1. Gases
 - a. Such as oxygen
- 2. Sympathetic
 - a. Such as epinephrine
- 3. Anticholinergic
 - a. Such as atropine
- 4. Antiarrhythmic
 - a. Such as lidocaine
- 5. Beta blocker
 - a. Selective
 - (1) Such as metoprolol

- b. Non-selective
 - (1) Such as propranolol
 - 6. Vasopressor
 - a. Such as dopamine
 - 7. Calcium channel blocker
 - a. Such as verapamil
 - 8. Purine nucleoside
 - a. Such as adenosine
 - 9. Platelet aggregate inhibitor
 - a. Such as aspirin
 - 10. Alkalinizing agents
 - a. Such as sodium bicarbonate
 - 11. Cardiac glycoside
 - a. Such as digitalis
 - 12. Narcotic/ analgesic
 - a. Such as morphine
 - 13. Diuretic
 - a. Such as furosemide
 - 14. Nitrate
 - a. Such as nitroglycerin
 - 15. Antihypertensive
 - a. Such as sodium nitroprusside
- C. Electrical
- 1. Purpose
 - 2. Methods
 - a. Synchronized cardioversion
 - b. Defibrillation
 - c. Cardiac pacing
 - (1) Implanted pacemaker functions
 - (a) Characteristics
 - (b) Pacemaker artifact
 - (c) ECG tracing of capture
 - (d) Failure to sense
 - i) ECG indications
 - ii) Clinical significance
 - (e) Failure to capture
 - i) ECG indications
 - ii) Clinical significance
 - (f) Failure to pace
 - i) ECG indications
 - ii) Clinical significance
 - (g) Pacer-induced tachycardia
 - i) ECG findings
 - ii) Clinical significance
 - iii) Treatment
 - (2) Transcutaneous pacing
 - (a) Criteria for use
 - (b) Bradycardia

- i) Patient is hypotensive/ hypoperfusing
 - ii) No change with pharmacologic intervention
 - (c) Second degree AV block
 - i) Patient is hypotensive/ hypoperfusing
 - ii) No change with pharmacologic intervention
 - (d) Complete AV block
 - i) Patient is hypotensive/ hypoperfusing
 - ii) No change with pharmacologic intervention
 - (e) Asystole
 - (f) Overdrive
 - i) Deter occurrence of recurrent tachycardia
 - d. Set-up
 - (1) Placement of electrodes
 - (2) Rate and milliamperage (mA) settings
 - (3) Pacer artifact
 - (4) Capture
 - (5) Failure to sense
 - (a) Causes
 - (b) Implications
 - (c) Interventions
 - (6) Failure to capture
 - (a) Causes
 - (b) Implications
 - (c) Interventions
 - (7) Failure to pace
 - (a) Causes
 - (b) Implications
 - (c) Interventions
 - (8) Hazards
 - (9) Complications
 - (a) Interventions
- D. Transport
 - 1. Indications for rapid transport
 - 2. Indications for no transport required
 - 3. Indications for referral
- E. Support and communications strategies
 - 1. Explanation for patient, family, significant others
 - 2. Communications and transfer of data to the physician

- VII. Angina pectoris
 - A. Epidemiology
 - 1. Precipitating causes
 - a. Atherosclerosis
 - b. Vasospastic (Prinzmetal's)
 - B. Morbidity/ mortality
 - 1. Not a self-limiting disease
 - 2. Chest pain may dissipate, but myocardial ischemia and injury can continue
 - 3. A single anginal episode may be a precursor to myocardial infarction

4. May not be cardiac in origin
 5. Must be diagnosed by a physician
 6. Related terminology
 - a. Defined as a brief discomfort, has predictable characteristics and is relieved promptly - no change in this pattern
 - b. Stable
 - (1) Occurs at a relative fixed frequency
 - (2) Usually relieved by rest and/ or medication
 - c. Unstable
 - (1) Occurs without fixed frequency
 - (2) May or may not be relieved by rest and/ or medication
 - d. Initial - first episode
 - e. Progressive - accelerating in frequency and duration
 - f. Preinfarction angina
 - (1) Pain at rest
 - (2) Sitting or lying down
 7. Differential diagnoses
 - a. Cholecystitis
 - b. Acute viral pericarditis or any other inflammatory cardiac disease
 - c. Aneurysm
 - d. Hiatal hernia
 - e. Esophageal disease
 - f. Gastric reflux
 - g. Pulmonary embolism
 - h. Peptic ulcer disease
 - i. Pancreatitis
 - j. Chest wall syndrome
 - k. Costochondritis
 - l. Acromioclavicular disease
 - m. Pleural irritation
 - n. Respiratory infections
 - o. Aortic dissection
 - p. Pneumothorax
 - q. Dyspepsia
 - r. Herpes zoster
 - s. Chest wall tumors
 - t. Chest wall trauma
- C. Initial assessment findings
1. Airway/ breathing
 - a. Labored breathing may or may not be present
 2. Circulation
 - a. Peripheral pulses
 - (1) Quality
 - (2) Rhythm
 - b. Changes in skin
 - (1) Color
 - (2) Temperature
 - (3) Moisture

- D. Focused history
 - 1. Chief complaint
 - a. Typical - sudden onset of discomfort, usually of brief duration, lasting three to five minutes, maybe five to 15 minutes; never 30 minutes to two hours
 - b. Typical - usually relieved by rest and/ or medication
 - c. Epigastric pain or discomfort
 - d. Atypical
 - 2. Denial
 - 3. Contributing history
 - a. Initial recognized event
 - b. Recurrent event
 - c. Increasing frequency and/ or duration of event
- E. Detailed physical exam
 - 1. Airway
 - 2. Breathing
 - a. May or may not be labored
 - (1) Sounds
 - (a) May be clear to auscultation
 - (b) May be congested in the bases
 - 3. Circulation
 - a. Alterations in heart rate and rhythm may occur
 - b. Peripheral pulses are usually not affected
 - c. Blood pressure may be elevated during the episode and normalize afterwards
 - d. ECG Devices
 - (1) Monitor
 - (2) Transmission
 - (3) Documentation
 - (4) Computerized pattern identification
 - (a) Pitfalls
 - (b) Common errors
 - e. Findings
 - (1) ST segment changes are often not specific
 - (2) Arrhythmias and ectopy may not be present
- F. Management
 - 1. Position of comfort
 - 2. Pharmacological
 - a. Gases
 - b. Nitrates
 - c. Analgesics
 - d. Possible antiarrhythmic
 - e. Possible antihypertensives
 - 3. ECG
 - a. Whenever possible, and scene time is not delayed, record and transmit 3-lead and/ or 12-lead ECG during pain, since ECG may be normal during the pain-free period
 - b. Measure, record and communicate ST segment changes
 - 4. Transport
 - a. Indications for rapid transport

- (1) Sense of urgency for reperfusion
 - (2) No relief with medications
 - (3) Hypotension/ hypoperfusion
 - (4) Significant changes in ECG
 - b. No transport
 - (1) Patient refusal
 - (2) Referral
- G. Support and communications strategies
 - 1. Explanation for patient, family, significant others
 - 2. Communications and transfer of data to the physician

VIII. Myocardial infarction

- A. Epidemiology
 - 1. Precipitating causes (as with angina)
 - a. Atherosclerosis
 - b. Persistent angina
 - c. Occlusion
 - d. Non-traumatic
 - (1) Recreational drugs
 - e. Trauma
- B. Morbidity/ mortality
 - 1. Sudden death
 - 2. Extensive myocardial damage
 - 3. May result in ventricular fibrillation
 - a. Prevention strategies
 - (1) Relieve pain
 - (2) Effect reperfusion
- C. Initial assessment findings
 - 1. Airway/ breathing
 - a. Labored breathing may or may not be present
 - 2. Circulation
 - a. Peripheral pulses
 - (1) Quality
 - (2) Rhythm
 - b. Changes in skin
 - (1) Color
 - (2) Temperature
 - (3) Moisture
- D. Focused history
 - 1. Chief complaint
 - a. Typical onset of discomfort, usually of long duration, over 30 minutes
 - b. Typically unrelieved by rest and/ or nitroglycerin preparation
 - c. Epigastric pain or discomfort
 - d. Atypical
 - 2. Contributing history
 - a. First time
 - b. Recurrent
 - c. Increasing frequency and/ or duration

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3. Denial
 - E. Detailed physical exam
 1. Airway
 2. Breath sounds
 - a. May be clear to auscultation
 - b. Congestion in bases may be present
 3. Circulation
 - a. Skin
 - (1) Pallor during the episode
 - (2) Temperature may vary
 - (3) Diaphoresis is usually present
 - b. Alterations in heart rate and rhythm may occur
 - c. Peripheral pulses are usually not affected
 - d. Blood pressure may be elevated or lowered
 - e. ECG findings
 - (1) ST segment elevation
 - (a) Height, depth and contour
 - (b) ST changes
 - (c) ST segment depression in reciprocal leads
 - (2) Q waves
 - (a) Depth, duration and significance
 - i) Greater than 5 mm, greater than .04 seconds
 - ii) May indicate necrosis
 - iii) May indicate extensive transient ischemia
 - (3) ECG Rhythm analysis
 - (a) Criteria for patient selection for rapid transport and reperfusion
 - (b) Value
 - (c) Signs of acute ischemia, injury, and necrosis
 - (d) Criteria for patient selection for rapid transport and reperfusion
 - i) Time of onset of pain
 - ii) Location of ischemia and infarction
 - iii) ST segment elevation
 - (4) Cardiac arrhythmias
 - (a) Sinus tachycardia with or without ectopy
 - (b) Narrow or wide QRS complex tachycardia
 - (c) Sinus bradycardia
 - (d) Heart blocks
 - (e) Ventricular fibrillation
 - (f) Pulseless electrical activity (PEA)
 - (g) Asystole (confirmed in a second lead)
 - F. Management
 1. Position of comfort
 2. Pharmacological
 - a. Gases
 - b. Nitrates
 - c. Platelet aggregate inhibitor
 - d. Analgesia
 - e. Increase or decrease heart rate

- f. Possible antiarrhythmic
- g. Possible antihypertensives
- 3. Electrical
 - a. Constant ECG monitoring
 - b. Defibrillation/ synchronized cardioversion
 - c. Transcutaneous pacing
- 4. Transport
 - a. Criteria for rapid transport
 - (1) No relief with medications
 - (a) Hypotension/ hypoperfusion
 - (b) Significant changes in ECG
 - i) Ectopy
 - ii) Arrhythmias
 - b. ECG criteria for rapid transport and reperfusion
 - (1) Time of onset of pain
 - (2) ECG rhythm abnormalities
 - c. Indications for "no transport"
 - (1) Refusal
 - (2) No other indications for no-transport
- 5. Support and communications strategies
 - (1) Explanation for patient, family, significant others
 - (2) Communications and transfer of data to the physician

IX. Heart failure

- A. Epidemiology
 - 1. Precipitating causes
 - a. Left sided failure
 - b. Right sided failure
 - b. Myocardial infarction
 - c. Pulmonary embolism
 - d. Hypertension
 - e. Cardiomegaly
 - f. High output failure
 - g. Low output failure
 - 2. Related terminology
 - a. Preload
 - b. Afterload
 - c. Congestive heart failure
 - (1) Loss of contractile ability which results in fluid overload
 - d. Chronic versus acute
 - (1) First time event
 - (2) Multiple events
- B. Morbidity/ mortality
 - 1. Pulmonary edema
 - 2. Respiratory failure
 - 3. Death
- C. Initial assessment
 - 1. Airway/ breathing

- a. Labored breathing may or may not be present
 - 2. Circulation
 - a. Peripheral pulses
 - (1) Quality
 - (2) Rhythm
 - b. Changes in skin
 - (1) Color
 - (2) Temperature
 - (3) Moisture
 - D. Focused history
 - 1. Chief complaint
 - a. Progressive or acute SOB
 - b. Progressive accumulation of edema
 - c. Weight gain over short period of time
 - d. Episodes of paroxysmal nocturnal dyspnea
 - e. Medication history
 - (1) Prescribed
 - (a) Compliance
 - (b) Non-compliance
 - (2) Borrowed
 - (3) Over-the-counter
 - f. Home oxygen use
- E. Detailed physical exam
 - 1. Level of consciousness
 - a. Unconscious
 - b. Altered levels of consciousness
 - 2. Airway/ breathing
 - a. Dyspnea
 - b. Productive cough
 - c. Labored breathing
 - (1) Most common, often with activity
 - (2) Paroxysmal nocturnal dyspnea (PND)
 - (3) Tripod position
 - (4) Adventitious sounds
 - (5) Retraction
 - 3. Circulation
 - a. Heart rate/ rhythm
 - (1) Any tachycardia with ectopy
 - (2) Any bradycardia with ectopy
 - (3) Atrial arrhythmias
 - b. Changes in skin
 - (1) Color
 - (2) Temperature
 - (3) Moisture
 - c. Peripheral pulses
 - (1) Quality
 - (2) Rhythm
 - d. Edema

- (1) Pitting versus non-pitting
 - (2) Extremities
 - (a) Localized in ankles
 - (b) To the midcalf
 - (c) To the knees
 - (d) Obliteration of pulses
 - (3) Ascites
 - (a) Engorged mass(es) in upper abdominal quadrants
 - (4) Sacral
- F. Complications
- 1. Pulmonary edema
 - a. Signs and symptoms
 - (1) Tachypnea
 - (2) Wheezing
 - (3) Rales at both bases
 - (4) Elevated jugular venous pressure
 - (5) Pulsus paradoxus
 - (6) Rapid "thready" pulse
 - (7) Pulsus alternans
 - (8) Abnormalities of apical pulse
 - (a) Due to displaced cardiac apex
 - (b) Abnormal bulges
 - (9) Cyanosis in advanced stages
 - (10) Frothy sputum
- G. Management
- 1. Position of comfort
 - 2. Pharmacological
 - a. Gases
 - b. Afterload reduction
 - c. Analgesia
 - d. Diuresis
 - e. Other
 - 3. Transport
 - a. Refusal
 - b. No other indications for no-transport
- H. Support and communications strategies
- 1. Explanation for patient, family, significant others
 - 2. Communications and transfer of data to the physician
- X. Cardiac tamponade
- A. Pathophysiology
 - 1. Defined as impaired diastolic filling of the heart caused by increased intrapericardiac pressure
 - 2. Precipitating causes
 - a. Gradual onset with neoplasm or infection
 - b. Acute onset with infarction
 - c. Trauma
 - (1) Can occur with CPR
 - (2) Penetrating injury

- (3) Non-penetrating injury
 - d. Secondary to renal disease
 - e. Hypothyroidism
 - B. Morbidity/ mortality
 - 1. Death if not relieved
 - C. Initial assessment
 - 1. Airway/ breathing
 - a. Labored breathing may or may not be present
 - 2. Circulation
 - a. Peripheral pulses
 - (1) Quality
 - (2) Rhythm
 - b. Changes in skin
 - (1) Color
 - (2) Temperature
 - (3) Moisture
 - D. Focused history (as in precipitating causes)
 - E. Detailed physical examination
 - 1. Airway/ breathing
 - a. Dyspnea
 - b. Orthopnea
 - 2. Circulation
 - a. Pulse rate and rhythm
 - b. Chest pain
 - c. Tachycardia
 - d. Ectopy
 - e. Elevated venous pressures (early sign)
 - f. Decreased systolic pressure (early sign)
 - g. Narrowing pulse pressure (early sign)
 - h. Pulsus paradoxus
 - i. Heart sounds normal early on, progressively faint or muffled
 - j. ECG changes
 - (1) Low voltage QRS and T waves
 - (2) ST elevation or non-specific T wave changes
 - (3) Electrical alternans of PQRST
 - (4) Usually inconclusive - should not be used as a diagnostic tool
 - F. Management
 - 1. Airway management and ventilation
 - 2. Circulation
 - 3. Pharmacological
 - 4. Non-pharmacological
 - 5. Rapid transport for pericardiocentesis
 - G. Support and communications strategies
 - 1. Explanation for patient, family, significant others
 - 2. Communications and transfer of data to the physician
- XI. Hypertensive emergencies
 - A. Epidemiology

1. Precipitating causes
 - a. History of hypertension
 - b. Non-compliance with medication or any other treatment
 - c. Toxemia of pregnancy
- B. Morbidity/ mortality
 - a. Hypertensive encephalopathy
 - b. Stroke
- C. Initial assessment
 1. Airway/ breathing
 - a. Labored breathing may or may not be present
 2. Circulation
 - a. Peripheral pulses
 - (1) Quality
 - (2) Rhythm
 - b. Changes in skin
 - (1) Color
 - (2) Temperature
 - (3) Moisture
- D. Focused history
 1. Chief complaint
 - a. As in precipitating causes above
 2. Medication history
 - a. Prescribed
 - (1) Compliance
 - (2) Non-compliance with medication or treatment
 - b. Borrowed
 - c. Over-the-counter
 3. Home oxygen use
- E. Detailed physical examination
 1. Airway
 2. Breath sounds
 3. Circulation
 - a. Pulse
 - b. Vital signs
 - (1) Blood pressure
 - (a) Systolic greater than 160 mmHg
 - (b) Diastolic greater than 94 mmHg
 4. Diagnostic signs/ symptoms
 - a. General appearance
 - b. Level of consciousness
 - (1) Unconscious
 - (2) Altered level of consciousness
 - (3) Responsive
 - c. Skin color
 - (1) Can be pallor, flushed, or normal
 - d. Skin hydration
 - (1) Can be dry or moist
 - e. Skin temperature

- f. (1) Can be warm or cool
Peripheral pulses
 - (1) Can be strong
 - g. Edema
 - (1) Pitting versus non-pitting
 - h. Paroxysmal nocturnal dyspnea
 - i. Labored breathing (SOB)
 - j. Orthopnea
 - k. Vertigo
 - l. Epistaxis
 - m. Tinnitus
 - n. Changes in visual acuity
 - o. Nausea/ vomiting
 - p. Seizures
 - q. Lateralizing signs
 - r. ECG findings
- F. Management
- 1. Non-pharmacologic
 - a. Position of comfort
 - b. Airway and ventilation
 - 2. Pharmacological
 - a. Gases
 - b. Other
 - 3. Rapid transport
 - a. Refusal
 - b. No other indications for no transport
- G. Support and communications strategies
- 1. Explanation for patient, family, significant others
 - 2. Communications and transfer of data to the physician
- XII. Cardiogenic shock
- A. Pathophysiology
- 1. Precipitating causes
 - a. Myocardial infarction
 - (1) Can be acute or progressive
 - b. Age
 - (1) Progressive
 - c. Trauma
- B. Initial assessment
- 1. Airway/ breathing
 - a. Labored breathing may or may not be present
 - 2. Circulation
 - a. Peripheral pulses
 - (1) Quality
 - (2) Rhythm
 - b. Changes in skin
 - (1) Color
 - (2) Temperature

- (3) Moisture
- C. Focused history
 - 1. Chief complaint
 - a. As in precipitating causes above
 - 2. Medication history
 - a. Prescribed
 - (1) Compliance
 - (2) Non-compliance
 - b. Borrowed
 - c. Over-the-counter
- D. Detailed physical exam
 - 1. Critical findings
 - a. Unconscious
 - b. Altered levels of consciousness
 - c. Airway
 - (1) Dyspnea
 - (2) Productive cough
 - (3) Labored breathing
 - (a) Paroxysmal nocturnal dyspnea (PND)
 - (b) Tripod position
 - (c) Adventitious sounds
 - (d) Retraction
 - d. ECG rhythm analysis
 - (1) Any tachycardia
 - (2) Atrial arrhythmias
 - (3) Ectopics
 - e. Changes in skin
 - (1) Color
 - (2) Temperature
 - (3) Moisture
 - f. Peripheral pulses
 - (1) Quality
 - (2) Rhythm
 - g. Edema
 - (1) Pitting versus non-pitting
 - (2) Extremities
 - (a) Obliteration of pulses
 - (3) Sacral
- E. Management
 - 1. Position of comfort
 - a. May prefer sitting upright with legs in dependent position
 - 2. Pharmacological
 - a. Gases
 - b. Vasopressor
 - c. Analgesia
 - d. Diuretics
 - e. Glycoside
 - f. Sympathetic agonist

- g. Alkalinizing agent
 - h. Other
 - F. Transport
 - 1. Refusal
 - 2. No other indications for no transport
 - G. Support and communications strategies
 - 1. Explanation for patient, family, significant others
 - 2. Communications and transfer of data to the physician
- XIII. Cardiac arrest
 - A. Pathophysiology
 - 1. Precipitating causes
 - a. Trauma
 - b. Medical conditions (for example)
 - (1) End stage renal disease
 - (2) Hyperkalemia with renal disease
 - B. Initial assessment
 - 1. Critical findings
 - a. Unresponsive
 - b. Apneic
 - c. Heart rate/ rhythm
 - (1) Ventricular fibrillation
 - (2) Ventricular tachycardia
 - (3) Asystole
 - (4) PEA
 - d. Peripheral pulses
 - (1) None
 - C. Focused history
 - 1. Witnessed event
 - 2. Witnessed by EMS personnel
 - 3. Bystander cardiopulmonary resuscitation (CPR)
 - 4. Time from discovery to activation of CPR
 - 5. Time from discovery to activation of EMS
 - 6. Past medical history
 - D. Management
 - 1. Related terminology
 - a. Resuscitation - to provide efforts to return spontaneous pulse and breathing to the patient in full cardiac arrest
 - b. Survival - patient is resuscitated and survives to hospital discharge
 - c. Return of spontaneous circulation (ROSC) - patient is resuscitated to the point of having pulse without CPR; may or may not have return of spontaneous respirations; patient may or may not go on to survive
 - 2. Indications for NOT initiating resuscitative techniques
 - a. Signs of obvious death
 - (1) For example - rigor; fixed lividity; decapitation
 - b. Local protocol
 - (1) For example - out-of-hospital advance directives
 - 3. Advanced airway management and ventilation

4. Circulation
 - a. CPR in conjunction with defibrillation
 - b. IV therapy
 - c. Defibrillation
 - d. Pharmacological
 - (1) Gases (oxygen)
 - (2) Sympathetic
 - (3) Anticholinergic
 - (4) Antiarrhythmic
 - (5) Vasopressor
 - (6) Alkalinizing agents
 - (7) Parasympatholytic
 5. Rapid transport
 6. Support and communications strategies
 - a. Explanation for patient, family, significant others
 - b. Communications and transfer of data to the physician
- E. Termination of resuscitation
1. Inclusion criteria (for example)
 - a. 18 years old or older
 - b. Arrest is presumed cardiac in origin and not associated with a condition potentially responsive to hospital treatment (for example - hypothermia, drug overdose, toxicologic exposure, etc.)
 - c. Endotracheal intubation has been successfully accomplished and maintained
 - d. Standard advanced cardiac life support (ACLS) measures have been applied throughout the resuscitative effort
 - e. On-scene ALS resuscitation efforts have been sustained for 25 minutes or the patient remains in asystole through four rounds of appropriate ALS drugs
 - f. Patient has a cardiac rhythm of asystole or agonal rhythm at the time the decision to terminate is made and this rhythm persists until the arrest is actually terminated
 - g. Victims of blunt trauma in arrest whose presenting rhythm is asystole, or who develop asystole while on scene
 2. Exclusion criteria - for example
 - a. Under the age of 18 years
 - b. Etiology for which specific in-hospital treatment may be beneficial
 - c. Persistent or recurrent ventricular tachycardia or fibrillation
 - d. Transient return of pulse
 - e. Signs of neurological viability
 - f. Arrest was witnessed by EMS personnel
 - g. Family or responsible party opposed to termination
 3. Criteria NOT to be considered as inclusionary or exclusionary
 - a. Patient age - for example, geriatric
 - b. Time of collapse prior to EMS arrival
 - c. Presence of a non-official do-not-resuscitate (DNR) order
 - d. "Quality of life" valuations
 4. Procedures (according to local protocol)
 - a. Direct communication with on-line medical direction
 - (1) Medical condition of the patient
 - (2) Known etiologic factors

- (3) Therapy rendered
- (4) Family present and apprised of the situation
- (5) Communicate any resistance or uncertainty on the part of the family
- (6) Maintain continuous documentation to include the ECG
- (7) Mandatory review after the event
 - (a) Grief support (according to local protocol)
 - i) EMS assigned personnel
 - ii) Community agency referral
 - (b) Law enforcement (according to local protocol)
 - i) On-scene determination if the event/ patient requires assignment of the patient to the medical examiner
 - ii) On-scene law enforcement communicates with attending physician for the death certificate
 - iii) If there is any suspicion about the nature of the death, or if the physician refuses or hesitates to sign the death certificate
 - iv) No attending physician is identified (the patient will be assigned to the medical examiner)

XIV. Vascular disorders

A. Epidemiology

1. Trauma

2. Non-traumatic

a. Precipitating causes

(1) Atherosclerosis

(2) Aneurysm

(a) Atherosclerotic

(b) Dissecting

i) Cystic medial necrosis

(c) Infections

(d) Congenital

(3) Marfan's syndrome

(4) Inflammation

(a) Arterial

(b) Peripheral arterial atherosclerotic disease

(5) Occlusive disease

(a) Trauma

(b) Thrombosis

(c) Tumor

(d) Embolus

(e) Idiopathic

(6) Venous thrombosis

(a) Phlebitis

(b) Varicose veins

B. Morbidity/ mortality

1. Pulmonary occlusion

2. Cerebral occlusion

3. Mesenteric occlusion

- 4. Hypoperfusion state
- 5. Death
- C. Initial assessment findings
 - 1. Airway/ breathing
 - a. Usually not affected
 - 2. Circulation (distal to or over the affected area)
 - a. Pain
 - b. Pallor
 - c. Pulselessness
 - d. Paralysis
 - e. Paresthesia
 - 3. Skin
 - a. Pallor or mottled distal to or over the affected area
 - b. Skin temperature may vary
- D. Focused history
 - 1. Chief complaint
 - a. Sudden or gradual onset of discomfort
 - b. May be localized
 - c. Pain
 - (1) Chest, abdominal or involved extremity
 - (a) Sudden or gradual
 - (b) Radiating or localized
 - (c) Claudication
 - (2) Relief with rest or not
 - 2. Contributing history
 - a. Initial recognized event
 - b. Recurrent event
 - c. Increasing frequency and/ or duration of event
- E. Detailed physical exam
 - 1. Airway
 - 2. Breath sounds
 - a. May be clear to auscultation
 - 3. Circulation
 - a. Alterations in heart rate and rhythm may occur
 - b. Peripheral pulses absent or diminished over the affected extremity
 - c. Blood pressure
 - (1) Unequal BP readings in each arm
 - (a) May indicate high thoracic aneurysm
 - d. Bruit over affected vessel(s)
 - e. Skin
 - (1) May be cool reflecting diminished circulation to the affected area or extremity
 - (2) May be moist or dry reflecting diminished circulation to the affected area or extremity
 - f. ECG findings may be non contributory
 - (1) Arrhythmias and ectopy may not be present
 - 4. Management
 - a. Position of comfort

- b. Pharmacological
 - (1) Gases
 - (2) Analgesics
- c. Transport
 - (1) Indications for rapid transport
 - (a) No relief with medications
 - (b) Hypotension/ hypoperfusion
 - (2) No transport
 - (a) Refusal
 - (b) Relief and refusal
- d. Support and communications strategies
 - (1) Explanation for patient, family, significant others
 - (2) Communications and transfer of data to the physician

XV. Integration

- A. Apply pathophysiological principles to the assessment of a patient with cardiovascular disease
- B. Formulation of field impression; decisions based on
 - 1. Initial assessment
 - 2. Focused history
 - 3. Detailed physical examination
- C. Develop and execute a patient management plan based on field impression
 - 1. Initial management
 - a. Airway support
 - b. Ventilation support
 - c. Circulation support
 - d. Non-pharmacological
 - e. Pharmacological
 - f. Electrical
 - 2. On-going assessment
 - 3. Transport criteria
 - a. Appropriate mode
 - b. Appropriate facility
 - 4. Non-transport criteria
 - 5. Advocacy
 - 6. Communications
 - 7. Prevention
 - 8. Documentation
 - 9. Quality assurance

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UNIT TERMINAL OBJECTIVE

- 5-3 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement the treatment plan for the patient with a neurological problem.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 5-3.1 Describe the incidence, morbidity and mortality of neurological emergencies. (C-1)
- 5-3.2 Identify the risk factors most predisposing to the nervous system. (C-1)
- 5-3.3 Discuss the anatomy and physiology of the organs and structures related to nervous system. (C-1)
- 5-3.4 Discuss the pathophysiology of non-traumatic neurologic emergencies. (C-1)
- 5-3.5 Discuss the assessment findings associated with non-traumatic neurologic emergencies. (C-1)
- 5-3.6 Identify the need for rapid intervention and the transport of the patient with non-traumatic emergencies. (C-1)
- 5-3.7 Discuss the management of non-traumatic neurological emergencies. (C-1)
- 5-3.8 Discuss the pathophysiology of coma and altered mental status. (C-1)
- 5-3.9 Discuss the assessment findings associated with coma and altered mental status. (C-1)
- 5-3.10 Discuss the management/ treatment plan of coma and altered mental status. (C-1)
- 5-3.11 Describe the epidemiology, including the morbidity/ mortality and prevention strategies, for seizures. (C-1)
- 5-3.12 Discuss the pathophysiology of seizures. (C-1)
- 5-3.13 Discuss the assessment findings associated with seizures. (C-1)
- 5-3.14 Define seizure. (C-1)
- 5-3.15 Describe and differentiate the major types of seizures. (C-3)
- 5-3.16 List the most common causes of seizures. (C-1)
- 5-3.17 Describe the phases of a generalized seizure. (C-1)
- 5-3.18 Discuss the pathophysiology of syncope. (C-1)
- 5-3.19 Discuss the assessment findings associated with syncope. (C-1)
- 5-3.20 Discuss the management/ treatment plan of syncope. (C-1)
- 5-3.21 Discuss the pathophysiology of headache. (C-1)
- 5-3.22 Discuss the assessment findings associated with headache. (C-1)
- 5-3.23 Discuss the management/ treatment plan of headache. (C-1)
- 5-3.24 Describe the epidemiology, including the morbidity/ mortality and prevention strategies, for neoplasms. (C-1)
- 5-3.25 Discuss the pathophysiology of neoplasms. (C-1)
- 5-3.26 Describe the types of neoplasms. (C-1)
- 5-3.27 Discuss the assessment findings associated with neoplasms. (C-1)
- 5-3.28 Discuss the management/ treatment plan of neoplasms. (C-1)
- 5-3.29 Define neoplasms. (C-1)
- 5-3.30 Recognize the signs and symptoms related to neoplasms. (C-1)
- 5-3.31 Correlate abnormal assessment findings with clinical significance in the patient with neoplasms. (C-3)
- 5-3.32 Differentiate among the various treatment and pharmacological interventions used in the management of neoplasms. (C-3)
- 5-3.33 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with neoplasms. (C-3)
- 5-3.34 Describe the epidemiology, including the morbidity/ mortality and prevention strategies, for abscess. (C-1)
- 5-3.35 Discuss the pathophysiology of abscess. (C-1)
- 5-3.36 Discuss the assessment findings associated with abscess. (C-1)
- 5-3.37 Discuss the management/ treatment plan of abscess. (C-1)

- 5-3.38 Define abscess. (C-1)
- 5-3.39 Recognize the signs and symptoms related to abscess. (C-1)
- 5-3.40 Correlate abnormal assessment findings with clinical significance in the patient with abscess. (C-3)
- 5-3.41 Differentiate among the various treatment and pharmacological interventions used in the management of abscess. (C-3)
- 5-3.42 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with abscess. (C-3)
- 5-3.43 Describe the epidemiology, including the morbidity/ mortality and prevention strategies, for stroke and intracranial hemorrhage. (C-1)
- 5-3.44 Discuss the pathophysiology of stroke and intracranial hemorrhage. (C-1)
- 5-3.45 Describe the types of stroke and intracranial hemorrhage. (C-1)
- 5-3.46 Discuss the assessment findings associated with stroke and intracranial hemorrhage. (C-1)
- 5-3.47 Discuss the management/ treatment plan of stroke and intracranial hemorrhage. (C-1)
- 5-3.48 Define stroke and intracranial hemorrhage. (C-1)
- 5-3.49 Recognize the signs and symptoms related to stroke and intracranial hemorrhage. (C-1)
- 5-3.50 Correlate abnormal assessment findings with clinical significance in the patient with stroke and intracranial hemorrhage. (C-3)
- 5-3.51 Differentiate among the various treatment and pharmacological interventions used in the management of stroke and intracranial hemorrhage. (C-3)
- 5-3.52 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with stroke and intracranial hemorrhage. (C-3)
- 5-3.53 Describe the epidemiology, including the morbidity/ mortality and prevention strategies, for transient ischemic attack. (C-3)
- 5-3.54 Discuss the pathophysiology of transient ischemic attack. (C-1)
- 5-3.55 Discuss the assessment findings associated with transient ischemic attack. (C-1)
- 5-3.56 Discuss the management/ treatment plan of transient ischemic attack. (C-1)
- 5-3.57 Define transient ischemic attack. (C-1)
- 5-3.58 Recognize the signs and symptoms related to transient ischemic attack. (C-1)
- 5-3.59 Correlate abnormal assessment findings with clinical significance in the patient with transient ischemic attack. (C-3)
- 5-3.60 Differentiate among the various treatment and pharmacological interventions used in the management of transient ischemic attack. (C-3)
- 5-3.61 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with transient ischemic attack. (C-3)
- 5-3.62 Describe the epidemiology, including the morbidity/ mortality and prevention strategies, for degenerative neurological diseases. (C-1)
- 5-3.63 Discuss the pathophysiology of degenerative neurological diseases. (C-1)
- 5-3.64 Discuss the assessment findings associated with degenerative neurological diseases. (C-1)
- 5-3.65 Discuss the management/ treatment plan of degenerative neurological diseases. (C-1)
- 5-3.66 Define the following: (C-1)
 - a. Muscular dystrophy
 - b. Multiple sclerosis
 - c. Dystonia
 - d. Parkinson's disease
 - e. Trigeminal neuralgia
 - f. Bell's palsy
 - g. Amyotrophic lateral sclerosis

- h. Peripheral neuropathy
 - i. Myoclonus
 - j. Spina bifida
 - k. Poliomyelitis
- 5-3.67 Recognize the signs and symptoms related to degenerative neurological diseases. (C-1)
- 5-3.68 Correlate abnormal assessment findings with clinical significance in the patient with degenerative neurological diseases. (C-3)
- 5-3.69 Differentiate among the various treatment and pharmacological interventions used in the management of degenerative neurological diseases. (C-3)
- 5-3.70 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with degenerative neurological diseases. (C-3)
- 5-3.71 Integrate the pathophysiological principles of the patient with a neurological emergency. (C-3)
- 5-3.72 Differentiate between neurological emergencies based on assessment findings. (C-3)
- 5-3.73 Correlate abnormal assessment findings with the clinical significance in the patient with neurological complaints. (C-3)
- 5-3.74 Develop a patient management plan based on field impression in the patient with neurological emergencies. (C-3)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 5-3.75 Characterize the feelings of a patient who regains consciousness among strangers. (A-2)
- 5-3.76 Formulate means of conveying empathy to patients whose ability to communicate is limited by their condition. (A-3)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 5-3.77 Perform an appropriate assessment of a patient with coma or altered mental status. (P-3)
- 5-3.78 Perform a complete neurological examination as part of the comprehensive physical examination of a patient with coma or altered mental status. (P-3)
- 5-3.79 Appropriately manage a patient with coma or altered mental status, including the administration of oxygen, oral glucose, 50% dextrose and narcotic reversal agents. (P-3)
- 5-3.80 Perform an appropriate assessment of a patient with syncope. (P-3)
- 5-3.81 Appropriately manage a patient with syncope. (P-3)
- 5-3.82 Perform an appropriate assessment of a patient with seizures. (P-3)
- 5-3.83 Appropriately manage a patient with seizures, including the administration of diazepam or lorazepam. (P-3)
- 5-3.84 Perform an appropriate assessment of a patient with stroke and intracranial hemorrhage or TIA. (P-3)
- 5-3.85 Appropriately manage a patient with stroke and intracranial hemorrhage or TIA. (P-3)
- 5-3.86 Demonstrate an appropriate assessment of a patient with a chief complaint of weakness. (P-3)

DECLARATIVE

- I. Introduction
 - A. Epidemiology
 - 1. Incidence
 - 2. Mortality/ morbidity
 - 3. Risk factors
 - 4. Prevention strategies
 - 5. Anatomy and physiology review

- II. General system pathophysiology, assessment and management
 - A. Physiology
 - 1. Alterations in cognitive systems
 - 2. Alterations in cerebral homeostasis
 - 3. Alterations in motor control
 - 4. Central nervous system disorders
 - a. Trauma
 - b. Cerebrovascular disorders
 - c. Tumors
 - d. Infection
 - e. Inflammation
 - f. Degenerative diseases
 - g. Hydrocephalus
 - 5. Peripheral nervous system disorders
 - 6. Neuromuscular junction disorders
 - B. Assessment findings
 - 1. History
 - a. General health
 - b. Previous medical conditions
 - c. Medications
 - d. Previous experience with complaint
 - e. Time of onset
 - f. Seizure activity
 - 2. Physical
 - a. General appearance
 - b. Assess for level of consciousness
 - (1) Mood
 - (2) Thought
 - (3) Perceptions
 - (4) Judgment
 - (5) Memory and attention
 - c. Speech
 - d. Skin
 - e. Posture and gait
 - f. Vital signs
 - (1) Hypertension
 - (2) Hypotension

- (3) Heart rate/ fast or slow
- (4) Ventilation rate/ quality
- (5) Temperature/ fever
- g. Head/ neck
 - (1) Facial expression
 - (2) Eyes
 - (a) Acuity
 - (b) Fields
 - (c) Position & alignment
 - (d) Iris
 - (e) Pupils
 - (f) Extraocular muscles
 - (3) Ears
 - (a) Auditory acuity
 - (4) Nose
 - (5) Mouth
 - (a) Odors on breath
- h. Thorax and lungs
 - (1) Auscultate
- i. Cardiovascular
 - (1) Heart rate
 - (2) Rhythm
 - (3) Bruits
 - (4) Jugular vein pressure
 - (5) Auscultation
 - (6) ECG monitoring
- j. Abdomen
- k. Nervous
 - (1) Cranial nerves
 - (2) Motor system
 - (a) Muscle tone
 - (b) Muscle strength
 - (c) Flexion
 - (d) Extension
 - (e) Grip
 - (f) Coordination
- l. Assessment tools
 - (1) Pulse oximetry
 - (2) End tidal CO₂
 - (3) Blood glucose
- 3. Ongoing assessment
- C. Management
 - 1. Airway and ventilatory support
 - a. Oxygen
 - b. Positioning
 - c. Assisted ventilation
 - d. Suction

- e. Advanced airway device
- 2. Circulatory support
 - a. Venous access
 - b. Blood analysis
- 3. Non-pharmacological interventions
 - a. Positioning
 - b. Spinal precautions
- 4. Pharmacological interventions
 - a. Antianxiety agent
 - b. Anticonvulsant
 - c. Antiinflammatories
 - d. Diuretic
 - e. Sedative-hypnotic
 - f. Skeletal muscle relaxant
 - g. Hyperglycemic
 - h. Antihypoglycemic
 - i. Vitamin
 - j. Emetic
- 5. Psychological support
- 6. Transport considerations
 - a. Appropriate mode
 - b. Appropriate facility

III. Specific injuries/ illnesses

- A. Stroke and intracranial hemorrhage
 - 1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Risk factors
 - d. Prevention strategies
 - e. Anatomy and physiology review
 - 2. Pathophysiology of regional disruption of cerebral blood flow
 - a. Thrombus
 - b. Hemorrhage
 - (1) Subarachnoid
 - (2) Intracerebral
 - (3) Cerebellar
 - c. Embolus
 - 3. Assessment findings
 - a. History
 - (1) General health
 - (2) Previous medical conditions
 - (3) Medications
 - (4) Previous experience with complaint
 - (5) Time of onset
 - (6) Seizure activity
 - (7) Headache

- (8) Nose bleed
- (9) Others
- b. Physical
 - (1) Standard physical exam for the patient with potential neurological event
- 4. Management
 - a. Airway and ventilatory support
 - (1) Oxygen
 - (2) Positioning
 - (3) Assisted ventilation
 - (4) Suction
 - (5) Advanced airway device
 - b. Circulatory support
 - (1) Venous access
 - (2) Blood analysis
 - c. Non-pharmacological interventions
 - (1) Positioning
 - (2) Spinal precautions
 - d. Pharmacological interventions
 - (1) Anticonvulsants
 - (2) Antiinflammatories
 - (3) Vasodilator
 - (4) Diuretic
 - (5) Skeletal muscle relaxant
 - (6) Hyperglycemic
 - (7) Antihypoglycemic
 - (8) Vitamin
 - (9) Thrombolytics
 - (10) Neuroprotectives
 - e. Psychological support
 - f. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
- B. Transient ischemic attack
 - 1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Risk factors
 - d. Prevention strategies
 - e. Anatomy and physiology review
 - 2. Pathophysiology
 - a. Transient neurological deficits
 - b. Partial disruptions of blood flow
 - (1) Hemorrhagic
 - (2) Vasospasm
 - (3) Subarachnoid
 - (4) Intracerebral
 - (5) Cerebellar

- c. Partially occlusive
 - (1) Emboli
 - (2) Thrombi
 - 3. Assessment findings
 - a. History
 - (1) General health
 - (2) Previous medical conditions
 - (3) Medications
 - (4) Previous experience with complaint
 - (5) Time of onset
 - (6) Seizures
 - (7) Headache
 - (8) Nosebleed
 - b. Physical
 - (1) Standard physical exam for patient with potential neurological event
 - 4. Management
 - a. Airway and ventilatory support
 - (1) Oxygen
 - (2) Positioning
 - (3) Assisted ventilation
 - (4) Suction
 - (5) Advanced airway device
 - b. Circulatory support
 - (1) Venous access
 - (2) Blood analysis
 - c. Non-pharmacological interventions
 - (1) Positioning
 - (2) Spinal precautions
 - d. Pharmacological interventions
 - (1) Anticonvulsants
 - (2) Antiinflammatories
 - (3) Diuretic
 - (4) Skeletal muscle relaxant
 - (5) Hyperglycemic
 - (6) Anti-hypoglycemic
 - (7) Vitamin
 - e. Psychological support
 - f. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
- C. Epilepsy/ Seizures
 - 1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Risk factors
 - d. Prevention strategies
 - e. Anatomy and physiology review

2. Pathophysiology
 - a. Unexpected electrical discharge of neurons in brain
 - b. Types
 - (1) Generalized
 - (a) Grand mal (tonic-clonic)
 - i) Preictal phase (aura)
 - ii) Tonic phase
 - iii) Clonic phase
 - iv) Postictal phase
 - (b) Tonic
 - (c) Clonic
 - (d) Petit mal
 - (2) Partial
 - (a) Simple partial (e.g., Jacksonian)
 - (b) Complex partial (e.g., psychomotor or temporal lobe)
 - (3) Status epilepticus
 - c. Causes other than epilepsy
 - (1) Idiopathic
 - (2) Fever
 - (3) Neoplasms
 - (4) Infection
 - (5) Metabolic
 - (a) Hypoxia
 - (b) Hypoglycemia
 - (c) Thyrotoxicosis
 - (d) Hypocalcemia
 - (6) Drug intoxication
 - (7) Drug withdrawal
 - (8) Head trauma
 - (9) Eclampsia
 - (10) Cerebral degenerative diseases
3. Assessment findings
 - a. History
 - (1) General health
 - (2) Previous medical conditions
 - (3) Medications
 - (4) Previous seizures
 - (5) Time of onset
 - (6) Seizure activity
 - (a) Duration
 - (b) Number of events
 - (c) Consciousness between
 - b. Physical
 - (1) Standard physical exam for patient with potential neurological event
 - (2) Pertinent findings
 - (a) Tongue laceration(s)
 - (b) Head

- i) Hemorrhage
 - ii) Wounds
 - (c) GI/ GU
 - i) Incontinence of bladder
 - ii) Incontinence of bowel
- 4. Management
 - a. Airway and ventilatory support
 - (1) Oxygen
 - (2) Positioning
 - (3) Assisted ventilation
 - (4) Suction
 - (5) Advanced airway device
 - b. Circulatory support
 - (1) Venous access
 - (2) Blood analysis
 - c. Non-pharmacological interventions
 - (1) Protection from injury
 - (2) Positioning
 - (3) Spinal precautions
 - d. Pharmacological interventions
 - (1) Anticonvulsants
 - (2) Antiinflammatories
 - (3) Skeletal muscle relaxant
 - (4) Hyperglycemic
 - (5) Anti-hypoglycemic
 - (6) Vitamin
 - e. Psychological support
 - f. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
- D. Syncope
 - 1. Pathophysiology
 - a. Brief loss of consciousness caused by transient cerebral hypoxia
 - b. Caused by lack of oxygen, glucose or seizure activity in the brain
 - 2. Assessment findings
 - a. Perceived as a sensation of light-headedness
 - 3. Management
 - a. Differentiate possible causes
 - (1) Seizure
 - (2) Other
 - b. Airway management
 - c. Oxygen
 - d. Reassure
 - e. Treat underlying cause
- E. Headache
 - 1. Epidemiology
 - a. Incidence

- b. Mortality/ morbidity
- c. Risk factors
- d. Prevention strategies
- e. Anatomy and physiology review
- 2. Pathophysiology
 - a. Primary
 - (1) Continuum of tension and migraine
 - b. Cluster
 - (1) Unknown
 - c. General thoughts
 - (1) Central serotonergic transmission abnormalities
 - (2) Vascular structure inflammation
 - (3) Neurogenic inflammation
 - (4) Platelet aggregation with release of vasoactive substances
- 3. Assessment findings
 - a. History
 - (1) General health
 - (2) Previous medical conditions
 - (3) Medications
 - (4) Previous experience with complaint
 - (5) Time of onset
 - b. Physical
 - (1) Standard exam for patient with potential neurological event
- 4. Management
 - a. Airway and ventilatory support
 - (1) Oxygen
 - (2) Positioning
 - (3) Suction
 - (4) Assisted ventilation
 - (5) Suction
 - (6) Advanced airway device
 - b. Circulatory support
 - (1) Venous access
 - (2) Blood analysis
 - c. Non-pharmacological interventions
 - (1) General comfort measures
 - d. Pharmacological interventions
 - (1) Antiemetics
 - (2) Rehydration
 - (3) Pain control
 - e. Psychological support
 - f. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
- F. Neoplasms
 - 1. Epidemiology
 - a. Incidence

- b. Mortality/ morbidity
 - c. Risk factors
 - (1) Genetics
 - (2) Exposure to radiation
 - (3) Tobacco
 - (4) Occupational
 - (5) Pollution
 - (6) Medications
 - (7) Diet
 - (8) Viruses
 - d. Prevention strategies
 - e. Anatomy and physiology review
2. Pathophysiology
- a. Tumors
 - b. Metabolic disorders
 - c. Hematologic disorders
 - d. Immunosuppression
 - e. Psychosocial effects
 - f. Staging
 - g. Types
3. Assessment findings
- a. History
 - (1) General health
 - (2) Previous medical conditions
 - (3) Medications
 - (4) Previous experience with complaint
 - (5) Time of onset
 - (6) Seizure activity
 - (7) Headache
 - (8) Nosebleed
 - (9) Type and timing of prior treatment
 - (a) Chemotherapy
 - (b) Radiation therapy
 - (c) Holistic and other nontraditional approaches
 - (d) Experimental treatment
 - b. Physical
 - (1) Standard physical exam for patient with potential neurological event
4. Management
- a. Airway and ventilatory support
 - (1) Oxygen
 - (2) Positioning
 - (3) Assisted ventilation
 - (4) Suction
 - (5) Advanced airway device
 - b. Circulatory support
 - (1) Venous access
 - (2) Blood analysis

- c. Non-pharmacological interventions
 - (1) Positioning
 - (2) Spinal precautions
 - d. Pharmacological interventions
 - (1) Anticonvulsants
 - (2) Antiinflammatories
 - (3) Diuretic
 - (4) Skeletal muscle relaxant
 - (5) Hyperglycemic
 - (6) Antihypoglycemic
 - (7) Vitamin
 - e. Psychological support
 - f. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
- G. Abscess
- 1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Risk factors
 - d. Prevention strategies
 - e. Anatomy and physiology review
 - 2. Pathophysiology
 - 3. Assessment findings
 - a. History
 - (1) General health
 - (2) Previous medical conditions
 - (3) Medications
 - (4) Previous experience with complaint
 - (5) Time of onset
 - (6) Seizure activity
 - (7) Headache
 - b. Physical
 - (1) Standard physical exam for patient with potential neurological event
 - 4. Management
 - a. Airway and ventilatory support
 - (1) Oxygen
 - (2) Positioning
 - (3) Assisted ventilation
 - (4) Suction
 - (5) Advanced airway device
 - b. Circulatory support
 - (1) Venous access
 - (2) Blood analysis
 - c. Non-pharmacological interventions
 - (1) Positioning
 - d. Pharmacological interventions

- e. Psychological support
 - f. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
- H. Degenerative neurological diseases
- 1. Epidemiology
 - a. Incidents
 - b. Mortality/ morbidity
 - c. Risk factors
 - d. Prevention strategies
 - e. Anatomy and physiology review
 - 2. Pathophysiology
 - a. Muscular dystrophy
 - (1) Genetic disease
 - (a) DNA
 - (2) Degeneration of muscle fibers
 - (3) Biochemical defect
 - (4) Types
 - (a) Duchenne
 - (b) Fascioscapulohumeral
 - (c) Limb girdle
 - (d) Myotonic
 - (5) Effects on CNS
 - (6) Incidence
 - (7) Characteristics
 - b. Multiple sclerosis
 - (1) Inflammatory disease
 - (2) Immune disorder/ CNS myelin
 - (3) Demyelination of nerve sheaths
 - (4) Progressively deteriorate
 - (5) Effects on CNS
 - (6) Incidence
 - (7) Characteristics
 - c. Dystonia
 - (1) Alterations in muscle tone
 - (2) Inhibition of muscle
 - (3) Types
 - (a) Focal
 - (b) Secondary
 - (c) Torsion
 - (d) Spasm
 - (e) Tic
 - (4) Incidence
 - (5) Characteristics
 - (6) Iatrogenic
 - d. Parkinson's disease
 - (1) Degenerative disease basal ganglia

- (2) Dopaminergic nigrostriatal pathway
- (3) Primary and secondary disorders
- (4) Incidence
 - (a) Occurs after 40 years
 - (b) Leading cause of neurologic disability >60 years
 - (c) 130 in 100,000 persons
 - (d) Estimated 500,000 in United States
- (5) Characteristics
- e. Central pain syndrome
 - (1) Trigeminal nerve infection or disease
 - (2) Tic douloureux
 - (3) Causes
 - (a) Tumor
 - (b) Lesions
 - (c) Medications (phenothiazine)
 - (4) Incidents
 - (5) Characteristics
- f. Bell's palsy
 - (1) Facial paralysis
 - (2) Causes
 - (a) Post-trauma
 - (b) Herpes simplex
 - (c) Lyme disease
 - (d) Idiopathic
 - (3) Incidence
 - (a) Most common form of facial paralysis
 - (b) 23 in 100,000 or 1 in 60 to 70 persons in a lifetime
 - (4) Characteristics
- g. Amyotrophic lateral sclerosis
 - (1) Progressive motor neuron disease
 - (2) Types
 - (a) Spinal muscular atrophy
 - (b) Bulbar palsy
 - (c) Primary lateral sclerosis
 - (d) Pseudobulbar palsy
 - (3) Incidence
 - (4) Characteristics
- h. Peripheral neuropathy
 - (1) Axons/ spinal cord neurons injured
 - (2) Autonomic nerve fibers
 - (3) Incidence
 - (4) Characteristics
- i. Myoclonus
 - (1) Involuntary random muscular contractions
 - (2) Fasciculation
 - (3) Metabolic and neurologic disorders
 - (4) Incidence

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-
- (5) Characteristics
 - j. Spina bifida
 - (1) Defects of neural tube closure
 - (a) Meningocele
 - (b) Myelomeningocele
 - (2) Vertebral defect
 - (3) Incidence
 - (4) Characteristics
 - k. Polio (poliomyelitis)
 - (1) Acute infectious inflammation of gray matter of spinal cord
 - (2) Enteroviruses
 - (3) Pathways
 - (a) Blood-CNS barrier
 - (b) Motor neuron
 - (4) Histopathologic findings
 - (5) Progressive
 - (6) Incidence
 - (7) Characteristics
3. Assessment findings
- a. History
 - (1) Acute or chronic
 - (2) General health
 - (3) Previous medical conditions
 - (4) Medications
 - (5) Experience with complaint
 - (6) Time of onset
 - (7) Seizure activity
 - b. Physical
 - (1) Standard physical exam for patient with potential neurological event
4. Management
- a. Airway and ventilatory support
 - (1) Oxygen
 - (2) Positioning
 - b. Circulatory support
 - (1) Venous access
 - (2) Blood analysis
 - c. Non-pharmacological interventions
 - (1) Positioning
 - d. Pharmacological interventions
 - (1) Hyperglycemic
 - (2) Antihypoglycemic
 - (3) Antihistamine (for medication-caused dystonic reactions)
 - (4) Analgesics
 - (5) Steroids
 - (6) Dopaminergics
 - e. Psychological support
 - f. Transport considerations

- (1) Appropriate mode
- (2) Appropriate facility

IV. Integration

- A. Develop management strategies, based on the pathophysiological principles, for the following patient presentations
 - 1. Coma/ decreased level of consciousness
 - 2. Headache
 - 3. Weakness
 - 4. Vertigo
 - 5. Seizure

UNIT TERMINAL OBJECTIVE

- 5-4 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with an endocrine problem.

COGNITIVE OBJECTIVE

At the completion of this unit, the paramedic student will be able to:

- 5-4.1 Describe the incidence, morbidity and mortality of endocrinologic emergencies. (C-1)
- 5-4.2 Identify the risk factors most predisposing to endocrinologic disease. (C-1)
- 5-4.3 Discuss the anatomy and physiology of organs and structures related to endocrinologic diseases. (C-1)
- 5-4.4 Review the pathophysiology of endocrinologic emergencies. (C-1)
- 5-4.5 Discuss the general assessment findings associated with endocrinologic emergencies. (C-1)
- 5-4.6 Identify the need for rapid intervention of the patient with endocrinologic emergencies. (C-1)
- 5-4.7 Discuss the management of endocrinologic emergencies. (C-1)
- 5-4.8 Describe osmotic diuresis and its relationship to diabetes. (C-1)
- 5-4.9 Describe the pathophysiology of adult onset diabetes mellitus. (C-1)
- 5-4.10 Describe the pathophysiology of juvenile onset diabetes mellitus. (C-1)
- 5-4.11 Describe the effects of decreased levels of insulin on the body. (C-1)
- 5-4.12 Correlate abnormal findings in assessment with clinical significance in the patient with a diabetic emergency. (C-3)
- 5-4.13 Discuss the management of diabetic emergencies. (C-1)
- 5-4.14 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with a diabetic emergency. (C-3)
- 5-4.15 Differentiate between the pathophysiology of normal glucose metabolism and diabetic glucose metabolism. (C-3)
- 5-4.16 Describe the mechanism of ketone body formation and its relationship to ketoacidosis. (C-1)
- 5-4.17 Discuss the physiology of the excretion of potassium and ketone bodies by the kidneys. (C-1)
- 5-4.18 Describe the relationship of insulin to serum glucose levels. (C-1)
- 5-4.19 Describe the effects of decreased levels of insulin on the body. (C-1)
- 5-4.20 Describe the effects of increased serum glucose levels on the body. (C-1)
- 5-4.21 Discuss the pathophysiology of hypoglycemia. (C-1)
- 5-4.22 Discuss the utilization of glycogen by the human body as it relates to the pathophysiology of hypoglycemia. (C-3)
- 5-4.23 Describe the actions of epinephrine as it relates to the pathophysiology of hypoglycemia. (C-3)
- 5-4.24 Recognize the signs and symptoms of the patient with hypoglycemia. (C-1)
- 5-4.25 Describe the compensatory mechanisms utilized by the body to promote homeostasis relative to hypoglycemia. (C-1)
- 5-4.26 Describe the management of a responsive hypoglycemic patient. (C-1)
- 5-4.27 Correlate abnormal findings in assessment with clinical significance in the patient with hypoglycemia. (C-1)
- 5-4.28 Discuss the management of the hypoglycemic patient. (C-1)
- 5-4.29 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with hypoglycemia. (C-3)
- 5-4.30 Discuss the pathophysiology of hyperglycemia. (C-1)
- 5-4.31 Recognize the signs and symptoms of the patient with hyperglycemia. (C-1)
- 5-4.32 Describe the management of hyperglycemia. (C-1)
- 5-4.33 Correlate abnormal findings in assessment with clinical significance in the patient with hyperglycemia. (C-3)
- 5-4.34 Discuss the management of the patient with hyperglycemia. (C-1)
- 5-4.35 Integrate the pathophysiological principles and the assessment findings to formulate a field impression

- and implement a treatment plan for the patient with hyperglycemia. (C-3)
- 5-4.36 Discuss the pathophysiology of nonketotic hyperosmolar coma. (C-1)
- 5-4.37 Recognize the signs and symptoms of the patient with nonketotic hyperosmolar coma. (C-1)
- 5-4.38 Describe the management of nonketotic hyperosmolar coma. (C-1)
- 5-4.39 Correlate abnormal findings in assessment with clinical significance in the patient with nonketotic hyperosmolar coma. (C-3)
- 5-4.40 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with nonketotic hyperosmolar coma. (C-3)
- 5-4.41 Discuss the management of the patient with hyperglycemia. (C-1)
- 5-4.42 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with hyperglycemia. (C-3)
- 5-4.43 Discuss the pathophysiology of diabetic ketoacidosis. (C-1)
- 5-4.44 Recognize the signs and symptoms of the patient with diabetic ketoacidosis. (C-1)
- 5-4.45 Describe the management of diabetic ketoacidosis. (C-1)
- 5-4.46 Correlate abnormal findings in assessment with clinical significance in the patient with diabetic ketoacidosis. (C-3)
- 5-4.47 Discuss the management of the patient with diabetic ketoacidosis. (C-1)
- 5-4.48 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with diabetic ketoacidosis. (C-3)
- 5-4.49 Discuss the pathophysiology of thyrotoxicosis. (C-1)
- 5-4.50 Recognize signs and symptoms of the patient with thyrotoxicosis. (C-1)
- 5-4.51 Describe the management of thyrotoxicosis. (C-1)
- 5-4.52 Correlate abnormal findings in assessment with clinical significance in the patient with thyrotoxicosis. (C-3)
- 5-4.53 Discuss the management of the patient with thyrotoxicosis. (C-1)
- 5-4.54 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with thyrotoxicosis. (C-3)
- 5-4.55 Discuss the pathophysiology of myxedema. (C-1)
- 5-4.56 Recognize signs and symptoms of the patient with myxedema. (C-1)
- 5-4.57 Describe the management of myxedema. (C-1)
- 5-4.58 Correlate abnormal findings in assessment with clinical significance in the patient with myxedema. (C-3)
- 5-4.59 Discuss the management of the patient with myxedema. (C-1)
- 5-4.60 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with myxedema. (C-3)
- 5-4.61 Discuss the pathophysiology of Cushing's syndrome. (C-1)
- 5-4.62 Recognize signs and symptoms of the patient with Cushing's syndrome. (C-1)
- 5-4.63 Describe the management of Cushing's syndrome. (C-1)
- 5-4.64 Correlate abnormal findings in assessment with clinical significance in the patient with Cushing's syndrome. (C-3)
- 5-4.65 Discuss the management of the patient with Cushing's syndrome. (C-1)
- 5-4.66 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with Cushing's syndrome. (C-3)
- 5-4.67 Discuss the pathophysiology of adrenal Insufficiency. (C-1)
- 5-4.68 Recognize signs and symptoms of the patient with adrenal insufficiency. (C-1)
- 5-4.69 Describe the management of adrenal insufficiency. (C-1)
- 5-4.70 Correlate abnormal findings in assessment with clinical significance in the patient with adrenal insufficiency. (C-3)
- 5-4.71 Discuss the management of the patient with adrenal insufficiency. (C-1)
- 5-4.72 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with adrenal insufficiency. (C-3)
- 5-4.73 Integrate the pathophysiological principles to the assessment of a patient with an endocrinological

- emergency. (C-3)
- 5-4.74 Differentiate between endocrine emergencies based on assessment and history. (C-3)
- 5-4.75 Correlate abnormal findings in the assessment with clinical significance in the patient with endocrinologic emergencies. (C-3)
- 5-4.76 Develop a patient management plan based on field impression in the patient with an endocrinologic emergency. (C-3)

AFFECTIVE OBJECTIVES

None identified for this unit.

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

- I. Introduction
 - A. Epidemiology
 - 1. Incidence
 - 2. Mortality/ morbidity
 - 3. Risk factors
 - 4. Prevention strategies
 - B. Anatomy and physiology
- II. General pathophysiology, assessment and management
 - A. Pathophysiology
 - 1. Endocrine system
 - a. Integrated chemical and coordination system enabling
 - (1) Reproduction
 - (2) Growth and development
 - (3) Regulation of energy
 - b. Works with the nervous system to help
 - (1) Maintain an internal homeostasis of the body
 - (2) Coordinate responses to environmental changes and stress
 - c. Composed of glands or glandular tissue that synthesize, store and secrete chemical messengers (hormones) that affect specific target organs and body tissues
 - d. Specificity of this system is determined by the affinity of receptors on target organs and body tissues to a particular hormone
 - 2. Endocrine glands
 - a. Ductless glands
 - (1) Highly vascular
 - (2) Synthesize and secrete hormones
 - (3) Specific glands
 - (a) Hypothalamus
 - (b) Pituitary
 - (c) Thyroid
 - (d) Parathyroid
 - (e) Adrenal
 - (f) Kidneys
 - (g) Pancreatic islets
 - (h) Ovaries
 - (i) Testes
 - (j) Hormones
 - (4) Common characteristics
 - (a) Circulation through the blood
 - (b) Secretion of minute but effective amounts at predictable but variable intervals bind to specific cellular receptors to change intercellular metabolism
 - (5) Structure
 - B. Assessment findings
 - 1. Scene size-up
 - a. Scene safety
 - b. Personal protective equipment (PPE)

- (1) General impression
 - (2) Trauma
 - (a) Responsive
 - (b) Unresponsive
 - (3) Medical
 - (a) Responsive
 - (b) Unresponsive
 - c. Nature of illness
 - 2. Initial assessment
 - a. Airway
 - b. Breathing
 - c. Circulation
 - d. Disability
 - e. Chief complaint
 - 3. Focused history
 - a. Onset
 - b. Provoking factors
 - c. Time
 - d. Nausea/ vomiting
 - e. Weight loss
 - f. Last meal
 - g. Non-specific
 - h. Changes in
 - (1) Energy level
 - (2) Alertness
 - (3) Sleep patterns
 - (4) Mood
 - (5) Affect
 - (6) Weight
 - (7) Skin
 - (8) Hair
 - (9) Personal appearance
 - (10) Sexual function
 - i. Specific history of
 - (1) Hypopituitarism
 - (2) Hypothyroidism
 - (3) Polydipsia
 - (4) Polyuria
 - (5) Polyphagia
 - (6) Diabetes
 - (7) Exophthalmus in hyperthyroidism
 - 4. Focused physical examination
 - a. Appearance
 - b. Level of consciousness
 - c. Apparent state of health
 - d. Skin color
 - e. Vital signs
- C. Management/ treatment plan
- 1. Airway and ventilatory support
 - a. Maintain an open airway

- b. High flow oxygen
- 2. Circulatory support
 - a. Monitor blood pressure
- 3. Pharmacological interventions
 - a. Consider initiating intravenous line
 - b. Avoid interventions which mask signs and symptoms
- 4. Non-pharmacological interventions
 - a. Monitor LOC
 - b. Monitor vital signs
- 5. Transport consideration
 - a. Appropriate mode
 - b. Appropriate facility
- 6. Psychological support
 - a. All actions reflect a calm, caring, competent attitude
 - b. Keep patient and significant others informed of your actions

III. Specific illnesses

A. Diabetes mellitus

- 1. Epidemiology
 - a. Incidence
 - b. Morbidity/ mortality
 - c. Long term complications
 - d. Risk factors
 - e. Prevention strategies
- 2. Anatomy and physiology review
- 3. Pathophysiology
 - a. Types
 - (1) Type I-insulin dependent
 - (2) Type II-non insulin dependent
 - b. A chronic system syndrome characterized by hyperglycemia caused by a decrease in the secretion or activity of insulin
 - c. Normal insulin metabolism
 - (1) Produced by beta cells in the islets of Langerhans
 - (2) Continuously released into the bloodstream
 - (a) Insulin is released from the beta cells as proinsulin
 - (b) Routed through the liver where 50-70 percent is extracted from the blood
 - (c) The level of plasma insulin rises after a meal
 - i) Stimulates storage of glucose as glycogen, liver and muscle tissue
 - ii) Enhances fat deposition in adipose tissue
 - iii) Inhibits protein degradation
 - iv) Accelerates protein synthesis
 - (d) The fall of plasma insulin levels during normal overnight fasting facilitates the release of
 - i) Stored glucose from the liver
 - ii) Protein from muscle tissue
 - iii) Fat from adipose tissue
 - (e) Average daily secretion is 0.6 units per kilogram of body weight
 - (3) Activity of released insulin

- (a) Lowers blood glucose levels
 - (b) Facilitates a stable, normal glucose range of approximately 70 to 120 mg/ dl
 - d. Ketone formation
 - (1) When insulin supply is insufficient, glucose cannot be used for cellular energy
 - (2) Response to cellular starvation
 - (3) Body releases and breaks down stored fats and protein to provide energy
 - (4) Free fatty acids from stored triglycerides are released and metabolized in the liver in such large quantities that ketones are formed
 - (5) Excess ketones upset the pH balance and acidosis develops
 - (6) Gluconeogenesis from protein is the last source used by the body as a compensatory response to provide cellular energy
 - (a) Results in an increase in glucose and nitrogen
 - (b) Due to prevailing insulin insufficiency, the glucose can not be used resulting in
 - i) Increased osmotic diuresis
 - ii) Dehydration and loss of electrolytes, particularly potassium
 - 4. Assessment findings
 - a. History
 - (1) Has insulin dosage changed recently?
 - (2) Has the patient had a recent infection?
 - (3) Has the patient suffered any psychologic stress?
 - b. Signs and symptoms
 - (1) Altered mental status
 - (2) Abnormal respiratory pattern (Kussmaul's breathing)
 - (3) Tachycardia
 - (4) Hypotension
 - (5) Breath has a distinct fruity odor
 - (6) Polydipsia
 - (7) Polyphagia
 - (8) Warm dry skin
 - (9) Weight loss
 - (10) Weakness
 - (11) Dehydration
 - 5. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological interventions
 - d. Non-pharmacological interventions
 - e. Transport consideration
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological support/ communication strategies
- B. Hypoglycemia
- 1. Epidemiology
 - a. Incidence
 - b. Morbidity/ mortality
 - c. Risk factors

- d. Prevention strategies
 - 2. Pathophysiology
 - a. Blood glucose levels fall below that required for normal body functioning
 - b. Combined effects of a decreased energy supply to the central nervous system and a hyperadrenergic state results from a compensatory increase in catecholamine secretion
 - (1) Tremors
 - (2) Diaphoresis
 - (3) Palpitations
 - (4) Tachycardia
 - (5) Pale, cool skin
 - (6) Low levels of blood glucose reaching the brain results in an altered mental status
 - (7) Irritability
 - (8) Confusion
 - (9) Stupor
 - (10) Coma
 - 3. Assessment
 - a. Known history of
 - (1) Diabetes
 - (2) Prolonged fasting
 - (3) Alcoholism
 - b. Signs and symptoms
 - (1) Weakness
 - (2) Irritability
 - (3) Hunger
 - (4) Confusion
 - (5) Anxiety
 - (6) Bizarre behavior
 - (7) Tachycardia
 - (8) Normal respiratory pattern
 - (9) Cool, pale skin
 - (10) Diaphoresis
 - 4. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological interventions
 - d. Non-pharmacological interventions
 - e. Transport consideration
 - (1) Appropriate mode
 - (2) Appropriate facility
 - (3) Psychological support/ communication strategies
- C. Hyperglycemia (hyperglycemic hyperosmolar nonketosis)
- 1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Risk factors
 - d. Prevention strategies
 - 2. Pathophysiology
 - a. Occurs in patients with diabetes who are able to produce enough insulin to

- prevent DKA but not enough to prevent severe hyperglycemia, osmotic diuresis and extracellular fluid depletion
 - b. Increasing blood glucose levels causes a fluid shift from intracellular to extracellular spaces
 - 3. Assessment
 - a. Known history of
 - (1) Diabetes
 - (2) Inadequate fluid intake
 - b. Signs and symptoms
 - (1) Neurologic abnormalities
 - (a) Somnolence
 - (b) Coma
 - (c) Seizures
 - (d) Hemiparesis
 - (e) Aphasia
 - (f) Increasing mental depression
 - (g) Dehydration
 - (h) Polydipsia
 - (i) Polyuria
 - (j) Polyphagia
 - 4. Management
 - a. Airway and ventilatory support
 - b. Circulation
 - c. Pharmacological interventions
 - d. Non-pharmacological interventions
 - e. Transport consideration
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological support/ communication strategies
- D. Diabetic ketoacidosis
 - 1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Risk factors
 - d. Prevention strategies
 - e. Anatomy and physiology review
 - 2. Pathophysiology
 - a. Hyperglycemia
 - b. Ketonemia
 - c. Relative insulin insufficiency
 - d. Counterregulatory hormone excess
 - 3. Assessment findings
 - a. History
 - (1) General health
 - (2) Previous medical conditions
 - (3) Medications
 - (4) Previous experience with complaint
 - (5) Time of onset
 - b. Physical
 - (1) Dehydration

- (2) Hypotension
 - (3) Reflex tachycardia
 - (4) Acetone (fruity) odor on breath
 - (5) Nausea
 - (6) Vomiting
 - (7) Abdominal pain
 - (8) Hyperventilation
 - (9) Kussmaul's respiration
4. Management
- a. Airway and ventilatory support
 - (1) Oxygen
 - (2) Positioning
 - (3) Suction
 - (4) Assisted ventilation
 - (5) Suction
 - (6) Advanced airway devices
 - b. Circulatory support
 - (1) Venous access
 - (2) Blood analysis
 - c. Non-pharmacological interventions
 - (1) General comfort measures
 - d. Pharmacological interventions
 - (1) Rehydration
 - (2) Bicarbonate
 - (3) Potassium
 - (4) Insulin
 - e. Psychological support
 - f. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
- E. Thyrotoxicosis (thyroid storm)
- 1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Risk factors
 - d. Prevention strategies
 - 2. Pathophysiology
 - a. Acute manifestation of all hyperthyroid symptoms
 - b. Excessive circulating level of thyroxine and triiodothyronine
 - (1) Regulate metabolism
 - (2) Regulate growth and development
 - 3. Assessment
 - a. History
 - b. Signs and symptoms
 - (1) Severe tachycardia
 - (2) Heart failure
 - (3) Cardiac dysrhythmias
 - (4) Shock
 - (5) Hyperthermia
 - (6) Restlessness

- (7) Agitation
 - (8) Abdominal pain
 - (9) Delirium
 - (10) Coma
 - 4. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological interventions
 - (1) Anti-thyroid drugs - in hospital management
 - (2) Beta adrenergic receptor blockers
 - d. Non-pharmacological interventions
 - e. Transport consideration
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological support/ communication strategies
 - F. Myxedema (adult hypothyroidism)
 - 1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Risk factors
 - d. Prevention strategies
 - 2. Pathophysiology
 - a. A disease caused by hyposecretion of the thyroid gland during the adult years
 - 3. Assessment
 - a. History
 - b. Signs and symptoms
 - (1) Edematous face
 - (2) Periorbital edema
 - (3) Mask-like effect
 - (4) Impaired memory
 - (5) Slowed speech
 - (6) Decreased initiative
 - (7) Somnolence
 - (8) Cold intolerance
 - (9) Dry, coarse skin
 - (10) Muscle weakness and swelling
 - (11) Constipation
 - (12) Weight gain
 - (13) Hair loss
 - (14) Hoarseness
 - 4. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological interventions
 - d. Non-pharmacological interventions
 - e. Transport consideration
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological support/ communication strategies
 - IV. Corticosteroid excess - Cushing's syndrome
-

- A. Epidemiology
 - 1. Incidence
 - 2. Mortality/ morbidity
 - 3. Risk factors
 - 4. Prevention strategies
 - B. Pathophysiology
 - 1. A spectrum of clinical abnormalities caused by an excess of corticosteroids, especially glucocorticoids
 - 2. Causes
 - a. Corticotropin secreting pituitary tumor
 - b. Cortical secreting neoplasm within the adrenal cortex
 - c. Excess secretion of corticotropin by a malignant growth outside the adrenal
 - d. Prolongs administration of high dose corticosteroids
 - C. Assessment
 - 1. History
 - 2. Signs and symptoms
 - a. Thinning hair
 - b. Acnes
 - c. Hump on back of neck (buffalo hump)
 - d. Supraclavicular fat pad
 - e. Thin extremities
 - f. Ecchymosis
 - g. Slow healing
 - h. Pendulous abdomen
 - i. Weight gain
 - j. Increased body and facial hair
 - D. Management
 - 1. Airway and ventilation
 - 2. Circulation
 - 3. Pharmacological interventions
 - 4. Non-pharmacological interventions
 - 5. Transport consideration
 - a. Appropriate mode
 - b. Appropriate facility
 - 6. Psychological support/ communication strategies
- V. Adrenal insufficiency - Addison's disease
- A. Epidemiology
 - 1. Incidence
 - 2. Mortality/ morbidity
 - 3. Risk factors
 - 4. Prevention strategies
 - B. Pathophysiology
 - 1. Adrenal insufficiency
 - a. Adrenal steroids are reduced
 - (1) Glucocorticoids
 - (2) Mineralocorticoids
 - (3) Androgens
 - 2. Most common cause is idiopathic atrophy of adrenal tissue
 - 3. Less common caused include hemorrhage, infarctions, fungal infections and acquired

- immune deficiency disease
 - C. Assessment
 - 1. History
 - 2. Signs and symptoms
 - a. Progressive weakness
 - b. Progressive weight loss
 - c. Progressive anorexia
 - d. Skin hyperpigmentation
 - (1) Areas exposed to the sun
 - (2) Areas exposed to pressure points
 - (3) Joints and creases
 - e. Hypotension
 - f. Hyponatremia
 - g. Hyperkalemia
 - h. Nausea
 - i. Vomiting
 - j. Diarrhea
 - D. Management
 - 1. Airway and ventilation
 - 2. Circulation
 - 3. Pharmacological interventions
 - 4. Non-pharmacological interventions
 - 5. Transport consideration
 - a. Appropriate mode
 - b. Appropriate facility
 - 6. Psychological support/ communication strategies
- VI. Integration

UNIT TERMINAL OBJECTIVE

5-5 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with an allergic or anaphylactic reaction.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 5-5.1 Define allergic reaction. (C-1)
- 5-5.2 Define anaphylaxis. (C-1)
- 5-5.3 Describe the incidence, morbidity and mortality of anaphylaxis. (C-1)
- 5-5.4 Identify the risk factors most predisposing to anaphylaxis. (C-1)
- 5-5.5 Discuss the anatomy and physiology of the organs and structures related to anaphylaxis. (C-1)
- 5-5.6 Describe the prevention of anaphylaxis and appropriate patient education. (C-1)
- 5-5.7 Discuss the pathophysiology of allergy and anaphylaxis. (C-1)
- 5-5.8 Describe the common methods of entry of substances into the body. (C-1)
- 5-5.9 Define natural and acquired immunity. (C-1)
- 5-5.10 Define antigens and antibodies. (C-1)
- 5-5.11 List common antigens most frequently associated with anaphylaxis. (C-1)
- 5-5.12 Discuss the formation of antibodies in the body. (C-1)
- 5-5.13 Describe physical manifestations in anaphylaxis. (C-1)
- 5-5.14 Differentiate manifestations of an allergic reaction from anaphylaxis. (C-3)
- 5-5.15 Recognize the signs and symptoms related to anaphylaxis. (C-1)
- 5-5.16 Differentiate among the various treatment and pharmacological interventions used in the management of anaphylaxis. (C-3)
- 5-5.17 Integrate the pathophysiological principles of the patient with anaphylaxis. (C-3)
- 5-5.18 Correlate abnormal findings in assessment with the clinical significance in the patient with anaphylaxis. (C-3)
- 5-5.19 Develop a treatment plan based on field impression in the patient with allergic reaction and anaphylaxis. (C-3)

AFFECTIVE OBJECTIVES

None identified for this unit.

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

- I. Introduction
 - A. Epidemiology
 - 1. Incidence
 - 2. Morbidity/ mortality
 - 3. Risk factors
 - 4. Prevention
 - B. Anatomy
 - 1. Review of cardiovascular system
 - 2. Review of respiratory system
 - 3. Review of nervous system
 - 4. Review of gastrointestinal system
 - C. Physiology
 - 1. Antigens
 - 2. Antibodies
 - a. IgE
 - D. Terminology
 - 1. Allergic reaction
 - 2. Anaphylaxis

- II. Pathophysiology
 - A. Allergen
 - B. Routes of entry
 - 1. Oral ingestion
 - 2. Injected/ envenomation
 - 3. Inhaled
 - 4. Topical
 - C. Common allergens
 - 1. Drugs
 - 2. Insects
 - 3. Foods
 - 4. Animals
 - 5. Other
 - D. Allergic response
 - 1. Histamine or histamine-like substance release
 - 2. Biphasic response
 - a. Acute reaction
 - b. Delayed reaction
 - 3. Immunity
 - 4. Sensitivity
 - 5. Hypersensitivity
 - E. Urticaria
 - 1. Redness of skin
 - F. Angioneurotic
 - 1. Swelling/ edema of the skin
 - G. Anaphylactic shock
 - 1. Cardiovascular system

2. Respiratory system
3. Gastrointestinal system
4. Nervous system

- III. Assessment findings
- A. Not all signs and symptoms are present in every case
 - B. History
 1. Previous exposure
 2. Previous experience to exposure
 3. Onset of symptoms
 4. Dyspnea
 - C. Level of consciousness
 1. Unable to speak
 2. Restless
 3. Decreased level of consciousness
 4. Unresponsive
 - D. Upper airway
 1. Hoarseness
 2. Stridor
 3. Pharyngeal edema/ spasm
 - E. Lower airway
 1. Tachypnea
 2. Hypoventilation
 3. Labored - accessory muscle use
 4. Abnormal retractions
 5. Prolonged expirations
 6. Wheezes
 7. Diminished lung sounds
 - F. Skin
 1. Redness
 2. Rashes
 3. Edema
 4. Moisture
 5. Itching
 6. Urticaria
 7. Pallor
 8. Cyanotic
 - G. Vital signs
 1. Tachycardia
 2. Hypotension
 - H. Gastrointestinal
 1. Abnormal crampings
 2. Nausea/ vomiting
 3. Diarrhea
 - I. Assessment tools
 1. Cardiac monitor
 2. Pulse oximetry low
 3. End tidal CO₂ high

- IV. Management of anaphylaxis
 - A. Remove offending agent (i.e. remove stinger)
 - B. Airway and ventilation
 - 1. Positioning
 - 2. Oxygen
 - 3. Assist ventilation
 - 4. Advanced airway
 - C. Circulation
 - 1. Venous access
 - 2. Fluid resuscitation
 - D. Pharmacological
 - 1. Oxygen
 - 2. Epinephrine - main stay of treatment
 - a. Bronchodilator
 - b. Decrease vascular permeability
 - 3. Antihistamine
 - 4. Antiinflammatory/ immunosuppressant
 - 5. Vasopressor
 - E. Psychological support
 - F. Transport considerations
- V. Management of allergic reaction
 - A. Without dyspnea
 - 1. Antihistamine
 - B. With dyspnea
 - 1. Oxygen
 - 2. Subcutaneous epinephrine
 - 3. Antihistamine
- VI. Patient Education

UNIT TERMINAL OBJECTIVE

- 5-6 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement the treatment plan for the patient with a gastroenterologic problem.

COGNITIVE OBJECTIVE

At the conclusion of this unit, the paramedic student will be able to:

- 5-6.1 Describe the incidence, morbidity and mortality of gastrointestinal emergencies. (C-1)
- 5-6.2 Identify the risk factors most predisposing to gastrointestinal emergencies. (C-1)
- 5-6.3 Discuss the anatomy and physiology of the organs and structures related to gastrointestinal diseases. (C-1)
- 5-6.4 Discuss the pathophysiology of inflammation and its relationship to acute abdominal pain. (C-1)
- 5-6.5 Define somatic pain as it relates to gastroenterology. (C-1)
- 5-6.6 Define visceral pain as it relates to gastroenterology. (C-1)
- 5-6.7 Define referred pain as it relates to gastroenterology. (C-1)
- 5-6.8 Differentiate between hemorrhagic and non-hemorrhagic abdominal pain. (C-3)
- 5-6.9 Discuss the signs and symptoms of local inflammation relative to acute abdominal pain. (C-1)
- 5-6.10 Discuss the signs and symptoms of peritoneal inflammation relative to acute abdominal pain. (C-1)
- 5-6.11 List the signs and symptoms of general inflammation relative to acute abdominal pain. (C-1)
- 5-6.12 Based on assessment findings, differentiate between local, peritoneal and general inflammation as they relate to acute abdominal pain. (C-3)
- 5-6.13 Describe the questioning technique and specific questions the paramedic should ask when gathering a focused history in a patient with abdominal pain. (C-1)
- 5-6.14 Describe the technique for performing a comprehensive physical examination on a patient complaining of abdominal pain. (C-1)
- 5-6.15 Define upper gastrointestinal bleeding. (C-1)
- 5-6.16 Discuss the pathophysiology of upper gastrointestinal bleeding. (C-1)
- 5-6.17 Recognize the signs and symptoms related to upper gastrointestinal bleeding. (C-1)
- 5-6.18 Describe the management for upper gastrointestinal bleeding. (C-1)
- 5-6.19 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with upper GI bleeding. (C-3)
- 5-6.20 Define lower gastrointestinal bleeding. (C-1)
- 5-6.21 Discuss the pathophysiology of lower gastrointestinal bleeding. (C-1)
- 5-6.22 Recognize the signs and symptoms related to lower gastrointestinal bleeding. (C-1)
- 5-6.23 Describe the management for lower gastrointestinal bleeding. (C-1)
- 5-6.24 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with lower GI bleeding. (C-3)
- 5-6.25 Define acute gastroenteritis. (C-1)
- 5-6.26 Discuss the pathophysiology of acute gastroenteritis. (C-1)
- 5-6.27 Recognize the signs and symptoms related to acute gastroenteritis. (C-1)
- 5-6.28 Describe the management for acute gastroenteritis. (C-1)
- 5-6.29 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with acute gastroenteritis. (C-3)
- 5-6.30 Define colitis. (C-1)
- 5-6.31 Discuss the pathophysiology of colitis. (C-1)
- 5-6.32 Recognize the signs and symptoms related to colitis. (C-1)
- 5-6.33 Describe the management for colitis. (C-1)
- 5-6.34 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with colitis. (C-3)

- 5-6.35 Define gastroenteritis. (C-1)
- 5-6.36 Discuss the pathophysiology of gastroenteritis. (C-1)
- 5-6.37 Recognize the signs and symptoms related to gastroenteritis. (C-1)
- 5-6.38 Describe the management for gastroenteritis. (C-1)
- 5-6.39 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with gastroenteritis. (C-3)
- 5-6.40 Define diverticulitis. (C-1)
- 5-6.41 Discuss the pathophysiology of diverticulitis. (C-1)
- 5-6.42 Recognize the signs and symptoms related to diverticulitis. (C-1)
- 5-6.43 Describe the management for diverticulitis. (C-1)
- 5-6.44 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with diverticulitis. (C-3)
- 5-6.45 Define appendicitis. (C-1)
- 5-6.46 Discuss the pathophysiology of appendicitis. (C-1)
- 5-6.47 Recognize the signs and symptoms related to appendicitis. (C-1)
- 5-6.48 Describe the management for appendicitis. (C-1)
- 5-6.49 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with appendicitis. (C-3)
- 5-6.50 Define peptic ulcer disease. (C-1)
- 5-6.51 Discuss the pathophysiology of peptic ulcer disease. (C-1)
- 5-6.52 Recognize the signs and symptoms related to peptic ulcer disease. (C-1)
- 5-6.53 Describe the management for peptic ulcer disease. (C-1)
- 5-6.54 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with peptic ulcer disease. (C-3)
- 5-6.55 Define bowel obstruction. (C-1)
- 5-6.56 Discuss the pathophysiology of bowel obstruction. (C-1)
- 5-6.57 Recognize the signs and symptoms related to bowel obstruction. (C-1)
- 5-6.58 Describe the management for bowel obstruction. (C-1)
- 5-6.59 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with bowel obstruction. (C-3)
- 5-6.60 Define Crohn's disease. (C-1)
- 5-6.61 Discuss the pathophysiology of Crohn's disease. (C-1)
- 5-6.62 Recognize the signs and symptoms related to Crohn's disease. (C-1)
- 5-6.63 Describe the management for Crohn's disease. (C-1)
- 5-6.64 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with Crohn's disease. (C-3)
- 5-6.65 Define pancreatitis. (C-1)
- 5-6.66 Discuss the pathophysiology of pancreatitis. (C-1)
- 5-6.67 Recognize the signs and symptoms related to pancreatitis. (C-1)
- 5-6.68 Describe the management for pancreatitis. (C-1)
- 5-6.69 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with pancreatitis. (C-3)
- 5-6.70 Define esophageal varices. (C-1)
- 5-6.71 Discuss the pathophysiology of esophageal varices. (C-1)
- 5-6.72 Recognize the signs and symptoms related to esophageal varices. (C-1)
- 5-6.73 Describe the management for esophageal varices. (C-1)
- 5-6.74 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with esophageal varices. (C-3)
- 5-6.75 Define hemorrhoids. (C-1)
- 5-6.76 Discuss the pathophysiology of hemorrhoids. (C-1)

- 5-6.77 Recognize the signs and symptoms related to hemorrhoids. (C-1)
- 5-6.78 Describe the management for hemorrhoids. (C-1)
- 5-6.79 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with hemorrhoids. (C-3)
- 5-6.80 Define cholecystitis. (C-1)
- 5-6.81 Discuss the pathophysiology of cholecystitis. (C-1)
- 5-6.82 Recognize the signs and symptoms related to cholecystitis. (C-1)
- 5-6.83 Describe the management for cholecystitis. (C-1)
- 5-6.84 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with cholecystitis. (C-3)
- 5-6.85 Define acute hepatitis. (C-1)
- 5-6.86 Discuss the pathophysiology of acute hepatitis. (C-1)
- 5-6.87 Recognize the signs and symptoms related to acute hepatitis. (C-1)
- 5-6.88 Describe the management for acute hepatitis. (C-1)
- 5-6.89 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with acute hepatitis. (C-3)
- 5-6.90 Integrate pathophysiological principles of the patient with a gastrointestinal emergency. (C-3)
- 5-6.91 Differentiate between gastrointestinal emergencies based on assessment findings. (C-3)
- 5-6.92 Correlate abnormal findings in the assessment with the clinical significance in the patient with abdominal pain. (C-3)
- 5-6.93 Develop a patient management plan based on field impression in the patient with abdominal pain. (C-3)

AFFECTIVE OBJECTIVES

None identified for this unit.

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

- I. Introduction
 - A. Epidemiology
 1. Incidence
 2. Mortality/ morbidity
 3. Risk factors
 4. Prevention strategies

- II. General pathophysiology, assessment and management
 - A. Pathophysiology of abdominal pain
 1. Bacterial contamination
 - a. Perforated appendix
 - b. Pelvic inflammatory disease
 2. Chemical irritation
 - a. Perforated ulcer
 - b. Pancreatitis
 3. Types of abdominal pain
 - a. Somatic pain
 - (1) Appendicitis
 - (2) Pancreatitis
 - (3) Perforated viscus
 - (a) Gallbladder
 - (b) Ulcer
 - (c) Intestine
 - b. Visceral pain
 - (1) Appendicitis
 - (2) Pancreatitis
 - (3) Cholecystitis
 - (4) Obstruction of hollow viscera
 - (a) Intestines
 - (b) Biliary tree
 - c. Referred pain
 - d. Hemorrhagic abdominal pain
 - e. Non hemorrhagic abdominal pain
 - B. Assessment findings
 1. Scene size-up
 - a. Scene safety
 - b. Personal protective equipment (PPE)
 - c. General impression
 - (1) Trauma
 - (a) Responsive
 - (b) Unresponsive
 - (2) Medical
 - (a) Responsive
 - (b) Unresponsive
 2. Initial assessment
 - a. Airway
 - b. Breathing
 - c. Circulation

- d. Disability
- e. Chief complaint
- 3. Focused history
 - a. Onset
 - b. Provoking factors
 - c. Quality
 - d. Region/ radiation
 - e. Severity
 - f. Time
 - g. Previous history of same event
 - h. Nausea/ vomiting
 - i. Change in bowel habits/ stool
 - (1) Constipation
 - (2) Diarrhea
 - j. Weight loss
 - k. Last meal
 - l. Chest pain
- 4. Focused physical examination
 - a. Appearance
 - b. Posture
 - c. Level of consciousness
 - d. Apparent state of health
 - e. Skin color
 - f. Vital signs
 - g. Inspect abdomen
 - h. Auscultate abdomen
 - i. Percuss abdomen
 - j. Palpate abdomen
 - k. Female abdominal exam
 - l. Male abdominal exam
- 5. Assessment tools
 - a. Hematocrit
- C. Management/ treatment plan
 - 1. Airway and ventilatory support
 - a. Maintain an open airway
 - b. High flow oxygen
 - 2. Circulatory support
 - a. Electrocardiogram
 - b. Monitor blood pressure
 - 3. Pharmacological interventions
 - a. Consider initiating intravenous line
 - b. Avoid intervention which mask signs and symptoms
 - 4. Non-pharmacological interventions
 - a. Nothing by mouth
 - b. Monitor LOC
 - c. Monitor vital signs
 - d. Position of comfort
 - 5. Transport consideration
 - a. Persistent pain for greater than six hours requires transport
 - b. Gentle but rapid transport

6. Psychological support
 - a. All actions reflect a calm, caring, competent attitude
 - b. Keep patient and significant others informed of your actions
- III. Specific Injuries/ illness
- A. Upper gastrointestinal bleeding
 1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Risk factors
 - d. Prevention
 - e. Anatomy and physiology review
 - f. Pathophysiology
 - (1) Lesions
 - (2) Peptic ulceration
 - (3) Erosive gastritis
 - (4) Esophagogastric varices
 2. Assessment findings
 - a. History
 - (1) Acute/ chronic
 - (2) Vomiting/ hematemesis
 - (3) Stool/ melena
 - b. Physical
 - (1) Altered level of consciousness
 - (2) Skin
 - (a) Pale
 - (b) Cool
 - (c) Moist
 - (3) Inspect abdomen
 - (a) Scars
 - (b) Ecchymosis
 - (c) Contour
 - i) Bulges
 - ii) Symmetry
 - (4) Auscultate
 - (a) Bowel sounds
 - (5) Percuss
 - (6) Palpate
 - c. Assessment tools
 - (1) Hematocrit
 3. Management
 - a. Airway and ventilatory support
 - (1) High flow oxygen
 - b. Circulatory support
 - (1) Positioning
 - (2) Consider MAST
 - (3) Consider fluid bolus or resuscitation
 - (4) Consider fluid lavage
 - c. Psychological support
 - d. Transport consideration

- B. Lower gastrointestinal bleeding
1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Risk factors
 - d. Prevention strategies
 - e. Pathophysiology
 - (1) Lesions
 - (2) Anal and rectal lesions
 - (a) Hemorrhoids
 - (b) Anal fissures
 - (c) Fistulas
 - (3) Colonic lesions
 - (a) Carcinoma
 - (b) Polyps
 - (4) Diverticula
 2. Assessment findings
 - a. History
 - (1) Acute/ chronic
 - (2) Vomiting/ hematemesis
 - (3) Stool/ melena
 - (4) Meal history
 - (5) Chest pain/ "gas pain"
 - b. Physical
 - (1) Altered level of consciousness
 - (2) Skin
 - (a) Pale
 - (b) Cool
 - (c) Moist
 - (3) Inspect abdomen
 - (a) Scars
 - (b) Ecchymosis
 - (c) Contour
 - i) Bulges
 - ii) Symmetry
 - (4) Auscultate
 - (5) Percuss
 - (6) Palpate
 - c. Assessment tools
 - (1) Hematocrit
 3. Management
 - a. Airway and ventilatory support
 - (1) High flow oxygen
 - b. Circulatory support
 - (1) Positioning
 - (2) Consider MAST
 - (3) Consider fluid bolus or resuscitation
 - (4) Consider fluid lavage
 - c. Psychological support
 - d. Transport consideration

- C. Acute gastroenteritis
1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Risk factors
 - d. Prevention strategies
 - e. Anatomy and physiology review
 - f. Pathophysiology
 - (1) Gastric mucosa
 - (2) Inflammatory process
 - (3) Pathogenesis
 2. Assessment
 - a. History
 - (1) Quality of pain
 - (2) Onset of pain
 - (3) Location of pain
 - (4) Blood in the stool
 - (5) Epigastric pain
 - (6) Nausea
 - (7) Vomiting
 - b. Physical
 - (1) Restless
 - (2) Skin
 - (a) Pale
 - (b) Cool
 - (c) Moist
 - (3) Vital Signs
 - (a) Hypotension
 - (4) Abdominal Exam
 - (a) Inspect
 - i) Contour
 - a) Bulges
 - b) Symmetry
 - (b) Auscultate
 - (c) Percuss
 - (d) Palpate
 3. Management
 - (1) Positioning
 - (2) Airway and ventilatory support
 - (a) Oxygen
 - (3) Circulatory support
 - (a) Fluid bolus
 - (4) Pharmacological interventions
 - (5) Non-pharmacological interventions
 - (6) Transport consideration
- D. Colitis
1. Epidemiology
 - a. Incidence
 - b. Morbidity/ mortality
 - c. Risk factors

- d. Anatomy and physiology review
- e. Pathophysiology
 - (1) inflammatory bowel disease
 - (2) inflammatory action of colonic mucosa
- 2. Assessment
 - a. History
 - (1) Quality of pain
 - (2) Onset of pain
 - (3) Location of pain
 - (4) Bloody diarrhea
 - (5) Fever
 - (6) Weight loss
 - b. Physical
 - (1) Restless
 - (2) Skin
 - (a) Pale
 - (b) Cool
 - (c) Moist
 - (d) Warm
 - (3) Fever
 - (4) Vital signs
 - (a) Hypotension
 - (5) Abdominal exam
 - (a) Inspect
 - i) Contour
 - a) Bulges
 - b) Symmetry
 - (b) Auscultate
 - (c) Percuss
 - i) Dull over bladder
 - (d) Palpate
- 3. Management
 - (1) Positioning
 - (2) Airway and ventilatory support
 - (a) Oxygen
 - (3) Circulatory support
 - (a) Fluid bolus
 - (4) Pharmacological interventions
 - (5) Non-pharmacological interventions
 - (6) Transport consideration
- E. Gastroenteritis
 - 1. Causative organisms
 - a. Rotavirus, Norwalk virus, and many others
 - b. Parasites
 - (1) Protozoa giardia lamblia
 - (2) Crypto sporidium parvum
 - (3) Cyclosporidium cayetenensis
 - c. Contracted via fecal-oral transmission, contaminated food and water
 - d. Cyclosporidium reported to be contracted by swimming in contaminated waters
 - 2. Bacteria

- a. Escherichia coli
- b. Klebsiella pneumonia
- c. Enterobacter
- d. Campylobacter jejuni
- e. Vibrio cholera
- f. Shigella
 - (1) Not part of normal intestinal flora
- g. Salmonella
 - (1) Not part of normal intestinal flora
- 3. System affected - GI system
- 4. Modes of transmission
 - a. Fecal-oral
 - b. Ingestion of infected food or non-potable water
- 5. Susceptibility and resistance
 - a. Travelers into endemic areas are more susceptible
 - b. Populations in disaster areas, where water supplies are contaminated, are susceptible
 - c. Native populations in endemic areas are generally resistant
- 6. Signs and symptoms - nausea, vomiting, fever, abdominal pain and cramping, anorexia, lassitude, and frank shock
 - a. Diarrhea of enteric bacteria - different clinical pictures depending on the degree of intestinal invasion
 - b. Chronic gastritis and ulcers with abdominal pain, nausea, and "heartburn" are caused by Helicobacter pylori infection
- 7. Patient management and protective measures
 - a. EMS personnel - do not work when ill if your job involves patient contact
 - b. Focused on environmental health and development/ availability of clean water reservoirs, food preparation and sanitation
 - c. Disaster workers and travelers to endemic areas must be vigilant in knowing the sources of their water supplies or drink hot beverages that have been brisk-boiled or disinfected
 - d. Health care workers treating gastroenteritis patients must be careful to avoid habits that facilitate fecal-oral/ mucous membrane transmission, observe BSI and effective hand washing
 - e. Selected organisms may be sensitive to antibiotics
 - f. Epidemic treatment is normally symptomatic
- 8. Immunizations are unavailable for many of the enteric bacteria, which are part of the normal intestinal flora
- F. Diverticulitis
 - 1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Risk factors
 - d. Prevention strategies
 - e. Anatomy and physiology review
 - f. Pathophysiology
 - (1) Inflammation in or around the diverticula
 - (2) Retention of undigested food residue and bacteria
 - 2. Assessment
 - a. History

- (1) Quality of pain
- (2) Onset of pain
- (3) Location of pain
- (4) Dark stool
- b. Physical
 - (1) Altered level of consciousness
 - (2) Skin
 - (a) Pale
 - (b) Cool
 - (c) Moist
 - (3) Inspect abdomen
 - (a) Scars
 - (b) Ecchymosis
 - (c) Contour
 - i) Bulges
 - ii) Symmetry
 - (4) Auscultate
 - (a) Bowel sounds
 - (5) Percuss
 - (6) Palpate
- c. Assessment tools
 - (1) Hematocrit
- 3. Management/ treatment plan
 - a. Airway and ventilatory support
 - (1) Oxygen
 - b. Circulatory support
 - (1) Positioning
 - (2) Consider fluid bolus
 - c. Pharmacological interventions
 - d. Non-pharmacological interventions
 - e. Psychological support
 - f. Transport consideration
- G. Appendicitis
 - 1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Risk factors
 - d. Anatomy and physiology review
 - e. Pathophysiology
 - (1) Obstruction appendiceal lumen
 - (2) Ulceration of appendiceal mucosa
 - (a) Viral
 - (b) Bacterial
 - 2. Assessment findings
 - a. History
 - (1) Quality of pain
 - (2) Onset of pain
 - (3) Location of pain
 - (4) Anorexia
 - (5) Nausea/ vomiting

- b. Physical
 - (1) Skin
 - (a) Pale
 - (b) Cool
 - (c) Moist
 - (d) Warm
 - (2) Fever
 - (3) Inspect abdomen
 - (a) Scars
 - (b) Ecchymosis
 - (c) Contour
 - i) Bulges
 - ii) Symmetry
 - (4) Auscultate
 - (a) Bowel sounds
 - (5) Percuss
 - (6) Palpate
- 3. Management/ treatment plan
 - a. Airway and ventilatory support
 - (1) Oxygen
 - b. Circulatory support
 - (1) Positioning
 - (2) Consider fluid bolus
 - c. Pharmacological interventions
 - d. Non-pharmacological interventions
 - e. Psychological support
 - f. Transport consideration
- H. Peptic ulcer disease
 - 1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Risk factors
 - d. Prevention strategies
 - e. Anatomy and physiology review
 - f. Pathophysiology
 - (1) Ulcerative disorder
 - (2) Acid-pepsin formation
 - (3) Loss of protective effects
 - (a) Gastric mucosa
 - (b) Bicarbonate ions
 - (c) Prostaglandins
 - 2. Assessment findings
 - a. History
 - (1) Acute/ chronic
 - (2) Quality of pain
 - (3) Onset of pain
 - (4) Location of pain
 - (5) Last meal
 - (6) Nausea
 - (7) Stool/ melena

- (8) Vomiting/ hematemesis
- b. Physical
 - (1) Altered level of consciousness
 - (2) Cardiovascular
 - (a) Hypotension
 - (b) Tachycardia
 - (3) Skin
 - (a) Pale
 - (b) Cool
 - (c) Moist
 - (4) Inspect abdomen
 - (a) Scars
 - (b) Ecchymosis
 - (c) Contour
 - i) Bulges
 - ii) Symmetry
 - (5) Auscultate
 - (a) Bowel sounds
 - (6) Percuss
 - (7) Palpate
- c. Assessment tools
 - (1) Hematocrit
- 3. Management
 - a. Airway and ventilatory support
 - (1) High flow oxygen
 - b. Circulatory support
 - (1) Positioning
 - (2) Consider fluid bolus or resuscitation
 - c. Pharmacological
 - (1) Antacid
 - (2) H₂ Blockers
 - d. Psychological support
 - e. Transport consideration
- I. Bowel obstruction
 - 1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Risk factors
 - d. Anatomy and physiology review
 - e. Pathophysiology
 - (1) Mechanical
 - (2) Non-mechanical
 - (3) Lesions
 - (4) Obturation of the lumen
 - (5) Small/ large bowel
 - (6) Adhesions
 - (7) Hernias
 - 2. Assessment findings
 - a. History
 - (1) Acute/ chronic

- (2) Quality of pain/ paroxysms
- (3) Onset of pain
- (4) Location of pain
- (5) Nausea
- (6) Vomiting/ odor/ bile
- (7) Stool/ diarrhea/ unable
- b. Physical
 - (1) Altered level of consciousness
 - (2) Cardiovascular
 - (a) Hypotension
 - (b) Tachycardia
 - (3) Skin
 - (a) Pale
 - (b) Cool
 - (c) Moist
 - (4) Inspect abdomen
 - (a) Scars
 - (b) Ecchymosis
 - (c) Contour
 - i) Bulges
 - ii) Symmetry
 - (5) Auscultate
 - (a) Bowel sounds/ absent
 - (6) Percuss
 - (7) Palpate
- 3. Management
 - a. Airway and ventilatory support
 - (1) High flow oxygen
 - b. Circulatory support
 - (1) Positioning
 - (2) Consider fluid bolus or resuscitation
 - c. Psychological support
 - d. Transport consideration
- J. Crohn's disease
 - 1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Risk factors
 - (1) Positive family history same disorder
 - (2) Stress
 - d. Prevention strategies
 - e. Anatomy and physiology review
 - f. Pathophysiology
 - (1) Inflammatory disorder
 - (a) Small bowel
 - (b) Large bowel
 - (2) Increased suppressor T-cell activity
 - (3) Intestinal submucosa
 - (4) Lesions
 - (5) Fistulas

2. Assessment findings
 - a. History
 - (1) Acute/ chronic
 - (2) Quality of pain
 - (3) Onset of pain
 - (4) Location of pain
 - (5) "Irritable bowel"
 - (6) Stool/ diarrhea
 - (7) Weight loss
 - b. Physical
 - (1) Skin
 - (a) Pale
 - (b) Cool
 - (c) Moist
 - (2) Inspect abdomen
 - (a) Scars
 - (b) Ecchymosis
 - (c) Contour
 - i) Bulges
 - ii) Symmetry
 - (3) Auscultate
 - (a) Bowel sounds
 - (4) Percuss
 - (5) Palpate
 3. Management
 - a. Airway and ventilatory support
 - (1) High flow oxygen
 - b. Circulatory support
 - (1) Positioning
 - c. Psychological support
 - d. Transport consideration
- K. Pancreatitis
1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Risk factors
 - (1) Gallstones
 - (2) Alcohol
 - d. Prevention strategies
 - e. Anatomy and physiology review
 2. Pathophysiology
 - a. Inflammation
 - b. Injury or disruption of pancreatic ducts or acini
 - c. Leaked enzymes
 3. Assessment findings
 - a. History
 - (1) Acute/ chronic
 - (2) Quality of pain
 - (3) Onset of pain
 - (4) Location of pain

- (5) Nausea/ vomiting
- b. Physical
 - (1) Cardiovascular
 - (a) Hypotension
 - (b) Tachycardia
 - (2) Lungs
 - (a) Pulmonary edema
 - (3) Skin
 - (a) Pale
 - (b) Cool
 - (c) Moist
 - (4) Edema
 - (5) Inspect abdomen
 - (a) Scars
 - (b) Ecchymosis
 - (c) Contour
 - i) Bulges
 - ii) Symmetry
 - (6) Auscultate
 - (a) Bowel sounds
 - (7) Percuss
 - (8) Palpate
- 4. Management
 - a. Airway and ventilatory support
 - (1) High flow oxygen
 - b. Circulatory support
 - (1) Positioning
 - (2) Fluid bolus
 - c. Psychological support
 - d. Transport considerations
- L. Esophageal varices
 - 1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Risk factors
 - d. Prevention strategies
 - e. Anatomy and physiology review
 - f. Pathophysiology
 - (1) Portal hypertension
 - (2) Esophagitis with erosion
 - (3) Ingestion caustic substance
 - 2. Assessment findings
 - a. History
 - (1) Acute
 - (2) Painless
 - (3) Nausea
 - (4) Vomiting/ hematemesis
 - b. Physical
 - (1) Cardiovascular
 - (a) Hypotension

- (b) Tachycardia
 - (2) Skin
 - (a) Pale
 - (b) Cool
 - (c) Moist
 - 3. Management
 - a. Airway and ventilatory support
 - (1) High flow oxygen
 - (2) Suction
 - b. Circulatory support
 - (1) Positioning
 - (2) Fluid bolus or resuscitation
 - c. Transport consideration
- M. Hemorrhoids
 - 1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Risk factors
 - d. Prevention strategies
 - e. Anatomy and physiology review
 - f. Pathophysiology
 - (1) Internal/ external hemorrhoid
 - (2) Increased portal vein pressure
 - (3) Mucosal surface
 - (a) Thrombosis
 - (b) Infection
 - (c) Erosion
 - 2. Assessment findings
 - a. History
 - (1) Rectal pain
 - (2) Increased pain with bowel movement
 - (3) Stool/ blood
 - b. Physical
 - 3. Management
 - a. Psychological support
 - b. Transport consideration
- N. Cholecystitis
 - 1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Risk factors
 - d. Prevention strategies
 - e. Anatomy and physiology review
 - f. Pathophysiology
 - (1) Gallstones in cystic duct
 - 2. Assessment findings
 - a. History
 - (1) Acute/ chronic
 - (2) Quality of pain
 - (3) Onset of pain

- (4) Location of pain
 - b. Physical
 - (1) Skin
 - (a) Pale
 - (b) Cool
 - (c) Moist
 - (d) Warm
 - (2) Fever
 - (3) Inspect abdomen
 - (a) Scars
 - (b) Ecchymosis
 - (c) Contour
 - i) Bulges
 - ii) Symmetry
 - (4) Auscultate
 - (a) Bowel sounds
 - (5) Percuss
 - (6) Palpate
 - 3. Management/ treatment plan
 - a. Pharmacological interventions
 - (1) Consider pain medication
 - b. Transport consideration
- O. Acute hepatitis
 - 1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Risk factors
 - d. Prevention strategies
 - e. Anatomy and physiology review
 - f. Pathophysiology
 - (1) Systemic infection of the liver
 - (2) Types
 - (3) Chronic liver disease
 - (4) Cirrhosis
 - (5) Pathogenesis
 - 2. Assessment findings
 - a. History
 - (1) Acute/ chronic onset
 - (2) Quality of abdominal pain
 - (3) Location of pain
 - (4) Anorexia
 - (5) Nausea
 - (6) Vomiting
 - (7) Fatigue
 - (8) Headache
 - (9) Malaise
 - (10) Photophobia
 - (11) Pharyngitis
 - (12) Cough
 - b. Physical

- (1) Skin
 - (a) Warm
 - (b) Rash
 - (2) Fever
 - (3) Inspect abdomen
 - (a) Scars
 - (b) Ecchymosis
 - (c) Contour
 - i) Bulges
 - ii) Symmetry
 - (4) Auscultate
 - (a) Bowel sounds
 - (5) Percuss
 - (6) Palpate
3. Management
- a. Psychological support
 - b. Transport consideration

IV. Integration

UNIT TERMINAL OBJECTIVE

- 5-7 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with a renal or urologic problem.

COGNITIVE OBJECTIVES

At the conclusion of this unit, the paramedic student will be able to :

- 5-7.1 Describe the incidence, morbidity, mortality, and risk factors predisposing to urological emergencies. (C-1)
- 5-7.2 Discuss the anatomy and physiology of the organs and structures related to urogenital diseases. (C-1)
- 5-7.3 Define referred pain and visceral pain as it relates to urology. (C-1)
- 5-7.4 Describe the questioning technique and specific questions the paramedic should utilize when gathering a focused history in a patient with abdominal pain. (C-1)
- 5-7.5 Describe the technique for performing a comprehensive physical examination of a patient complaining of abdominal pain. (C-1)
- 5-7.6 Define acute renal failure. (C-1)
- 5-7.7 Discuss the pathophysiology of acute renal failure. (C-1)
- 5-7.8 Recognize the signs and symptoms related to acute renal failure. (C-1)
- 5-7.9 Describe the management for acute renal failure. (C-1)
- 5-7.10 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with acute renal failure. (C-3)
- 5-7.11 Define chronic renal failure. (C-1)
- 5-7.12 Discuss the pathophysiology of chronic renal failure. (C-1)
- 5-7.13 Recognize the signs and symptoms related to chronic renal failure. (C-1)
- 5-7.14 Describe the management for chronic renal failure. (C-1)
- 5-7.15 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with chronic renal failure. (C-3)
- 5-7.16 Define renal dialysis. (C-1)
- 5-7.17 Discuss the common complication of renal dialysis. (C-1)
- 5-7.18 Define renal calculi. (C-1)
- 5-7.19 Discuss the pathophysiology of renal calculi. (C-1)
- 5-7.20 Recognize the signs and symptoms related to renal calculi. (C-1)
- 5-7.21 Describe the management for renal calculi. (C-1)
- 5-7.22 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with renal calculi. (C-3)
- 5-7.23 Define urinary tract infection. (C-1)
- 5-7.24 Discuss the pathophysiology of urinary tract infection. (C-1)
- 5-7.25 Recognize the signs and symptoms related to urinary tract infection. (C-1)
- 5-7.26 Describe the management for a urinary tract infection. (C-1)
- 5-7.27 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with a urinary tract infection. (C-3)
- 5-7.28 Apply the epidemiology to develop prevention strategies for urological emergencies. (C-2)
- 5-7.29 Integrate pathophysiological principles to the assessment of a patient with abdominal pain. (C-3)
- 5-7.30 Synthesize assessment findings and patient history information to accurately differentiate between pain of a urogenital emergency and that of other origins. (C-3)
- 5-7.31 Develop, execute, and evaluate a treatment plan based on the field impression made in the assessment. (C-3)

AFFECTIVE OBJECTIVES

None identified for this unit.

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

- I. Introduction
 - A. Epidemiology
 - 1. Incidence
 - 2. Mortality/ morbidity
 - 3. Risk factors
 - 4. Prevention strategies
 - B. Anatomy and physiology review
 - C. Mechanisms of injuries/ illness

- II. General pathophysiology, assessment and management
 - A. Pathophysiology of abdominal pain
 - 1. Bacterial contamination
 - a. Urinary tract infection
 - 2. Types of abdominal pain
 - a. Visceral pain
 - (1) Obstruction of hollow viscera (ureters, urethra, etc.)
 - b. Referred pain
 - B. Assessment findings
 - 1. Scene size-up
 - 2. Initial assessment
 - a. Airway
 - b. Breathing
 - c. Circulation
 - d. Disability
 - e. Chief complaint
 - 3. Focused history
 - a. Onset
 - b. Provoking factors
 - c. Quality
 - d. Region/ radiation
 - e. Severity
 - f. Time
 - g. Previous history of same event
 - h. Nausea / vomiting
 - i. Change in bowel habits/ stool
 - (1) Constipation
 - (2) Diarrhea
 - j. Weight loss
 - k. Last meal
 - l. Chest pain
 - 4. Focused physical examination
 - a. Appearance
 - b. Posture
 - c. Level of consciousness
 - d. Apparent state of health
 - e. Skin color
 - f. Vital signs
 - g. Inspect abdomen

- h. Auscultate abdomen
 - i. Percuss abdomen
 - j. Palpate abdomen
 - k. Female abdominal exam
 - l. Male abdominal exam
 - 5. Assessment tools
 - a. Hematocrit
 - C. Management/ treatment plan
 - 1. Airway and ventilatory support
 - a. Maintain an open airway
 - b. High flow oxygen
 - 2. Circulatory support
 - a. Electrocardiogram
 - b. Monitor blood pressure
 - 3. Pharmacological interventions
 - a. Consider initiating intravenous line
 - b. Avoid intervention which mask signs and symptoms
 - 4. Non-pharmacological interventions
 - a. Nothing by mouth
 - b. Monitor LOC
 - c. Monitor vital signs
 - d. Position of comfort
 - 5. Transport consideration
 - a. Persistent pain for greater than six hours requires transport
 - b. Gentle but rapid transport
 - 6. Psychological support
 - a. All actions reflect a calm, caring, competent attitude
 - b. Keep patient and significant others informed of your actions
- III. Specific injuries/ illness
- A. Acute renal failure
 - 1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - (1) Overall mortality 50%
 - c. Risk factors
 - (1) Prerenal
 - (2) Postrenal
 - (3) Renal
 - d. Prevention strategies
 - (1) Protection of cardiovascular function and volume
 - (2) Reduce exposure to nephrotoxic drugs
 - e. Anatomy and physiology review
 - f. Pathophysiology
 - (1) Function of the nephron and glomerular filtration rate
 - (2) Retention of nitrogenous waste products and electrolytes
 - (3) Aberrations in glucose reabsorption
 - (4) Disorders of renal hypoperfusion
 - (a) Hypovolemia
 - (b) Low cardiac output

- (c) Increased renal systemic vascular resistance ratio
 - (d) Diseases of renal parenchyma
 - i) Renovascular obstruction
 - ii) Glomerular renal microvasculature
 - iii) Acute tubular necrosis
 - iv) Interstitial nephritis
 - (e) Acute obstruction of the urinary tract
 - i) Ureter
 - ii) Bladder neck
 - iii) Urethra
 - (f) Hyperkalemia
 - (g) Metabolic acidosis
2. Assessment findings
- a. History
 - (1) Oliguria/ anuria
 - (2) Edema
 - (3) Acidosis
 - b. Physical
 - (1) Altered level of consciousness
 - (2) Skin
 - (a) Pale
 - (b) Cool
 - (c) Moist
 - (3) Cardiovascular
 - (a) Hypotension
 - (b) Tachycardia
 - (c) ECG findings
 - (4) Inspect abdomen
 - (a) Scars
 - (b) Ecchymosis
 - (c) Contour
 - i) Bulges
 - ii) Symmetry
 - (5) Auscultate
 - (6) Palpate
 - c. Assessment tools
 - (1) Hematocrit
 - (2) Urinalysis
3. Management
- a. Airway and ventilatory support
 - (1) High flow oxygen
 - b. Circulatory support
 - (1) Positioning
 - (2) Consider fluid bolus or resuscitation
 - (3) Consider fluid lavage
 - c. Psychological support
 - d. Transport consideration
- B. Chronic renal failure
- 1. Epidemiology
 - a. Incidence

- b. Mortality/ morbidity
 - c. Risk factors
 - (1) Diabetes mellitus
 - (2) Hypertension
 - d. Prevention strategies
 - e. Anatomy and physiology review
 - f. Pathophysiology
 - (1) Reduction of renal mass
 - (2) Reduction of nephron mass
 - (3) Glucose intolerance
 - (4) Electrolyte imbalance
 - (5) Anemia
2. Assessment findings
- a. History
 - (1) Anorexia
 - (2) Nausea
 - (3) Vomiting
 - (4) Anxiety
 - (5) Seizure activity
 - b. Physical
 - (1) Altered level of consciousness
 - (a) Delirium
 - (2) Skin
 - (a) Pale
 - (b) Cool
 - (c) Moist
 - (d) Jaundice
 - (e) Uremic frost
 - (3) Cardiovascular
 - (a) Hypotension
 - (b) Tachycardia
 - (c) ECG findings
 - (d) Pericarditis rub
 - (e) Edema
 - (4) Lungs
 - (a) Pulmonary edema
 - (5) Neurological
 - (a) Seizure
 - (b) Muscle twitching
 - (6) Inspect abdomen
 - (a) Scars
 - (b) Ecchymosis
 - (c) Contour
 - (d) Bulges
 - (7) Symmetry
 - (8) Auscultate
 - (9) Percuss
 - (10) Palpate
 - c. Assessment tools
 - (1) Hematocrit

- 3. Management
 - (2) Urinalysis
 - a. Airway and ventilatory support
 - (1) High flow oxygen
 - b. Circulatory support
 - (1) Positioning
 - (2) Consider fluid bolus or resuscitation
 - (3) Consider fluid lavage
 - c. Pharmacological
 - (1) Vasopressor
 - d. Non-pharmacological
 - (1) Renal dialysis
 - (a) Definition
 - i) Process of diffusing blood across a semi-permeable membrane to remove substances that normally the kidney would eliminate
 - ii) May restore electrolyte and acid base imbalances
 - (b) Complications
 - i) Vascular-access related - most common
 - a) Bleeding from dialysis puncture site
 - b) Thrill in access has been lost
 - c) Infection
 - ii) Non-vascular access related
 - a) Hypotension
 - b) Shortness of breath
 - c) Chest pain
 - d) Neurologic abnormalities
 - e. Psychological support
 - f. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
- C. Renal calculi
 - 1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Risk factors
 - (1) Absent sensory/ motor impulses
 - (2) Medications
 - (a) Anesthetics
 - (b) Opiates
 - (c) Psychotropic
 - (3) Postoperative
 - d. Prevention strategies
 - e. Anatomy and physiology review
 - f. Pathophysiology
 - (1) Urinary stones
 - (a) Calcium salts
 - (b) Uric acid
 - (c) Cystine
 - (d) Struvite

- 2. Assessment findings
 - a. History
 - (1) Quality of pain
 - (2) Onset of pain
 - (3) Location of pain
 - (4) Dysuria
 - (5) Hematuria
 - (6) Nocturia
 - (7) Frequent urination
 - (8) History of same condition
 - b. Physical
 - (1) Restless
 - (2) Skin
 - (a) Pale
 - (b) Cool
 - (c) Moist
 - (3) Vital signs
 - (a) Vary considerably
 - (4) Abdominal exam
 - (a) Inspect
 - i) Contour
 - a) Bulges
 - b) Symmetry
 - (b) Auscultate
 - (c) Palpate
- 3. Management
 - a. Airway and ventilatory support
 - b. Circulatory support
 - (1) Positioning
 - c. Pharmacological
 - (1) Consider pain management
 - d. Non-pharmacological
 - (1) Pain management
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
- D. Urinary tract infection
 - 1. Epidemiology
 - a. Incidence
 - b. Mortality/ morbidity
 - c. Risk factors
 - (1) Nerve disruption
 - (2) Diabetes
 - d. Prevention strategies
 - e. Anatomy and physiology review
 - f. Pathophysiology
 - (1) Lower tract infection
 - (a) Urethritis
 - (b) Cystitis
 - (c) Prostatitis

- (2) Upper tract infection
 - (a) Pyelonephritis
 - (b) Intrarenal and perinephric abscesses
 - (3) Pathogenic microorganisms
2. Assessment findings
- a. History
 - (1) Quality of pain
 - (2) Onset of pain
 - (3) Location of pain
 - (4) Dysuria
 - (5) Urgency to urinate
 - (6) Strong urine odor
 - (7) History of same condition
 - b. Physical
 - (1) Restless
 - (2) Skin
 - (a) Pale
 - (b) Cool
 - (c) Moist
 - (d) Warm
 - (3) Fever
 - (4) Vital signs
 - (a) Vary considerably
 - (5) Abdominal exam
 - (a) Inspect
 - i) Contour
 - a) Bulges
 - b) Symmetry
 - (b) Auscultate
 - (c) Palpate
3. Management
- a. Airway and ventilatory support
 - b. Circulatory support
 - (1) Positioning
 - c. Pharmacological
 - (1) Consider pain management
 - d. Non-pharmacological
 - (1) Pain management
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility

IV. Integration

UNIT TERMINAL OBJECTIVE

- 5-8 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient with a toxic exposure.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 5-8.1 Describe the incidence, morbidity and mortality of toxic emergencies. (C-1)
- 5-8.2 Identify the risk factors most predisposing to toxic emergencies. (C-1)
- 5-8.3 Discuss the anatomy and physiology of the organs and structures related to toxic emergencies. (C-1)
- 5-8.4 Describe the routes of entry of toxic substances into the body. (C-1)
- 5-8.5 Discuss the role of the Poison Control Center in the United States. (C-1)
- 5-8.6 List the toxic substances that are specific to your region. (C-1)
- 5-8.7 Discuss the pathophysiology of the entry of toxic substances into the body. (C-1)
- 5-8.8 Discuss the assessment findings associated with various toxidromes. (C-1)
- 5-8.9 Identify the need for rapid intervention and transport of the patient with a toxic substance emergency. (C-1)
- 5-8.10 Discuss the management of toxic substances. (C-1)
- 5-8.11 Define poisoning by ingestion. (C-1)
- 5-8.12 List the most common poisonings by ingestion. (C-1)
- 5-8.13 Describe the pathophysiology of poisoning by ingestion. (C-1)
- 5-8.14 Recognize the signs and symptoms related to the most common poisonings by ingestion. (C-1)
- 5-8.15 Correlate the abnormal findings in assessment with the clinical significance in the patient with the most common poisonings by ingestion. (C-1)
- 5-8.16 Differentiate among the various treatments and pharmacological interventions in the management of the most common poisonings by ingestion. (C-3)
- 5-8.17 Discuss the factors affecting the decision to induce vomiting in a patient with ingested poison. (C-1)
- 5-8.18 Integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with the most common poisonings by ingestion. (C-3)
- 5-8.19 Define poisoning by inhalation. (C-1)
- 5-8.20 List the most common poisonings by inhalation. (C-1)
- 5-8.21 Describe the pathophysiology of poisoning by inhalation. (C-1)
- 5-8.22 Recognize the signs and symptoms related to the most common poisonings by inhalation. (C-1)
- 5-8.23 Correlate the abnormal findings in assessment with the clinical significance in patients with the most common poisonings by inhalation. (C-1)
- 5-8.24 Differentiate among the various treatments and pharmacological interventions in the management of the most common poisonings by inhalation. (C-3)
- 5-8.25 Integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with the most common poisonings by inhalation. (C-3)
- 5-8.26 Define poisoning by injection. (C-1)
- 5-8.27 List the most common poisonings by injection. (C-1)
- 5-8.28 Describe the pathophysiology of poisoning by injection. (C-1)
- 5-8.29 Recognize the signs and symptoms related to the most common poisonings by injection. (C-1)
- 5-8.30 Correlate the abnormal findings in assessment with the clinical significance in the patient with the most common poisonings by injection. (C-3)
- 5-8.31 Differentiate among the various treatments and pharmacological interventions in the management of the most common poisonings by injection. (C-3)

- 5-8.32 Integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with the most common poisonings by injection. (C-3)
- 5-8.33 Define poisoning by surface absorption. (C-1)
- 5-8.34 List the most common poisonings by surface absorption. (C-1)
- 5-8.35 Describe the pathophysiology of poisoning by surface absorption. (C-1)
- 5-8.36 Recognize the signs and symptoms related to the most common poisonings by surface absorption. (C-1)
- 5-8.37 Correlate the abnormal findings in assessment with the clinical significance in patients with the most common poisonings by surface absorption. (C-3)
- 5-8.38 Differentiate among the various treatments and pharmacological interventions in the management of the most common poisonings by surface absorption. (C-3)
- 5-8.39 Integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for patients with the most common poisonings by surface absorption. (C-3)
- 5-8.40 Define poisoning by overdose. (C-1)
- 5-8.41 List the most common poisonings by overdose. (C-1)
- 5-8.42 Describe the pathophysiology of poisoning by overdose. (C-1)
- 5-8.43 Recognize the signs and symptoms related to the most common poisonings by overdose. (C-1)
- 5-8.44 Correlate the abnormal findings in assessment with the clinical significance in patients with the most common poisonings by overdose. (C-3)
- 5-8.45 Differentiate among the various treatments and pharmacological interventions in the management of the most common poisonings by overdose. (C-3)
- 5-8.46 Integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for patients with the most common poisonings by overdose. (C-3)
- 5-8.47 Define drug abuse. (C-1)
- 5-8.48 Discuss the incidence of drug abuse in the United States. (C-1)
- 5-8.49 Define the following terms: (C-1)
 - a. Substance or drug abuse
 - b. Substance or drug dependence
 - c. Tolerance
 - d. Withdrawal
 - e. Addiction
- 5-8.50 List the most commonly abused drugs (both by chemical name and street names). (C-1)
- 5-8.51 Describe the pathophysiology of commonly used drugs. (C-1)
- 5-8.52 Recognize the signs and symptoms related to the most commonly abused drugs. (C-1)
- 5-8.53 Correlate the abnormal findings in assessment with the clinical significance in patients using the most commonly abused drugs. (C-3)
- 5-8.54 Differentiate among the various treatments and pharmacological interventions in the management of the most commonly abused drugs. (C-3)
- 5-8.55 Integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for patients using the most commonly abused drugs. (C-3)
- 5-8.56 List the clinical uses, street names, pharmacology, assessment finding and management for patient who have taken the following drugs or been exposed to the following substances: (C-1)
 - 1. Cocaine
 - 2. Marijuana and cannabis compounds
 - 3. Amphetamines and amphetamine-like drugs
 - 4. Barbiturates
 - 5. Sedative-hypnotics
 - 6. Cyanide

7. Narcotics/ opiates
 8. Cardiac medications
 9. Caustics
 10. Common household substances
 11. Drugs abused for sexual purposes/ sexual gratification
 12. Carbon monoxide
 13. Alcohols
 14. Hydrocarbons
 15. Psychiatric medications
 16. Newer anti-depressants and serotonin syndromes
 17. Lithium
 18. MAO inhibitors
 19. Non-prescription pain medications
 - (1) Nonsteroidal anitnflammatory agents
 - (2) Salicylates
 - (3) Acetaminophen
 20. Theophylline
 21. Metals
 22. Plants and mushrooms
- 5-8.57 Discuss common causative agents, pharmacology, assessment findings and management for a patient with food poisoning. (C-1)
- 5-8.58 Discuss common offending organisms, pharmacology, assessment findings and management for a patient with a bite or sting. (C-1)
- 5-8.59 Integrate pathophysiological principles of the patient with a toxic substance exposure. (C-1)
- 5-8.60 Differentiate between toxic substance emergencies based on assessment findings. (C-3)
- 5-8.61 Correlate abnormal findings in the assessment with the clinical significance in the patient exposed to a toxic substance. (C-3)
- 5-8.62 Develop a patient management plan based on field impression in the patient exposed to a toxic substance. (C-3)

AFFECTIVE OBJECTIVES

None identified for this unit.

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

- I. General toxicology, assessment and management
 - A. Types of toxicological emergencies
 - 1. Unintentional poisoning
 - a. Dosage errors
 - b. Idiosyncratic reactions
 - c. Childhood poisoning
 - d. Environmental exposure
 - e. Occupational exposures
 - f. Neglect and Abuse
 - 2. Drug/ alcohol abuse
 - 3. Intentional poisoning/ overdose
 - a. Chemical warfare
 - b. Assault/ homicide
 - c. Suicide attempts
 - B. Use of poison control centers
 - C. Routes of absorption
 - 1. Ingestion
 - 2. Inhalation
 - 3. Injection
 - 4. Absorption
 - D. Poisoning by ingestion
 - 1. Examples
 - 2. Anatomy and physiology review
 - a. Absorption
 - b. Distribution
 - 3. Assessment findings
 - 4. General management considerations
 - E. Poisoning by inhalation
 - 1. Examples
 - 2. Anatomy and physiology review
 - a. Absorption
 - b. Distribution
 - 3. Assessment findings
 - 4. General management considerations
 - F. Poisoning by injection
 - 1. Examples
 - a. IV drug abuse
 - b. Venomous bites and stings
 - 2. Anatomy and physiology review
 - a. Absorption
 - b. Distribution

3. Assessment findings
 4. General management considerations
- G. Poisoning by absorption
1. Examples
 2. Anatomy and physiology review
 - a. Absorption
 - b. Distribution
 3. Assessment findings
 4. General management considerations
- H. Drugs abuse
1. Epidemiology
 - a. Incidence
 - b. Morbidity/ mortality
 - c. Risk factors
 - d. Prevention
 2. Psychological issues
 3. Psycho-social issues
 4. Pathophysiology of long term drug abuse
 - a. End organ damage
 - (1) Brain
 - (2) Liver
 - (3) Heart
 - b. Malnutrition
 5. Basic concepts
 - a. Habituation/ dependence/ addiction
 - (1) Physical
 - (2) Psychological
 - b. Tolerance
 - c. Antagonist
 - d. Potentiating
 - e. Synergism
 - f. Withdrawal syndromes
 6. Assessment finding
- I. Alcoholism
1. Epidemiology
 - a. Incidence
 - b. Morbidity/ mortality
 - c. Risk factors
 - d. Prevention
 2. Psychological issues
 3. Psycho-social issues
 4. Pathophysiology of long term alcohol abuse

- a. End organ damage
 - (1) Brain
 - (2) Liver
 - (3) Heart
 - (4) Bone
 - (5) Pancreas
- b. Malnutrition
- c. Withdrawal syndrome
- 5. Assessment findings
- J. Toxic syndromes
 - 1. Definition/ advantages
 - a. Grouping of toxicologically similar agents
 - b. Useful for remembering the assessment and management of toxicological emergencies
 - c. Does not consider how or why the toxin has been introduced to the body
 - d. Be sure to include the general management based or route of entry in addition to specific treatments
 - 2. Cholinergics
 - a. Common causative agents - pesticides
 - (organophosphates, carbamates) and nerve agents (sarin, Soman)
 - b. Assessment findings
 - (1) Headache
 - (2) Dizziness
 - (3) Weakness
 - (4) Nausea
 - (5) SLUDGE (salivation, lacrimation, urination, defecation, GI Upset, Emesis)
 - (6) Bradycardia, wheezing, bronchoconstriction, miosis, coma, convulsions
 - (7) Diaphoresis, seizures
 - c. Management
 - (1) Decontamination
 - (2) Airway and ventilation
 - (a) Aggressive airway management
 - (3) Circulation
 - (4) Pharmacological
 - (a) Atropine

- (b) Pralidoxime chloride (2-PAM)
 - (c) Diazepam
 - (d) Activated charcoal
 - (5) Non-pharmacological
 - (6) Transport considerations
 - (a) Appropriate mode
 - (b) Appropriate facility
 - (7) Psychological/ communication strategies
- 3. Anticholinergic
 - a. Common causative agents
 - b. Assessment findings
 - c. Management
 - (1) Airway and ventilation
 - (2) Circulation
 - (3) Pharmacological
 - (4) Non-pharmacological
 - (5) Transport considerations
 - (a) Appropriate mode
 - (b) Appropriate facility
 - (6) Psychological/communication strategies
- 4. Hallucinogens
 - a. Common causative agents - lysergic acid diethylamide (LSD), phenyclicidine (PCP), peyote, mushrooms, jimson weed, mescaline
 - b. Assessment findings
 - (1) Chest pain
 - c. Management
 - (1) Airway and ventilation
 - (2) Circulation
 - (3) Pharmacological
 - (4) Non-pharmacological
 - (5) Transport considerations
 - (a) Appropriate mode
 - (b) Appropriate facility
 - (6) Psychological/ communication strategies
- 5. Narcotics/ opiates
 - a. Common causative agents - heroin, morphine, codeine, meperidine, propoxyphene, fentanyl
 - b. Assessment findings
 - (1) Euphoria
 - (2) Hypotension
 - (3) Respiratory depression/ arrest
 - (4) Nausea

- (5) Pinpoint pupils
- (6) Seizures
- (7) Coma
- c. Management
 - (1) Airway and ventilation
 - (2) Circulation
 - (3) Pharmacological
 - (a) Naloxone- opiate specific antidotal therapy
 - (4) Non-pharmacological
 - (5) Transport considerations
 - (a) Appropriate mode
 - (b) Appropriate facility
 - (6) Psychological/ communication strategies
- 6. Sympathomimetics
 - a. Common causative agents
 - b. Assessment findings
 - c. Management
 - (1) Airway and ventilation
 - (2) Circulation
 - (3) Pharmacological
 - (4) Non-pharmacological
 - (5) Transport considerations
 - (a) Appropriate mode
 - (b) Appropriate facility
 - (6) Psychological/ communication strategies

II. Specific toxicology, assessment and management

A. Cocaine

- 1. Clinical uses
- 2. Common causative agents
- 3. Common street names
- 4. Pharmacodynamics
- 5. Pharmacokinetics
- 6. Assessment findings
- 7. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological
 - d. Non-pharmacological
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility

- f. Psychological/ communication strategies
- B. Marijuana and cannabis compounds
 - 1. Clinical uses
 - 2. Common causative agents
 - 3. Common street names
 - 4. Pharmacodynamics
 - 5. Pharmacokinetics
 - 6. Assessment findings
 - 7. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological
 - d. Non-pharmacological
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological/ communication strategies
- C. Amphetamines and amphetamine-like drugs
 - 1. Clinical uses
 - 2. Common causative agents
 - 3. Common street names
 - 4. Pharmacodynamics
 - 5. Pharmacokinetics
 - 6. Assessment findings
 - 7. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological
 - d. Non-pharmacological
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological/communication strategies
- D. Barbiturates
 - 1. Clinical uses
 - 2. Common causative agents
 - 3. Common street names
 - 4. Pharmacodynamics
 - 5. Pharmacokinetics
 - 6. Assessment findings
 - 7. Management
 - a. Airway and ventilation
 - b. Circulation

- c. Pharmacological
 - d. Non-pharmacological
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological/ communication strategies
- E. Sedative-hypnotics
- 1. Clinical use
 - 2. Common causative agents - benzodiazepines (diazepam, chlordiazepoxide, midazolam)
 - 3. Common street names
 - 4. Pharmacodynamics
 - 5. Pharmacokinetics
 - 6. Assessment findings
 - a. Respiratory depression/ respiratory arrest
 - b. Hypotension
 - 7. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological
 - (1) Antidote
 - d. Non-pharmacological
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological/ communication strategies
- F. Cyanide
- 1. Sources
 - 2. Common causative agents
 - a. Used in industry (electroplating, ore extraction, fumigation of structures)
 - b. Product of combustion of nylon or polyurethane
 - c. Ingestion of seeds (apricot, cherry, pears)
 - d. Nitroprusside administration
 - 3. Pharmacodynamics
 - 4. Pharmacokinetics
 - 5. Assessment findings
 - a. History of cyanide exposure
 - b. Early findings (anxiety, dyspnea, confusion, hypertension, agitation)
 - c. Late findings (hypotension, acidosis, seizures, pulmonary edema, dysrhythmias, coma)
 - 6. Management

- a. Personal protective equipment
 - (1) Remove patient from the source of poison
 - b. Airway and ventilation
 - c. Circulation
 - (1) Monitoring for hypotension as a result of therapy
 - d. Pharmacological
 - (1) Antidotes
 - (2) Cyanide antidote kit
 - e. Non-pharmacological
 - f. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - g. Psychological/ communication strategies
- G. Narcotics/ opiates
- 1. Clinical uses
 - 2. Common causative agents - heroin, morphine, codeine, meperidine, propoxyphene, fentanyl
 - 3. Pharmacodynamics
 - 4. Pharmacokinetics
 - 5. Assessment findings
 - a. Euphoria
 - b. Hypotension
 - c. Respiratory depression/ arrest
 - d. Nausea
 - e. Pinpoint pupils
 - f. Seizures
 - g. Coma
 - 6. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological
 - (1) Naloxone - opiate specific antidotal therapy
 - d. Non-pharmacological
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological/ communication strategies
- H. Cardiac medications
- 1. Clinical use
 - 2. Common causative agents - antidysrhythmics, beta blockers, calcium channel blockers, glycosides

3. Pharmacodynamics
 4. Pharmacokinetics
 5. Assessment findings
 6. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological
 - d. Non-pharmacological
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological/ communication strategies
- I. Caustics
1. Source
 2. Common causative agents - acids and alkali
 3. Pharmacodynamics
 4. Pharmacokinetics
 5. Assessment findings
 6. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological
 - d. Non-pharmacological
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological/ communication strategies
- J. Common household poisonings
1. Sources
 2. Common causative agents - bleach, cleaning agents
 3. Pharmacodynamics
 4. Pharmacokinetics
 5. Assessment findings
 6. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological
 - d. Non-pharmacological
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological/ communication strategies

- K. Drugs abused for sexual purposes/ sexual gratification
 - 1. Sources
 - 2. Common causative agents
 - 3. Pharmacodynamics
 - 4. Pharmacokinetics
 - 5. Assessment findings
 - 6. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological
 - d. Non-pharmacological
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological/ communication strategies
- L. Carbon monoxide
 - 1. Source
 - 2. Common causative agents
 - 3. Pharmacodynamics
 - 4. Pharmacokinetics
 - 5. Assessment findings
 - 6. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological
 - d. Non-pharmacological
 - (1) Hyperbaric treatment
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological/ communication strategies
- M. Alcohols
 - 1. Clinical use/ sources
 - 2. Common causative agents - ethylene glycol, methanol, isopropyl alcohol, ethanol
 - 3. Pharmacodynamics
 - 4. Pharmacokinetics
 - 5. Assessment findings
 - 6. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological
 - (1) Antidote

- d. Non-pharmacological
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological/ communication strategies
- N. Hydrocarbons
- 1. Source
 - 2. Common causative agents - gasoline
 - 3. Pharmacodynamics
 - a. Aspiration pneumonia
 - b. CNS depression
 - c. Acute gastritis
 - 4. Pharmacokinetics
 - 5. Assessment findings
 - 6. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological
 - d. Non-pharmacological
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological/ communication strategies
- O. Psychiatric medications
- 1. Tricyclic antidepressants
 - a. Clinical use
 - b. Common causative agents - amitriptyline, amoxapine, clomipramine, doxepin, imipramine, nortriptyline
 - c. Pharmacodynamics
 - d. Pharmacokinetics
 - e. Assessment findings
 - (1) Early findings (dry mouth, confusion, hallucinations)
 - (2) Late findings (delirium, respiratory depression, hypotension, hyperthermia, seizures, coma)
 - (3) Cardiotoxicity - dysrhythmias
 - f. Management
 - (1) Airway and ventilation
 - (2) Circulation
 - (3) Pharmacological
 - (a) Antidote

- (b) Sodium bicarbonate may reverse the cardiotoxic effects
 - (4) Non-pharmacological
 - (5) Transport considerations
 - (a) Appropriate mode
 - (b) Appropriate facility
 - (6) Psychological/ communication strategies
2. Newer anti-depressants and serotonin syndromes
- a. Clinical uses
 - b. Common causative agents
 - c. Common street names
 - d. Pharmacodynamics
 - e. Pharmacokinetics
 - f. Assessment findings
 - g. Management
 - (1) Airway and ventilation
 - (2) Circulation
 - (3) Pharmacological
 - (4) Non-pharmacological
 - (5) Transport considerations
 - (a) Appropriate mode
 - (b) Appropriate facility
 - (6) Psychological/ communication strategies
3. Lithium
- a. Clinical uses
 - b. Common causative agents
 - c. Common street names
 - d. Pharmacodynamics
 - e. Pharmacokinetics
 - f. Assessment findings
 - g. Management
 - (1) Airway and ventilation
 - (2) Circulation
 - (3) Pharmacological
 - (4) Non-pharmacological
 - (5) Transport considerations
 - (a) Appropriate mode
 - (b) Appropriate facility
 - (6) Psychological/ communication strategies
4. MAO inhibitors
- a. Clinical use
 - b. Common causative agents
 - c. Pharmacodynamics

- d. Pharmacokinetics
 - e. Assessment findings
 - f. Management
 - (1) Airway and ventilation
 - (2) Circulation
 - (3) Pharmacological
 - (4) Non-pharmacological
 - (5) Transport considerations
 - (a) Appropriate mode
 - (b) Appropriate facility
 - (6) Psychological/ communication strategies
5. Other
- P. Non-prescription pain medications
- 1. Nonsteroidal anti-inflammatory agents
 - a. Clinical uses
 - b. Common causative agents
 - c. Common street names
 - d. Pharmacodynamics
 - e. Pharmacokinetics
 - f. Assessment findings
 - g. Management
 - (1) Airway and ventilation
 - (2) Circulation
 - (3) Pharmacological
 - (4) Non-pharmacological
 - (5) Transport considerations
 - (a) Appropriate mode
 - (b) Appropriate facility
 - (6) Psychological/ communication strategies
 - 2. Salicylates
 - a. Clinical uses
 - b. Common causative agents
 - c. Common street names
 - d. Pharmacodynamics
 - e. Pharmacokinetics
 - f. Assessment findings
 - g. Management
 - (1) Airway and ventilation
 - (2) Circulation
 - (3) Pharmacological
 - (4) Non-pharmacological
 - (5) Transport considerations
 - (a) Appropriate mode

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-
- (b) Appropriate facility
 - (6) Psychological/ communication strategies
3. Acetaminophine
- a. Clinical use
 - b. Common causative agents
 - c. Pharmacodynamics
 - d. Pharmacokinetics
 - e. Assessment findings
 - f. Management
 - (1) Airway and ventilation
 - (2) Circulation
 - (3) Pharmacological
 - (4) Non-pharmacological
 - (5) Transport considerations
 - (a) Appropriate mode
 - (b) Appropriate facility
 - (6) Psychological/ communication strategies
- Q. Theophylline
- 1. Clinical use
 - 2. Common causative agents
 - 3. Pharmacodynamics
 - 4. Pharmacokinetics
 - 5. Assessment findings
 - 6. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological
 - d. Non-pharmacological
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological/ communication strategies
- R. Metals
- 1. Clinical use
 - 2. Common causative agents - iron, lead, mercury
 - 3. Pharmacodynamics
 - 4. Pharmacokinetics
 - 5. Assessment findings
 - 6. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological
 - (1) Antidote

- d. Non-pharmacological
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological/ communication strategies
- S. Plants and mushrooms
- 1. Clinical use
 - 2. Common causative agents
 - 3. Common street names
 - 4. Pharmacodynamics
 - 5. Pharmacokinetics
 - 6. Assessment findings
 - 7. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological
 - d. Non-pharmacological
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological/ communication strategies
- T. Food poisoning
- 1. Common causative agents
 - 2. Pharmacodynamics
 - a. Type I reaction
 - b. Gastrointestinal allergy
 - c. Bacterial toxins
 - (1) Exotoxins
 - (2) Enterotoxins
 - d. Neurotoxins
 - (1) Paralytic shellfish poisoning
 - 3. Pharmacokinetics
 - 4. Assessment findings
 - 5. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological
 - d. Non-pharmacological
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological/ communication strategies
- U. Bites and stings

1. Common offending organisms - hymenoptera, spider bites, other arthropods, snake bites, marine animal
2. Pharmacodynamics
3. Pharmacokinetics
4. Assessment findings
5. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological
 - d. Non-pharmacological
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological/ communication strategies

UNIT TERMINAL OBJECTIVE

5-9 At the completion of this unit, the paramedic student will be able to integrate the pathophysiological principles of the hematopoietic system to formulate a field impression and implement a treatment plan.

COGNITIVE OBJECTIVES

At the completion to this unit, the paramedic student will be able to:

- 5-9.1 Identify the anatomy of the hematopoietic system. (C-1)
- 5-9.2 Describe volume and volume-control related to the hematopoietic system. (C-1)
- 5-9.3 Identify and describe the blood-forming organs. (C-1)
- 5-9.4 Describe normal red blood cell (RBC) production, function and destruction. (C-1)
- 5-9.5 Explain the significance of the hematocrit with respect to red cell size and number. (C-1)
- 5-9.6 Explain the correlation of the RBC count, hematocrit and hemoglobin values. (C-1)
- 5-9.7 Define anemia. (C-1)
- 5-9.8 Describe normal white blood cell (WBC) production, function and destruction. (C-1)
- 5-9.9 Identify the characteristics of the inflammatory process. (C-1)
- 5-9.10 Identify the difference between cellular and humoral immunity. (C-1)
- 5-9.11 Identify alterations in immunologic response. (C-1)
- 5-9.12 Describe the number, normal function, types and life span of leukocytes. (C-1)
- 5-9.13 List the leukocyte disorders. (C-1)
- 5-9.14 Describe platelets with respect to normal function, life span and numbers. (C-1)
- 5-9.15 Describe the components of the hemostatic mechanism. (C-1)
- 5-9.16 Describe the function of coagulation factors, platelets and blood vessels necessary for normal coagulation. (C-1)
- 5-9.17 Describe the intrinsic and extrinsic clotting systems with respect to identification of factor deficiencies in each stage. (C-3)
- 5-9.18 Identify blood groups. (C-1)
- 5-9.19 Describe how acquired factor deficiencies may occur. (C-3)
- 5-9.20 Define fibrinolysis. (C-1)
- 5-9.21 Identify the components of physical assessment as they relate to the hematologic system. (C-1)
- 5-9.22 Describe the pathology and clinical manifestations and prognosis associated with: (C-3)
 - 1. Anemia
 - 2. Leukemia
 - 3. Lymphomas
 - 4. Polycythemia
 - 5. Disseminated intravascular coagulopathy
 - 6. Hemophilia
 - 7. Sickle cell disease
 - 8. Multiple myeloma
- 5-9.23 Integrate pathophysiological principles into the assessment of a patient with hematologic disease. (C-3)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 5-9.24 Value the sense of urgency for initial assessment and

interventions for patients with hematologic crises.

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

5-9.25 Perform an assessment of the patient with hematologic disorder.
(P-1)

DECLARATIVE

- I. Introduction
 - A. Epidemiology
 - 1. Incidence
 - a. Prevalence of hematologic disorders
 - b. Supportive statistics
 - c. Prevalence of warning signs and symptoms
 - 2. Morbidity/ mortality
 - a. Reduced with early recognition
 - b. Reduced with early access to EMS system
 - 3. Risk factors
 - 4. Prevention strategies
 - B. Anatomy and physiology review
 - 1. Blood
 - a. Components
 - b. Color, specific gravity, pH
 - c. Function
 - d. Volume and volume control
 - 2. Plasma
 - a. Components
 - b. Color
 - c. Function
 - d. Volume control
 - 3. Blood-forming organs
 - a. Bone marrow
 - b. Liver
 - c. Spleen
 - 4. Normal red cell production, function and destruction
 - a. Erythrocytes
 - b. Hemoglobin
 - c. Production stimulus
 - d. Destruction
 - 5. Normal white cell production and function
 - 6. The inflammatory process
 - 7. Immunity
 - a. Cellular immunity
 - b. Humoral immunity
 - c. Autoimmune diseases
 - d. Alterations in immunologic response
 - 8. Blood groups
 - 9. Hemostasis
 - a. Vascular components

- b. Coagulation mechanisms
 - (1) Intrinsic and extrinsic pathways
- II. General pathophysiology, assessment and management
- A. Pathophysiology
 - B. Assessment of the hematopoietic system
 - 1. General signs and symptoms
 - 2. Specific signs and symptoms
 - a. Vital signs
 - b. Laboratory values
 - C. Focused history
 - 1. SAMPLE
 - 2. Chief complaint
 - 3. Pertinent past history
 - 4. Related signs and symptoms
 - D. Detailed physical examination
 - 1. Levels of consciousness
 - a. Vertigo
 - b. Fatigue
 - c. Syncopal episode(s)
 - 2. Skin
 - a. Prolonged bleeding
 - b. Bruising
 - c. Itching
 - d. Pallor
 - e. Jaundice
 - 3. Visual disturbances
 - 4. Gastrointestinal
 - a. Epistaxis
 - b. Bleeding gums
 - c. Infections of the gums
 - d. Ulcerations
 - e. Melena
 - f. Liver disease
 - g. Pain
 - 5. Skeletal
 - a. Arthralgia
 - b. Nuchal rigidity
 - 6. Cardiorespiratory
 - a. Dyspnea
 - b. Chest pain
 - c. Hemoptysis
 - d. Tachycardia

7. Genitourinary
 - a. Hematuria
 - b. Menorrhagia
 - c. Infections
- E. Management
 1. Airway and ventilation
 - a. Oxygen
 2. Circulation
 - a. Fluid volume replacement
 - b. Manage dysrhythmias
 3. Pharmacological
 - a. Oxygen
 - b. Platelet aggregate inhibitor
 - c. Alkalinizing agents
 - d. Narcotic/ analgesic
 - e. Diuretic
 4. Non-pharmacological
 5. Transport considerations
 - a. Appropriate mode
 - b. Appropriate facility
 6. Psychological/ communication strategies

III. Specific illnesses/ injuries

- A. Anemia
 1. Epidemiology
 - a. Reduction below normal levels of hemoglobin or erythrocytes and is a symptom of an underlying disease process
 2. Pathophysiology
 - a. Morbidity/ mortality
 - (1) Can be self-limiting disease
 - (2) Must be confirmed by laboratory diagnosis
 - b. Precipitating causes
 - (1) Blood loss (acute or chronic)
 - (2) Decreased production of erythrocytes
 - (3) Increased destruction of erythrocytes
 - c. Hemolytic
 - (1) Hereditary
 - (a) Sickle cell
 - (b) Thalassemia
 - (c) Glucose-6-phosphate dehydrogenase deficiency
 - (2) Acquired

- (a) Immune
 - (b) Drug
- 3. Initial assessment findings
 - a. Airway/ breathing
 - (1) Labored breathing may or may not be present
 - b. Circulation
 - (1) Peripheral pulses
 - (a) Quality
 - (b) Rhythm
 - (2) Changes in skin
 - (a) Color
 - (b) Temperature
 - (c) Moisture
- 4. Focused history
 - a. Complaints
 - (1) Complaints secondary to anemia
 - (a) Fatigue
 - (b) Lethargy
 - (c) Hypoxia
 - (d) Dyspnea
 - (2) Complaints secondary to leukopenia
 - (a) Infections
 - (b) Fevers
 - (3) Complaints secondary to thrombocytopenia
 - (a) Cutaneous bleeding
 - (b) Bleeding from mucous membranes
- 5. Detailed physical exam
 - a. Airway
 - b. Breathing
 - c. Circulation
 - (1) Alterations in heart rate and rhythm may occur
 - (2) Peripheral pulses
 - (3) Blood pressure
 - (4) ECG findings
 - (a) Arrhythmias and ectopy
- 6. Management
 - a. Airway and ventilation
 - b. Circulatory support
 - c. Pharmacological
 - (1) Analgesics
 - (2) Fluid volume replacement
 - (3) Control of bleeding

- d. Non-pharmacological
 - (1) Position of comfort
 - e. Transport considerations
 - (1) Appropriate mode
 - (a) Indications for rapid transport
 - i) Significant changes in LOC
 - ii) Hypotension/ hypoperfusion
 - (2) Appropriate facility
 - f. Support and communication strategies
 - (1) Explanation for patient, family, significant others
 - (2) Communications and transfer of data to the physician
- B. Leukemia
- 1. Epidemiology
 - 2. Pathophysiology
 - a. Morbidity/ mortality
 - (1) Blood loss
 - (2) Death
 - b. Neoplastic disease
 - (1) Acute versus chronic
 - c. Precipitating causes
 - (1) Radiation exposure
 - (2) Viral infections
 - (3) Chemicals
 - (4) Immune defects
 - (5) Chromosomal changes
 - 3. Initial assessment findings
 - a. Levels of consciousness
 - b. Airway/ breathing
 - (1) Labored breathing may or may not be present
 - c. Circulation
 - (1) Peripheral pulses
 - (a) Quality
 - (b) Tachycardia
 - (2) Changes in skin
 - (a) Color
 - (b) Temperature
 - (c) Moisture
 - 4. Focused history
 - a. Complaints
 - (1) Fatigue, bone pain, diaphoresis
 - (2) Elevated body temperature

- (3) Sternal tenderness
 - (4) Heat intolerance
 - (5) Abdominal fullness
 - (6) Bleeding
 - b. Contributing history
 - (1) Recurrent bleeding
 - (2) Increasing frequency and/ or duration
 - 5. Detailed physical exam
 - a. Airway
 - b. Breath sounds
 - c. Circulation
 - (1) Skin
 - (2) Blood pressure may low
 - (3) ECG findings
 - (a) Tachycardia
 - (b) Ectopic
 - 6. Management
 - a. Position of comfort
 - b. Pharmacological
 - (1) Analgesia
 - (2) Increase or decrease heart rate
 - (3) Fluid volume replacement
 - c. Electrical
 - (1) Constant ECG monitoring
 - d. Transport
 - (1) Criteria for rapid transport
 - (a) No relief with medications
 - i) Hypotension/ hypoperfusion
 - ii) Significant changes in ECG
 - (2) Indications for no transport
 - (a) Refusal
 - (b) Referral
 - e. Support and communication strategies
 - (a) Explanation for patient, family, significant others
 - (b) Communications and transfer of data to the physician
- C. Lymphomas
 - 1. Epidemiology
 - a. Hyperplasia of the lymphoreticular system
 - 2. Pathophysiology
 - a. Morbidity/ mortality
 - (1) Blood loss

- (2) Pain
- (3) Death
- 3. Initial assessment findings
 - a. Levels of consciousness
 - b. Airway/ breathing
 - c. Circulation
- 4. Focused history
 - a. Complaints
 - (1) Fever
 - (2) Night sweats
 - (3) Generalized pruritus
 - (4) Anorexia
 - (5) Weight loss
 - (6) Fatigue, bone pain, diaphoresis
- 5. Detailed physical exam
 - a. Airway
 - b. Breath sounds
 - (1) May be clear to auscultation
 - (2) Congestion in bases may be present
 - c. Circulation
 - (1) Skin
 - (a) Pallor during the episode
 - (b) Temperature may vary
 - (c) Diaphoresis is usually present
 - (2) Blood pressure may low
 - (3) ECG findings
 - (a) Tachycardia
 - (b) Ectopic
- 6. Management
 - a. Position of comfort
 - b. Pharmacological
 - (1) Analgesia
 - (2) Increase or decrease heart rate
 - (3) Fluid volume replacement
 - c. Electrical
 - (1) Constant ECG monitoring
 - d. Transport
 - (1) Criteria for rapid transport
 - (a) No relief with medications
 - i) Hypotension/ hypoperfusion
 - ii) Significant changes in ECG
 - (2) Indications for no transport
 - (a) Refusal

- (b) Referral
 - e. Support and communication strategies
 - (a) Explanation for patient, family, significant others
 - (b) Communications and transfer of data to the physician
- D. Polycythemia
- 1. Epidemiology
 - a. Overabundant production of red blood cells, white blood cells and platelets
 - b. Rare disorder seen in persons over 50 years of age
 - 2. Pathophysiology
 - a. Morbidity/ mortality
 - (1) Thrombosis
 - (2) Death from thrombosis
 - 3. Initial assessment findings
 - a. Levels of consciousness
 - b. Airway/ breathing
 - (1) Labored breathing is common
 - c. Circulation
 - (1) Peripheral pulses
 - (a) Quality
 - (b) Tachycardia
 - (2) Changes in skin
 - (a) Color - red-purple complexion
 - (b) Red hands and feet
 - (c) Pruritic
 - 4. Focused history
 - a. Complaints
 - (1) Dyspnea
 - (2) Generalized pruritus
 - 5. Detailed physical exam
 - a. Airway
 - b. Breath sounds
 - c. Circulation
 - (1) Skin
 - (a) As above
 - (b) Temperature may vary
 - (2) ECG findings
 - (a) Tachycardia
 - 6. Management
 - a. Position of comfort
 - b. Pharmacological

- (1) Analgesia
 - (2) Increase or decrease heart rate
 - c. Non-pharmacological
 - (1) Phlebotomy
 - d. Transport for
 - (1) Indications for no transport
 - (a) Refusal
 - (b) Referral
 - e. Support and communication strategies
 - (a) Explanation for patient, family, significant others
 - (b) Communications and transfer of data to the physician
- E. Disseminated intravascular coagulopathy
- 1. Epidemiology
 - a. A complication of severe injury, trauma or disease; acute bleeding disorder resulting from defibrination
 - b. First phase characterized by free thrombin in the blood, fibrin deposits and aggregation of platelets
 - c. Phase two is hemorrhage caused by depletion of clotting factors
 - 2. Pathophysiology
 - a. Morbidity/ mortality
 - (1) Uncontrolled bleeding
 - (2) Shock
 - (3) Death
 - 3. Initial assessment findings
 - a. Level of consciousness
 - b. Airway/ breathing
 - (1) Labored breathing is common
 - c. Circulation
 - (1) Peripheral pulses
 - (a) Weak and thready
 - (2) Tachycardia
 - d. Changes in skin
 - (1) Pallor
 - (2) Purpura over chest and abdomen
 - (3) Cool, clammy
 - (4) Bleeding
 - (5) Hypotension/ hypoperfusion
 - 4. Focused history

- a. Complaints
 - (1) Dyspnea
 - (2) Bleeding
- 5. Detailed physical exam
 - a. Airway
 - b. Breath sounds
 - (1) May be clear to auscultation
 - (2) Congestion in bases may be present
 - c. Circulation
 - (1) Skin
 - (a) As above
 - (b) Temperature may vary
 - (2) ECG findings
 - (a) Tachycardia
 - (b) Ectopic
- 6. Management
 - a. Position of comfort
 - b. Pharmacological
 - (1) Analgesia
 - (2) Increase or decrease heart rate
 - (3) Fluid volume replacement
 - c. Support and communication strategies
 - (a) Explanation for patient, family, significant others
 - (b) Communications and transfer of data to the physician
- F. Hemophilia
 - 1. Epidemiology
 - a. A hereditary disorder transmitted by the female to the male
 - b. In true hemophilia A factor VIII is nearly absent
 - c. In hemophilia B there is a deficiency in factor IX
 - d. The ability to produce thrombin is severely impaired by deficiency or absence of these factors
 - 2. Pathophysiology
 - a. Morbidity/ mortality
 - (1) Uncontrolled bleeding
 - (2) Shock
 - (3) Death
 - 3. Initial assessment findings
 - a. Levels of consciousness
 - b. Airway/ breathing
 - (1) Labored breathing is common

- c. Circulation
 - (1) Peripheral pulses
 - (a) Weak and thready
 - (2) Tachycardia
 - d. Changes in skin
 - (1) Pallor
 - (2) Cool, clammy
 - (3) Bleeding
 - (a) From body orifices
 - (b) Knees
 - (c) Wrists
 - (d) Elbows
 - (e) Hematuria
 - (f) Epistaxis
 - (g) Hemoptysis
 - (h) Hematemesis
 - (i) Melena
 - (4) Hypotension/ hypoperfusion
4. Focused history
- a. Complaints
 - (1) Dyspnea
 - (2) Bleeding
5. Detailed physical exam
- a. Airway
 - b. Breath sounds
 - (1) May be clear to auscultation
 - (2) Congestion in bases may be present
 - c. Circulation
 - (1) ECG findings
 - (2) Tachycardia
 - (3) Ectopy
 - d. Skin
 - (1) As above
 - (2) Temperature may vary
6. Management
- a. Position of comfort
 - b. Pharmacological
 - (1) Analgesia
 - (2) Fluid volume replacement
 - c. Transport for reperfusion
 - (1) Indications for no transport
 - (a) Refusal
 - d. Support and communication strategies

- (a) Explanation for patient, family, significant others
 - (b) Communications and transfer of data to the physician
- G. Sickle cell disease
- 1. Epidemiology
 - a. Highest incidence in blacks, Puerto Ricans and persons of Spanish, French, Italian, Greek and Turkish origin
 - 2. Pathophysiology
 - a. A congenital hemolytic anemia
 - b. A chemical defect within the hemoglobin of red blood cells
 - c. Morbidity/ mortality
 - (1) Sepsis
 - (2) Shock
 - (3) Death
 - 3. Initial assessment findings
 - a. Levels of consciousness
 - b. Airway/ breathing
 - c. Circulation
 - (1) Peripheral pulses
 - (2) Changes in skin
 - (a) Pallor
 - (b) Cool; clammy
 - (3) Hypotension/ hypoperfusion
 - 4. Focused history
 - a. Chief complaint
 - (1) Sudden onset develops into a condition called "crisis"
 - (a) Thrombotic crisis (painful)
 - (b) Aplastic
 - (c) Hemolytic
 - 5. Detailed physical exam
 - a. Airway
 - b. Breath sounds
 - c. Circulation
 - (1) Skin
 - (a) As above
 - (b) Temperature may vary
 - (2) ECG findings
 - (a) Tachycardia
 - (b) Ectopy

- d. Increased weakness
- e. Aching
- f. Chest pain
- g. Sudden, severe abdominal pain
- h. Bony deformities
- i. Icteric sclera
- j. Abdominal pain
- k. Fever
- l. Arthralgia
- 6. Management
 - a. Position of comfort
 - b. Pharmacological
 - (1) Analgesia
 - (2) Fluid volume replacement
 - c. Transport for reperfusion
 - (1) Indications for no transport
 - (a) Refusal
 - d. Support and communication strategies
 - (a) Explanation for patient, family, significant others
 - (b) Communications and transfer of data to the physician
- H. Multiple myeloma
 - 1. Epidemiology
 - a. A plasma cell dyscrasia characterized by neoplastic cells that infiltrate bone marrow
 - b. Eventually plasma cells become malignant leading to tumor formation within the bone
 - 2. Pathophysiology
 - a. Morbidity/ mortality
 - (1) Fractures
 - (2) Bleeding
 - (3) Shock
 - (4) Death
 - 3. Initial assessment findings
 - a. Levels of consciousness
 - b. Airway/ breathing
 - (1) Labored breathing is common
 - c. Circulation
 - (1) Peripheral pulses
 - (a) Weak and thready
 - (b) Tachycardia
 - (2) Changes in skin

- (a) Pallor
- (b) Cool, clammy
- (3) Bleeding
- (4) Hypotension/ hypoperfusion
- 4. Focused history
 - a. Complaints
 - (1) Weakness
 - (2) Skeletal pain
 - (3) Hemorrhage
 - (4) Hematuria
 - (5) Lethargy
 - (6) Weight loss
 - (7) Frequent fractures
 - 5. Detailed physical exam
 - a. Airway
 - b. Breath sounds
 - c. Circulation
 - (1) Skin
 - (a) As above
 - (b) Temperature may vary
 - (2) ECG findings
 - (a) Tachycardia
 - (b) Ectopy
 - d. Increased weakness
 - e. Aching
 - f. Chest pain
 - g. Sudden severe abdominal pain
 - h. Bony deformities
 - i. Arthralgia
 - 6. Management
 - a. Position of comfort
 - b. Pharmacological
 - (1) Analgesia
 - (2) Fluid volume replacement
 - c. Transport for reperfusion
 - (1) Indications for no transport
 - (a) Refusal
 - d. Support and communication strategies
 - (a) Explanation for patient, family, significant others
 - (b) Communications and transfer of data to the physician

IV. Integration

- A. Apply pathophysiological principles and the assessment findings to a patient with a hematologic disorder
- B. Formulation of field impression - decisions based on
 - 1. Initial assessment
 - 2. Focused history
 - 3. Detailed physical examination
- C. Develop and execute a patient management plan based on field impression
 - 1. Initial management
 - a. Airway support
 - b. Ventilation support
 - c. Circulation support
 - d. Non-pharmacological
 - e. Pharmacological
 - 2. On-going assessment
 - 3. Transport criteria
 - a. Appropriate mode
 - b. Appropriate facility
 - 4. Non-transport criteria
 - 5. Advocacy
 - 6. Communications
 - 7. Prevention
 - 8. Documentation
 - 9. Quality assurance

UNIT TERMINAL OBJECTIVE

- 5-10 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement the treatment plan for the patient with an environmentally induced or exacerbated medical or traumatic condition.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 5-10.1 Define "environmental emergency." (C-1)
- 5-10.2 Describe the incidence, morbidity and mortality associated with environmental emergencies. (C-1)
- 5-10.3 Identify risk factors most predisposing to environmental emergencies. (C-1)
- 5-10.4 Identify environmental factors that may cause illness or exacerbate a preexisting illness. (C-1)
- 5-10.5 Identify environmental factors that may complicate treatment or transport decisions. (C-1)
- 5-10.6 List the principal types of environmental illnesses. (C-1)
- 5-10.7 Define "homeostasis" and relate the concept to environmental influences. (C-1)
- 5-10.8 Identify normal, critically high and critically low body temperatures. (C-1)
- 5-10.9 Describe several methods of temperature monitoring. (C-1)
- 5-10.10 Identify the components of the body's thermoregulatory mechanism. (C-1)
- 5-10.11 Describe the general process of thermal regulation, including substances used and wastes generated. (C-1)
- 5-10.12 Describe the body's compensatory process for over heating. (C-1)
- 5-10.13 Describe the body's compensatory process for excess heat loss. (C-1)
- 5-10.14 List the common forms of heat and cold disorders. (C-1)
- 5-10.15 List the common predisposing factors associated with heat and cold disorders. (C-1)
- 5-10.16 List the common preventative measures associated with heat and cold disorders. (C-1)
- 5-10.17 Integrate the pathophysiological principles and complicating factors common to environmental emergencies and discuss differentiating features between emergent and urgent presentations. (C-3)
- 5-10.18 Define heat illness. (C-1)
- 5-10.19 Describe the pathophysiology of heat illness. (C-1)
- 5-10.20 Identify signs and symptoms of heat illness. (C-1)
- 5-10.21 List the predisposing factors for heat illness. (C-1)
- 5-10.22 List measures to prevent heat illness. (C-1)
- 5-10.23 Discuss the symptomatic variations presented in progressive heat disorders. (C-1)
- 5-10.24 Relate symptomatic findings to the commonly used terms: heat cramps, heat exhaustion, and heatstroke. (C-3)
- 5-10.25 Correlate the abnormal findings in assessment with their clinical significance in the patient with heat illness. (C-3)
- 5-10.26 Describe the contribution of dehydration to the development of heat disorders. (C-1)
- 5-10.27 Describe the differences between classical and exertional heatstroke. (C-1)
- 5-10.28 Define fever and discuss its pathophysiologic mechanism. (C-1)
- 5-10.29 Identify the fundamental thermoregulatory difference between fever and heatstroke. (C-1)
- 5-10.30 Discuss how one may differentiate between fever and heatstroke. (C-1)
- 5-10.31 Discuss the role of fluid therapy in the treatment of heat disorders. (C-1)
- 5-10.32 Differentiate among the various treatments and interventions in the management of heat disorders. (C-3)
- 5-10.33 Integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient who has dehydration, heat exhaustion, or heatstroke. (C-3)
- 5-10.34 Define hypothermia. (C-1)

- 5-10.35 Describe the pathophysiology of hypothermia. (C-1)
- 5-10.36 List predisposing factors for hypothermia. (C-1)
- 5-10.37 List measures to prevent hypothermia. (C-1)
- 5-10.38 Identify differences between mild and severe hypothermia. (C-1)
- 5-10.39 Describe differences between chronic and acute hypothermia. (C-1)
- 5-10.40 List signs and symptoms of hypothermia. (C-1)
- 5-10.41 Correlate abnormal findings in assessment with their clinical significance in the patient with hypothermia. (C-3)
- 5-10.42 Discuss the impact of severe hypothermia on standard BCLS and ACLS algorithms and transport considerations. (C-1)
- 5-10.43 Integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient who has either mild or severe hypothermia. (C-3)
- 5-10.44 Define frostbite. (C-1)
- 5-10.45 Define superficial frostbite (frostnip). (C-1)
- 5-10.46 Differentiate between superficial frostbite and deep frostbite. (C-3)
- 5-10.47 List predisposing factors for frostbite. (C-1)
- 5-10.48 List measures to prevent frostbite. (C-1)
- 5-10.49 Correlate abnormal findings in assessment with their clinical significance in the patient with frostbite. (C-3)
- 5-10.50 Differentiate among the various treatments and interventions in the management of frostbite. (C-3)
- 5-10.51 Integrate pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the patient with superficial or deep frostbite. (C-3)
- 5-10.52 Define near-drowning. (C-1)
- 5-10.53 Describe the pathophysiology of near-drowning. (C-1)
- 5-10.54 List signs and symptoms of near-drowning. (C-1)
- 5-10.55 Describe the lack of significance of fresh versus saltwater immersion, as it relates to near-drowning. (C-3)
- 5-10.56 Discuss the incidence of "wet" versus "dry" drownings and the differences in their management. (C-3)
- 5-10.57 Discuss the complications and protective role of hypothermia in the context of near-drowning. (C-1)
- 5-10.58 Correlate the abnormal findings in assessment with the clinical significance in the patient with near-drowning. (C-3)
- 5-10.59 Differentiate among the various treatments and interventions in the management of near-drowning. (C-3)
- 5-10.60 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the near-drowning patient. (C-3)
- 5-10.61 Define self contained underwater breathing apparatus (SCUBA). (C-1)
- 5-10.62 Describe the laws of gasses and relate them to diving emergencies. (C-1)
- 5-10.63 Describe the pathophysiology of diving emergencies. (C-1)
- 5-10.64 Define decompression illness (DCI). (C-1)
- 5-10.65 Identify the various forms of DCI. (C-1)
- 5-10.66 Identify the various conditions that may result from pulmonary over-pressure accidents. (C-1)
- 5-10.67 Differentiate between the various diving emergencies. (C-3)
- 5-10.68 List signs and symptoms of diving emergencies. (C-1)
- 5-10.69 Correlate abnormal findings in assessment with their clinical significance in the patient with a diving related illness. (C-3)
- 5-10.70 Describe the function of the Divers Alert Network (DAN) and how its members may aid in the management of diving related illnesses. (C-1)
- 5-10.71 Differentiate among the various treatments and interventions for the management of diving accidents. (C-3)
- 5-10.72 Describe the specific function and benefit of hyperbaric oxygen therapy for the management of diving

- accidents. (C-1)
- 5-10.73 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a management plan for the patient who has had a diving accident. (C-3)
- 5-10.74 Define altitude illness. (C-1)
- 5-10.75 Describe the application of gas laws to altitude illness. (C-2)
- 5-10.76 Describe the etiology and epidemiology of altitude illness. (C-1)
- 5-10.77 List predisposing factors for altitude illness. (C-1)
- 5-10.78 List measures to prevent altitude illness. (C-1)
- 5-10.79 Define acute mountain sickness (AMS). (C-1)
- 5-10.80 Define high altitude pulmonary edema (HAPE). (C-1)
- 5-10.81 Define high altitude cerebral edema (HACE). (C-1)
- 5-10.82 Discuss the symptomatic variations presented in progressive altitude illnesses. (C-1)
- 5-10.83 List signs and symptoms of altitude illnesses. (C-1)
- 5-10.84 Correlate abnormal findings in assessment with their clinical significance in the patient with altitude illness. (C-3)
- 5-10.85 Discuss the pharmacology appropriate for the treatment of altitude illnesses. (C-1)
- 5-10.86 Differentiate among the various treatments and interventions for the management of altitude illness. (C-3)
- 5-10.87 Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the patient who has altitude illness. (C-1)
- 5-10.88 Integrate the pathophysiological principles of the patient affected by an environmental emergency. (C-3)
- 5-10.89 Differentiate between environmental emergencies based on assessment findings. (C-3)
- 5-10.90 Correlate abnormal findings in the assessment with their clinical significance in the patient affected by an environmental emergency. (C-3)
- 5-10.91 Develop a patient management plan based on the field impression of the patient affected by an environmental emergency. (C-3)

AFFECTIVE OBJECTIVES

None identified for this unit.

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

- I. Environmental emergency
 - A. A medical condition caused or exacerbated by the weather, terrain, atmospheric pressure or other local factors
 1. Instances of environmental emergencies
 2. Environmental impact on morbidity and mortality
 - (1) Environmental stressors that induce or exacerbate other medical or traumatic conditions
 3. Role of special rescue resources
 - a. Mountain
 - b. Cave
 - c. Swift water
 - d. Dive
 - B. Risk factors
 1. Age
 2. General health
 3. Fatigue
 4. Predisposing medical conditions
 5. Medications
 - a. Prescription
 - b. Over the counter (OTC)
 - C. Environmental factors
 1. Climate
 - a. Localized prevailing weather norms
 - b. Breadth of deviation from mean
 - c. Effect of deviation from mean
 2. Season
 - a. Annual variation of climate
 - b. Localized characteristics of seasonal variation to climate
 3. Weather
 - a. Wind
 - b. Rain
 - c. Snow
 - d. Humidity
 - e. Temperature
 - f. Radiation
 - g. Heat
 - h. Cold
 4. Atmospheric pressure
 - a. At altitude
 - b. Underwater
 5. Terrain
 - a. Injury
 - b. Complications to rescue
 - D. Types of environmental illnesses

1. Heat illnesses
 2. Cold illnesses
 3. Pressurization illnesses
 - a. Over-pressurization illnesses
 - b. Under-pressurization illnesses
 4. Localized injuries
 - a. Frostbite
 - b. Radiation burns, e.g., sunburn
- II. General pathophysiology, assessment and management
- A. Homeostasis
1. "Normal" body temperatures
 - a. Core
 - b. Periphery
 2. Evaluation of body temperatures
 - a. Oral
 - b. Axillary
 - c. Tympanic
 - d. Rectal
 - e. Tactile
- B. Thermoregulation
1. Regulatory center
 2. Peripheral thermoreceptors
 3. Central thermoreceptors
 4. Metabolic rate
 - a. Basal
 - b. Exertional
 - c. Caloric requirements
 5. Heat balancing
 - a. Core versus periphery
 - b. Deep versus superficial veins
 - (1) Counter-current heat exchange
 - (2) Effects of vascular constriction and dilation
 - c. Effect of common drugs on thermoregulation
 - (1) Alcohol
 - (2) Nicotine
 - (3) Aspirin and acetaminophen
- C. Thermogenesis
1. Muscular
 - a. Baseline muscular activity
 - b. Exertion
 - c. Shivering
 2. Metabolic
 - a. Processing of food and nutrients
 - (1) Carbohydrates - sugars and starches
 - (2) Fats
 - (3) Proteins

- b. Glycogen
 - 3. Endocrine
 - a. Role of hormones in setting basal metabolic rate
 - D. Thermolysis
 - 1. Conduction
 - 2. Convection
 - 3. Radiation
 - 4. Evaporation
 - 5. Respiration
- III. Specific pathology, assessment, and management - heat disorders
 - A. Heat illness
 - 1. Definition
 - a. Increased core body temperature (CBT) due to inadequate thermolysis
 - 2. General signs and symptoms
 - a. Signs of thermolysis
 - (1) Diaphoresis
 - (2) Posture
 - (3) Increased skin temperature
 - (4) Flushing
 - b. Signs of thermolytic inadequacy
 - (1) Altered mentation
 - (2) Altered level of consciousness
 - B. Physiology of heat gain and loss
 - 1. Heat gain
 - a. Metabolic heat production
 - (1) Thermogenesis through increased metabolic activity
 - b. Environmental heat gain
 - (1) Heat transfer from the environment
 - 2. Heat loss
 - a. Metabolic heat loss
 - (1) Increased thermolysis from vasodilation
 - b. Environmental heat loss
 - (1) Increased thermolysis from heat transfer to the environment
 - C. Predisposing factors
 - 1. Age
 - a. Pediatric age groups
 - b. Geriatric age groups
 - 2. General health and medications
 - a. Diabetes
 - (1) Autonomic neuropathy interferes with vasodilation and perspiration
 - (2) Autonomic neuropathy may interfere with thermoregulatory input
 - b. Antihypertensive medications
 - (1) Diuretics
 - (a) Predispose to dehydration
 - (2) Beta blockers
 - (a) Interfere with vasodilation

- (b) Reduce capacity to increase heart rate in response to volume loss
 - (c) May interfere with thermoregulatory input
 - c. Psychotropic medications and antihistamines
 - (1) All interfere with central thermoregulation
 - (2) Antipsychotics
 - (3) Antihistamines
 - (4) Phenothiazines
 - d. Acclimatization
 - 3. Length of exposure
 - 4. Intensity of exposure
 - 5. Environmental
 - a. Humidity
 - b. Wind
- D. Preventative measures
 - 1. Maintain adequate fluid intake
 - a. Thirst is an inadequate indicator of dehydration
 - 2. Acclimatize
 - a. Acclimatization results in more perspiration with lower salt concentration
 - b. Increases fluid volume in body
 - 3. Limit exposure
- E. Heat disorders
 - 1. Heat cramps
 - a. Muscle cramps due to dehydration and overexertion
 - b. Not specifically related to heat illness
 - 2. Heat exhaustion (mild heat illness)
 - a. Ill-defined term referring to milder forms of heat illness
 - b. Increased CBT with some neurologic deficit
 - c. Signs of active thermolysis usually present
 - d. Symptoms may be due solely to simple dehydration, combined with overexertion
 - (1) Result is orthostatic hypotension
 - (2) Symptoms resolve with rest and supine positioning
 - (a) Fluids and elevation of knees beneficial
 - e. Symptoms that do not resolve with rest and supine positioning may be due to increased CBT, are predictive of impending heatstroke and must be treated aggressively
 - 3. Heatstroke
 - a. Increased CBT with significant neurologic deficit
 - b. Organ damage
 - (1) Brain
 - (2) Liver
 - (3) Kidneys
 - c. Signs of active thermolysis may be present or absent
 - (1) Classic
 - (a) Commonly presents in those with chronic illnesses
 - (b) Increased CBT due to deficient thermoregulatory function
 - (c) Predisposing conditions include age, diabetes and other medical

- (d) conditions
 - (d) "Hot, red, dry" common
 - (2) Exertional
 - (a) Commonly presents in those who are in good general health
 - (c) Excessive ambient temperature
 - (d) Excessive exertion
 - (e) Prolonged exposure
 - (f) Poor acclimatization
 - (g) "Moist, pale" common
 - F. Role of dehydration in heat disorders
 - 1. Common concomitant syndrome
 - 2. Inhibits vasodilatation and therefore thermolysis
 - 3. Leads to orthostatic hypotension and subsequent symptoms
 - a. Nausea, vomiting, abdominal distress
 - b. Vision disturbances
 - c. Decreased urine output
 - d. Poor skin turgor
 - e. Signs of hypovolemic shock
 - f. May occur with signs or symptoms of heatstroke
 - G. Fever
 - 1. Pathophysiology
 - 2. Differentiation from heatstroke
 - a. History of infection or illness
 - b. Neurological symptoms may present with either
 - c. If unsure, treat for heatstroke
 - H. Treatment
 - 1. Remove from environment
 - 2. Active cooling
 - a. Misting and fanning
 - b. Moist wraps
 - c. Risks of over-cooling
 - (1) Reflex hypothermia
 - d. Use of tepid water for cooling
 - (1) Ice packs and cold water immersion may produce reflex vasoconstriction and shivering due to effect on peripheral thermoreceptors
 - I. Fluid therapy
 - 1. Oral
 - a. Some salt additive is beneficial
 - b. Limited need for other electrolytes in oral rehydration
 - c. Salt tablets
 - (1) May cause GI irritation and ulceration
 - (2) May cause hypernatremia
 - (3) Should be avoided
 - 2. Intravenous
 - a. Normal saline solution preferred
- IV. Specific pathology, assessment, and management - cold disorders
-

- A. Hypothermia
 - 1. Definition
 - a. Decreased CBT due to
 - (1) Inadequate thermogenesis
 - (2) Excess cold stress
 - (3) A combination of both
- B. Mechanisms of heat loss
 - 1. Physiological
 - 2. Environmental
- C. Predisposing factors
 - 1. Age
 - a. Pediatric age group
 - b. Geriatric age group
 - 2. General health and medications
 - a. Hypothyroidism
 - b. Malnutrition
 - c. Hypoglycemia
 - d. Medications that interfere with thermogenesis
 - (1) Narcotics, phenothiazine, alcohol, and barbiturates
 - (2) Antiseizure medications
 - (3) Antihistamines and other allergy medications
 - (4) Antipsychotics, sedatives, and antidepressants
 - (5) Various pain medications, including aspirin, acetaminophen, and NSAIDs
 - 3. Fatigue and exhaustion
 - 4. Length of exposure
 - 5. Intensity of exposure
 - 6. Environmental
 - a. Humidity
 - b. Wind
 - c. Temperature
- D. Preventative measures
 - 1. Dress
 - 2. Rest
 - 3. Food
 - 4. Limit exposure
- E. Categories of hypothermia
 - 1. Severity
 - a. Mild
 - (1) Presence of signs and symptoms with a CBT that is greater than 90° F
 - b. Severe
 - (1) Presence of signs and symptoms with a CBT that is less than 90° F
 - c. Compensated
 - (1) Presence of signs and symptoms with a normal CBT
 - (2) CBT being maintained by thermogenesis
 - (3) As energy stores (liver and muscle glycogen) are exhausted, CBT will drop
 - 2. Onset

- a. Acute (immersion)
 - b. Subacute (exposure)
 - c. Chronic (urban)
 3. Primary vs. secondary hypothermia
 - a. Cold exposure may be primary cause of hypothermia
 - b. Hypothermia may be secondary to other problems
- F. Principal signs and symptoms
 1. No reliable correlation between signs or symptoms and specific CBT
 2. Signs of thermogenesis efforts
 3. Diminished coordination and psychomotor function
 4. Altered mentation
 5. Altered level of consciousness
 6. Cardiac irritability
 - a. Presence of "J" wave on ECG; not useful, diagnostically
- G. Specific treatment
 1. Stop heat loss
 - a. Remove from environment
 - b. Dry
 - c. Wind/ vapor/ moisture barrier
 - d. Insulate
 2. Rewarming
 - a. Passive external
 - (1) Insulation
 - (2) Wind/ vapor/ moisture barrier
 - b. Active external
 - (1) Heat packs
 - (a) Placed over areas of high heat transfer with core
 - i) Base of neck
 - ii) Axilla
 - iii) Groin
 - (b) Insulate underneath to prevent burning
 - (2) Heat guns
 - (3) Lights
 - (4) Warm water immersion
 - (a) 102° F to 104° F
 - (b) Can induce rewarming shock
 - (c) Little application in out-of-hospital setting
 - c. Active internal
 - (1) Warmed (102° F to 104° F) humidified oxygen
 - (2) Warmed (102° F to 104° F) intravenous administration
 - (3) Role of warmed administration
 - (a) Crucial, to prevent further heat loss
 - (4) Limitations of warmed administration
 - (a) Actual heat transferred is minimal
 - (b) limited contribution to rewarming
 3. Rewarming shock
 - a. Active external rewarming causes reflex vasodilation

- b. Requires more heat transference than is possible with methods available in out-of-hospital setting
 - c. Easily prevented by IV fluid administration during rewarming
 - 4. Cold diuresis and the need for fluid resuscitation
 - a. Oral
 - b. Intravenous
 - 5. Resuscitation considerations
 - a. BCLS considerations
 - (1) Increased time to evaluate vital signs
 - (2) Use of normal chest compression and ventilation rates
 - (3) Use of oxygen
 - (4) AED recommendations
 - b. ACLS considerations
 - (1) Effects of cold on cardiac medications
 - (2) Considerations for airway management
 - (a) No increased risk of inducing ventricular fibrillation (V-fib) from orotracheal or nasotracheal intubation
 - (3) AHA recommendations
 - (4) Risks and management of V-fib
 - (a) Risks of V-fib related both to depth and duration of hypothermia
 - (b) Rough handling can induce V-fib
 - (c) It is generally impossible to electrically defibrillate a hypothermic heart that is colder than 86° F
 - (d) Lidocaine and procainamide paradoxically lower fibrillatory threshold in a hypothermic heart and increase resistance to defibrillation
 - (e) Bretylium and magnesium sulfate may be effective even in hypothermic hearts
 - 6. Transport considerations
 - a. Gentle transportation necessary due to myocardial irritability
 - b. Transport with patient level or head slightly head down
 - c. General rewarming options of destination
 - d. Availability of cardiac bypass rewarming preferable in destination consideration
 - H. Local cold injuries
 - 1. Frostbite
 - a. Classifications
 - (1) Superficial
 - (a) Also referred to as frostnip
 - (b) Some freezing of epidermal tissue
 - (c) Initial redness followed by blanching
 - (d) Diminished sensation
 - (2) Deep
 - (a) Freezing of epidermal and subcutaneous layers
 - (b) White appearance
 - (c) Hard (frozen) to palpation
 - (d) Loss of sensation
 - b. Treatment

- (1) Transport to hospital for rewarming by immersion
 - (2) Rewarm rapidly, by immersion, if transport will be delayed
 - (a) 104° F max
 - (b) Do not rewarm if there is risk of re-freezing
 - (c) Consider analgesics
 - (3) Transport considerations
 - (a) Immobilize
 - (b) Do not rewarm extremities if needed for transport (walking)
 2. Trench foot (immersion foot)
 - a. Similar to frostbite but occurs at temperatures above freezing
 - (1) Associated with prolonged exposure to moisture
 - b. Principal signs and symptoms
 - (1) Similar to frostbite
 - (2) Blisters may form upon spontaneous rewarming
 - (3) Pain
 - c. Specific treatment
 - (1) Dry and warm
 - (2) Aerate
- V. Specific pathology, assessment, and management - near-drowning
 - A. Definition
 1. Submersion episode with at least transient recovery
 - B. Pathophysiology
 1. Wet versus dry drownings
 - a. Fluid in posterior oropharynx stimulates laryngospasm
 - b. Aspiration occurs after muscular relaxation
 - c. Suffocation occurs with or without aspiration
 - d. Aspiration presents as airway obstruction
 2. Fresh versus saltwater considerations
 - a. Despite mechanistic differences, there is no difference in metabolic result
 - b. No difference in out-of-hospital treatment
 3. Hypothermic considerations in near-drownings
 - a. Common concomitant syndrome
 - b. May be organ protective in cold-water near-drownings
 - c. Always treat hypoxia first
 - d. Treat all near-drowning patients for hypothermia
 - C. Treatment
 1. Establish airway
 - a. Conflicting recommendations regarding prophylactic abdominal thrusts
 - b. Questionable scientific data to support prophylactic abdominal thrusts
 2. Ventilation
 3. Oxygen
 - D. Trauma considerations
 1. Immersion episode of unknown etiology warrants trauma management
 - E. Post-resuscitation complications
 1. Adult respiratory distress syndrome (ARDS) or renal failure often occur post-resuscitation
 2. Symptoms may not appear for 24 hours or more, post-resuscitation

3. All near-drowning patients should be transported for evaluation
- VI. Specific pathology, assessment, and management - diving emergencies
- A. Application of gas laws
 1. Boyle's law
 2. Dalton's law
 3. Henry's law
 - B. Pathophysiology
 1. Increased pressure dissolves gasses into blood
 - a. Oxygen metabolizes
 - b. Nitrogen dissolves
 2. Primary etiology is too rapid an ascent from depth
 - C. Classification of diving emergencies
 1. Decompression illnesses
 - a. Excess nitrogen bubbles out of solution on depressurization
 - b. Occurs in joints, tendons, spinal cord, skin, brain, inner ear
 - c. Occludes circulation
 - d. Principal signs and symptoms
 - (1) Joint pain
 - (2) Fatigue
 - (3) Paresthesias
 - (4) CNS disturbances
 - e. Specific treatment
 - (1) High flow oxygen
 - (2) Treat for shock
 - (3) IV initiation
 - (4) Place patient in supine position
 - (5) Transport to emergency department
 - (6) Definitive care is typically hyperbaric oxygen therapy (HBO)
 2. Pulmonary over-pressure accidents
 - a. Air trapped in lungs by
 - (1) Breath holding
 - (2) Bronchospasm
 - (3) Mucous plug
 - b. Shallow depths (<6') most dangerous
 - c. Pressure decreases and volume increases on ascent
 - d. Lung tissue ruptures in severe cases, producing a pneumothorax
 - e. Principal signs and symptoms
 - (1) Respiratory distress
 - (2) Substernal chest pain
 - (3) Diminished breath sounds
 - f. Specific treatment
 - (1) Rest
 - (2) Supplemental oxygen
 - (3) Hyperbaric oxygen not usually required
 - (4) Treatment is the same as for pneumothorax of any etiology
 3. Arterial Gas Embolism (AGE)

- a. Air in bloodstream secondary to pulmonary over-pressure
 - (1) Access to pulmonary circulation from ruptured alveoli
 - (2) Entrance to central circulation via left atrium
- b. Occlusion of small vessels occurs
 - (1) Cardiac compromise
 - (2) Pulmonary compromise
 - (3) Cerebral compromise
- c. Principal signs and symptoms
 - (1) Usually appear within 10 minutes of surfacing (most commonly within 2 minutes)
 - (2) Varies according to organ system that is primarily affected
 - (3) Most common presentation is similar to cerebral vascular accident
 - (a) Hemispheric presentations are rare
 - (b) Vertigo
 - (c) Confusion
 - (d) Loss of consciousness
 - (e) Visual disturbances
- d. Specific treatment
 - (1) High flow oxygen
 - (2) Transport supine, not in Trendelenburg
 - (3) Best treatment may be immediate hyperbaric oxygen
 - (4) Treat as for near-drowning
 - (5) Treat according to other symptoms
 - (6) Attempt to keep the patient at or below the altitude of the injury during transport
- 4. Nitrogen narcosis
 - a. Excess nitrogen dissolved in bloodstream under pressure
 - (1) Most common appearance is at depths of 70-100 feet
 - b. Gas anesthetic effect due to lipid solubility
 - c. Result is intoxication
 - (1) Accidents at depth often result from impaired judgement
 - d. Principal signs and symptoms
 - (1) Intoxication, impaired judgement
 - (2) Altered level of consciousness
 - e. Specific treatment
 - (1) Self-resolving upon ascent
 - (2) Return to shallow depths
- 5. Other diving related illnesses
 - a. Oxygen toxicity
 - (1) Usually seen only with prolonged exposure or excess concentration
 - b. Contaminated gases
 - c. Hypercapnia
 - d. Hyperventilation
- D. Divers Alert Network (DAN)
 - 1. Non-profit organization affiliated with Duke University Medical Center
 - 2. Specializes in diving related illnesses
 - 3. Available for consultation and referral

4. (919) 684-8111 for emergencies
 5. (919) 684-2948 for non-emergency consultation and referral
- VII. Specific pathology, assessment, and management - altitude illness
- A. Application of gas laws
 - B. Exposure to high altitude may exacerbate chronic medical conditions, even without inducing altitude illness
 1. Angina pectoris
 2. Congestive heart failure
 3. Chronic obstructive pulmonary disease
 4. Hypertension
 - C. Etiology and epidemiology of altitude illnesses
 1. Principal occurrence over 8000 feet above sea level
 2. Hypoxic basis
 3. Incidence
 - D. Predisposing factors
 1. None
 2. Typically presents in otherwise healthy individuals
 3. Only predictor is hypoxic ventilatory response
 - E. Preventative measures
 1. Gradual ascent
 2. Limited exertion
 3. Decreased sleeping altitude
 4. High carbohydrate diet
 5. Acetazolamide
 - a. Speeds acclimatization and decreases incidence of acute mountain sickness
 6. Nifedipine
 - a. Used solely by those with a previous history of high altitude pulmonary edema to prevent re-occurrence upon ascent
 7. Steroids - efficacy is controversial
 - F. Signs and symptoms
 1. Malaise
 2. Anorexia
 3. Headache
 4. Sleep disturbances
 5. Respiratory distress that increases with exertion
 - G. Categorization of altitude illnesses
 1. Acute mountain sickness (AMS)
 - a. Mild
 - b. Severe
 2. High altitude pulmonary edema (HAPE)
 - a. Pulmonary edema develops from increased pulmonary artery pressure
 3. High altitude cerebral edema (HACE)
 - a. Cerebral edema develops from unknown causes and produces increased intracranial pressure
 - H. Treatment
 1. Descent

2. Oxygen
3. Portable hyperbaric chamber
4. Medications
 - a. Acetazolamide for AMS, HAPE, or HACE
 - b. Nifedipine for HAPE only
 - c. Steroids for severe AMS or HACE only
 - d. Adjunctive medications
 - (1) Prochlorperazine for AMS or HACE
 - (2) Furosemide for HAPE
 - (3) Morphine for HAPE

VIII. Integration

- A. Impact of the environment on human metabolism
 1. Heat gain or loss that exceeds the body's capacity to compensate
 2. Pressure changes that exceed the body's capacity to compensate
- B. Assessment findings in patients with environmentally induced illnesses
 1. Abnormal core body temperatures
 2. Signs of metabolic decompensation
 3. Development of shock state
- C. Patient management
 1. Field stabilization
 - a. Removal of environmental influence
 - b. Support of metabolic compensation
 - c. Selection of definitive care location

Dave.Bryson

<http://www.nhtsa.gov/people/injury/ems/E>
03/23/09 08:22 AM



UNIT TERMINAL OBJECTIVE

- 5-11 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement a management plan for the patient with infectious and communicable diseases.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 5-11.1 Review the specific anatomy and physiology pertinent to infectious and communicable diseases. (C-1)
- 5-11.2 Define specific terminology identified with infectious/ communicable diseases. (C-1)
- 5-11.3 Discuss public health principles relevant to infectious/ communicable disease. (C-1)
- 5-11.4 Identify public health agencies involved in the prevention and management of disease outbreaks. (C-1)
- 5-11.5 List and describe the steps of an infectious process. (C-1)
- 5-11.6 Discuss the risks associated with infection. (C-1)
- 5-11.7 List and describe the stages of infectious diseases. (C-1)
- 5-11.8 List and describe infectious agents, including bacteria, viruses, fungi, protozoans, and helminths (worms). (C-1)
- 5-11.9 Describe host defense mechanisms against infection. (C-1)
- 5-11.10 Describe characteristics of the immune system, including the categories of white blood cells, the reticuloendothelial system (RES), and the complement system. (C-1)
- 5-11.11 Describe the processes of the immune system defenses, to include humoral and cell-mediated immunity. (C-1)
- 5-11.12 In specific diseases, identify and discuss the issues of personal isolation. (C-1)
- 5-11.13 Describe and discuss the rationale for the various types of PPE. (C-1)
- 5-11.14 Discuss what constitutes a significant exposure to an infectious agent. (C-1)
- 5-11.15 Describe the assessment of a patient suspected of, or identified as having, an infectious/ communicable disease. (C-1)
- 5-11.16 Discuss the proper disposal of contaminated supplies (sharps, gauze sponges, tourniquets, etc.). (C-1)
- 5-11.17 Discuss disinfection of patient care equipment, and areas in which care of the patient occurred. (C-1)
- 5-11.18 Discuss the following relative to HIV - causative agent, body systems affected and potential secondary complications, modes of transmission, the seroconversion rate after direct significant exposure, susceptibility and resistance, signs and symptoms, specific patient management and personal protective measures, and immunization. (C-1)
- 5-11.19 Discuss Hepatitis A (infectious hepatitis), including the causative agent, body systems affected and potential secondary complications, routes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)
- 5-11.20 Discuss Hepatitis B (serum hepatitis), including the causative agent, the organ affected and potential secondary complications, routes of transmission, signs and symptoms, patient management and protective measures, and immunization. (C-1)
- 5-11.21 Discuss the susceptibility and resistance to Hepatitis B. (C-1)
- 5-11.22 Discuss Hepatitis C, including the causative agent, the organ affected, routes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization and control measures. (C-1)
- 5-11.23 Discuss Hepatitis D (Hepatitis delta virus), including the causative agent, the organ affected, routes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization and control measures. (C-1)
- 5-11.24 Discuss Hepatitis E, including the causative agent, the organ affected, routes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and

- immunization and control measures. (C-1)
- 5-11.25 Discuss tuberculosis, including the causative agent, body systems affected and secondary complications, routes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization and control measures. (C-1)
 - 5-11.26 Discuss meningococcal meningitis (spinal meningitis), including causative organisms, tissues affected, modes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization and control measures. (C-1)
 - 5-11.27 Discuss other infectious agents known to cause meningitis including streptococcus pneumonia, hemophilus influenza type b, and other varieties of viruses. (C-1)
 - 5-11.28 Discuss pneumonia, including causative organisms, body systems affected, routes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)
 - 5-11.29 Discuss tetanus, including the causative organism, the body system affected, modes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)
 - 5-11.30 Discuss rabies and hantavirus as they apply to regional environmental exposures, including the causative organisms, the body systems affected, routes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization and control measures. (C-1)
 - 5-11.31 Identify pediatric viral diseases. (C-3)
 - 5-11.32 Discuss chickenpox, including the causative organism, the body system affected, mode of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization and control measures. (C-1)
 - 5-11.33 Discuss mumps, including the causative organism, the body organs and systems affected, mode of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)
 - 5-11.34 Discuss rubella (German measles), including the causative agent, the body tissues and systems affected, modes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)
 - 5-11.35 Discuss measles (rubeola, hard measles), including the causative organism, the body tissues, organs, and systems affected, mode of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)
 - 5-11.36 Discuss the importance of immunization, and those diseases, especially in the pediatric population, which warrant widespread immunization (MMR). (C-1)
 - 5-11.37 Discuss pertussis (whooping cough), including the causative organism, the body organs affected, mode of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)
 - 5-11.38 Discuss influenza, including causative organisms, the body system affected, mode of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)
 - 5-11.39 Discuss mononucleosis, including the causative organisms, the body regions, organs, and systems affected, modes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)
 - 5-11.40 Discuss herpes simplex type 1, including the causative organism, the body regions and system affected, modes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)
 - 5-11.41 Discuss the characteristics of, and organisms associated with, febrile and afebrile respiratory disease, to include bronchiolitis, bronchitis, laryngitis, croup, epiglottitis, and the common cold. (C-1)
 - 5-11.42 Discuss syphilis, including the causative organism, the body regions, organs, and systems affected,

- modes of transmission, susceptibility and resistance, stages of signs and symptoms, patient management and protective measures, and immunization. (C-1)
- 5-11.43 Discuss gonorrhea, including the causative organism, the body organs and associated structures affected, mode of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)
- 5-11.44 Discuss chlamydia, including the causative organism, the body regions, organs, and systems affected, modes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)
- 5-11.45 Discuss herpes simplex 2 (genital herpes), including the causative organism, the body regions, tissues, and structures affected, mode of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)
- 5-11.46 Discuss scabies, including the etiologic agent, the body organs affected, modes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)
- 5-11.47 Discuss lice, including the infesting agents, the body regions affected, modes of transmission and host factors, susceptibility and resistance, signs and symptoms, patient management and protective measures, and prevention. (C-1)
- 5-11.48 Describe lyme disease, including the causative organism, the body organs and systems affected, mode of transmission, susceptibility and resistance, phases of signs and symptoms, patient management and control measures, and immunization. (C-1)
- 5-11.49 Discuss gastroenteritis, including the causative organisms, the body system affected, modes of transmission, susceptibility and resistance, signs and symptoms, patient management and protective measures, and immunization. (C-1)
- 5-11.50 Discuss the local protocol for reporting and documenting an infectious/ communicable disease exposure. (C-1)
- 5-11.51 Articulate the pathophysiological principles of an infectious process given a case study of a patient with an infectious/ communicable disease. (C-3)
- 5-11.52 Articulate the field assessment and management, to include safety considerations, of a patient presenting with signs and symptoms suggestive of an infectious/ communicable disease. (C-3)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 5-11.53 Advocate compliance with standards and guidelines by role modeling adherence to universal/ standard precautions and BSI. (A-1)
- 5-11.54 Value the importance of immunization, especially in children and populations at risk. (A-1)
- 5-11.55 Value the safe management of a patient with an infectious/ communicable disease. (A-2)
- 5-11.56 Advocate respect for the feelings of patients, family, and others at the scene of an infectious/ communicable disease. (A-2)
- 5-11.57 Advocate empathy for a patient with an infectious/ communicable disease. (A-2)
- 5-11.58 Value the importance of infectious/ communicable disease control. (A-2)
- 5-11.59 Consistently demonstrate the use of body substance isolation. (A-2)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 5-11.60 Demonstrate the ability to comply with body substance isolation guidelines. (P-2)
- 5-11.61 Perform an assessment of a patient with an infectious/ communicable disease. (P-2)

- 5-11.62 Effectively and safely manage a patient with an infectious/ communicable disease, including airway and ventilation care, support of circulation, pharmacological intervention, transport considerations, psychological support/ communication strategies, and other considerations as mandated by local protocol. (P-2)

DECLARATIVE

- I. Public health principles relative to infectious (communicable) diseases
 - A. Infectious diseases affect entire populations of humans
 - B. Important to understand the demographic characteristics of the population
 - C. The relationships between populations is important when studying the dynamics of infectious diseases
 - D. The study of an infectious disease cluster (a discrete population which is infected in a defined span of time in a defined geographical area) is, by its nature, regional; however, the consequences of that cluster becoming infected may be international
 - E. Populations display varying susceptibilities to infection, and conversely, varying degrees of susceptibility
 - F. When dealing with infectious diseases, the paramedic needs to consider the needs of the patient and the potential consequence on public health
 - G. Paramedics should think of the consequences of their person-to-person contacts with family members and friends

- II. Public health agencies involved in the prevention/ management of disease outbreaks
 - A. Local (municipal, city, county) health agencies
 - 1. First line of defense in disease surveillance
 - 2. First line of defense in disease outbreaks
 - B. State agencies
 - 1. Frequently involved in regulation and enforcement of federal guidelines
 - 2. They frequently are, by statute or public law, obliged to meet or exceed federal guidelines and recommendations
 - C. Private sector
 - 1. Regional and national health care providers and local and national health maintenance organizations
 - 2. Influence protocols and guidelines for dealing with disease surveillance/ response to outbreaks
 - D. Federal and national organizations
 - 1. U.S. Congress plays an integral role in national health policy through public laws and by drafting of the federal budget
 - 2. U.S. Department of Labor
 - a. Occupational Safety and Health Administration (OSHA)
 - 3. U.S. Department of Health and Human Services
 - (1) Centers for Disease Control
 - (2) National Institute for Occupational Safety and Health (NIOSH)
 - 4. U.S. Department of Defense and Federal Emergency Management Agency (FEMA)
 - 5. National Fire Protection Association (NFPA), U.S. Fire Protection Administration and International Association of Firefighters (IAFF)

- III. Infection, pathogenicity, and infectious agents
 - A. Steps of infectious process
 - 1. Infectious agent resident in reservoir (animal, man, environment)
 - 2. Infectious agent may be present in the ecosystem, affected by
 - a. Life-cycle of the infectious agent
 - b. Environmental factors which dictate presence of endemic species outside of the

- host
- c. Climatic conditions
- 3. Transmission of infectious agent to the host
- 4. Development and/ or manifestations of clinical disease dependent on several factors
 - a. Virulence (degree of pathogenicity) of the agent - strength of the microorganisms to infect the host
 - b. Number of infectious agents (dose)
 - c. Resistance (immune status) of the host
 - d. Correct mode of entry
 - e. Virulence, dose, resistance, and correct mode of entry must all exist to create a risk of exposure
 - (1) Does not mean a person will become infected
 - (2) Exposure, with all necessary risk factors, does not necessarily equal infection
- 5. Life-cycle of the infectious agent
 - a. Demographics of host
 - (1) Populations and their ability to move internationally
 - (2) Age distributions
 - (3) Socioeconomic considerations
 - (4) Population settling and migration dictated by religion
 - b. Genetic factors
 - c. Efficacy of therapeutic interventions once infection has been established
- 6. Risk of infection is
 - a. Theoretical - the possibility of transmission is acknowledged to have the potential to occur, but has not been reported
 - b. Measurable - some factors of infectious agent transmission, and the risks associated with those factors, are known or deduced from reported data
- B. Stages of an infectious disease (NOTE - The numerical order does not imply that this is a chronological progression)
 - 1. Latent period
 - a. Period after infection of a host when the infectious agent cannot be transmitted to another host or cause clinically significant symptoms
 - 2. Communicable period
 - a. Period after an infection when the infectious agent can be transmitted to another host
 - b. Clinically significant symptoms from the infection may be manifested during this period
 - 3. Incubation period
 - a. Time interval between exposure to an infectious agent and the first appearance of symptoms associated with the infection
 - 4. Window phase
 - a. A period after infection in which antigen is present, but no detectable antibody
 - 5. Disease period
 - a. Time interval between the first appearance of symptoms associated with the infection and resolution of those symptoms, or death
 - b. Resolution of symptoms does not mean that the infectious agent is destroyed
- C. Infectious agents - an overview
 - 1. Bacteria

- a. Prokaryotic - nuclear material not contained within a distinct envelope
 - b. Self-reproducing without host cell
 - c. Signs and symptoms depend on cells and tissues that are infected
 - d. Toxins - often more lethal than the bacterium itself
 - (1) Endotoxins
 - (a) Chemicals, usually proteins
 - (b) Integral parts of a bacteria's outer membrane and steadily shed from living bacteria
 - (2) Exotoxin
 - (a) Proteins released by bacteria that can cause disease symptoms by acting as neurotoxins or enterotoxins
 - e. Lysis of bacteria may release endotoxins
 - f. Can be localized or systemic infection
2. Viruses
- a. Must invade host cells to reproduce
 - b. Cannot survive outside of host cell
 - c. Other microorganisms
 - d. Eukaryotic - nuclear material contained within a distinct envelope
3. Fungi
- a. Protective capsules surround the cell wall and protect the fungi from phagocytes
4. Protozoans
5. Helminths (worms) - not necessarily microorganisms

IV. Host defense mechanisms

- A. Nonspecific and surface defense mechanisms (the body's own PPE)
 - 1. Skin
 - a. First line of defense against infection
 - 2. Respiratory system
 - a. Turbinates
 - (1) Create turbulent air flow
 - (2) Nasal hairs trap foreign material
 - b. Mucous can trap and kill alien material and is eliminated as sputum (from pharynx) or phlegm (generally from larynx and below)
 - c. Mucociliary escalator - moves pollutants trapped by mucous up the respiratory system and prevents inhalation into alveoli
 - 3. Normal bacterial flora
 - a. In GI and GU systems, competition between colonies of microorganisms for nutrients and space helps to prevent proliferation of pathogenic organisms
 - b. Create environmental conditions that are not conducive to pathogens
 - c. Stomach acids may destroy some microorganisms or deactivate their toxic products
 - 4. GI and GU systems also facilitate elimination of pathogens via feces and urine
 - 5. Inflammatory response
 - a. Local reaction to cellular injury
 - b. Injury may be physical, thermal, or chemical, or result from invasion by microorganisms
 - c. Like the immune response, the inflammatory response may initiate destruction of the body's own tissue if it overreacts, the so-called autoinflammatory or

autoimmune response

- B. The immune system - an overview**
1. White blood cells are the backbone of the immune system
 - a. Humoral immunity component
 - (1) Time-consuming response
 - (2) Specialized white blood cells, called B-cells, eventually differentiate into antibodies
 - b. Cell-mediated immunity component
 - (1) Time-consuming response
 - (2) Specialized white blood cells, called T-cells, that coordinate the activity of other components of the immune system to deal with foreign material
 - (3) Helper T-cells
 - (4) Suppressor T-cells
 - (5) Killer T-cells
 - (6) Inflammatory T-cells
 - c. Nonspecific effector cells without a specialized function
 - (1) Monocytes
 - (2) Neutrophils
 - (3) Eosinophils
 - (4) Basophils
 - (5) NK or natural killer cells
 2. Reticuloendothelial system (RES)
 - a. Composed of immune cells in the spleen, lymph nodes, liver, bone marrow, lungs, and intestines
 - b. RES works in conjunction with the lymphatic system to dispose of "garbage" material that results from immune system attack of intruders
 - c. RES structures serve as sites where mature B- and T-cells are stored until the immune system is activated by presence of intruders
 3. Complement system
 - a. Part of the immune system that can recognize and kill invaders on first sight
 - b. Doesn't take time to mobilize specialized responses like the humoral and cell-mediated components of white blood cells
- C. Specific immune system defenses**
1. Humoral immunity
 2. Cell-mediated immunity
 3. Complement
 - a. Necessary because
 - (1) Humoral and cell-mediated immunity processes are time-consuming
 - (2) Both cell-mediated and humoral processes depend on previous exposure

V. Agency and personal responsibility relative to isolation from infectious agent exposure

- A. Components of a healthcare agency's exposure plan**
1. **Health maintenance and surveillance**
 2. **Appointing a Designated Officer (DO) to serve as the liaison between the agency and community health agencies involved in monitoring/ response to communicable diseases**
 3. **Identification of job classifications, and in some cases, specific tasks where possibility exists for exposure to bloodborne pathogens**
 4. **A schedule of when and how the provisions of bloodborne pathogen standards will be**

- implemented, to include
 - a. Engineering and work practice controls
 - b. Personal protective equipment
 - c. Baseline employee evaluations, immunizations, and follow up
 - d. Training of employees
 - 5. Personal protective equipment (PPE)
 - a. Includes, but is not limited to gowns, gloves, face shields, masks, protective eyewear, aprons, and similar items
 - b. Considered appropriate only when they do not allow blood or other potentially infectious body fluids to reach the emergency responder's work clothes, undergarments, skin, eyes, mouth, or other mucous membranes under normal conditions of use
 - c. Emergency responders may decide to not wear protective clothing for short periods of time when it interferes with patient care
 - 6. Body substance isolation
 - a. Standard precautions are more inclusive than BSI
 - b. BSI is more inclusive than universal
 - 7. Procedures for evaluating the circumstances of an exposure and postexposure counselling, to include rights to know of emergency response employees exposed to patients with communicable diseases (per Ryan White Act)
 - 8. Interfacing with, and notification of, local health authorities, state and federal agencies
 - 9. Personal, building, vehicular, and equipment disinfection and storage
 - 10. HazComm education for employees regarding disinfection agents
 - 11. After-action analysis of agency response
 - 12. Correct disposal of needles into containers which meet specific criteria of being rigid, puncture resistant, leak proof, closeable, and have the bio-hazard label
 - 13. Correct handling of body-fluid tinged linens and supplies used in patient care
 - 14. Identification of agency and/ or contracted personnel for counselling, authorization of acute medical care, and documentation
- B. Individual responsibilities
- 1. Develop a proactive attitude relative to infection control
 - 2. Maintenance of personal hygiene and prevention of offensive body odors (aesthetics of patient care)
 - 3. Attention to wounds and maintenance of integument (external barrier to infection)
 - 4. Effective hand washing after every patient contact with warm water and antiseptic cleanser or waterless antiseptic cleanser when potable water is not available
 - 5. Removal or disposal of work garments when leaving work station/ site; do not expose others to contaminated garments
 - 6. Handling uniforms in accordance with their her agency's definition of PPE
 - 7. Proper handling and laundering of work clothes soiled with body fluids, with consideration for bathing/ showering after work shift, and before returning home
 - 8. Preparing food and eating in appropriate areas
 - 9. Maintenance of general physiological and psychological health to prevent distress, which can immunocompromise a healthy individual
 - 10. Correct disposal of needles and sharps into appropriate containers
 - 11. Correct disposal of body-fluid tinged linens and supplies used in patient care
 - 12. Become aware of, and avoid tendencies to wipe face and/ or rub eyes, nose, mouth with gloved hands

13. Knowledge of general classifications of exposure since the type of exposure will determine the extent of the infection control measures applied to the health care worker
- VI. Approach to the call, and patient, with a suspected infectious or communicable disease
- A. Suspecting infectious diseases
 - B. Acknowledge visceral or intuitive hunches that the dispatched call may involve an infectious disease
 - C. Gloves are worn according to the task to be performed (OSHA and CDC recommendations)
 - D. Protective eye wear
 - E. Patient assessment
 1. Body substance isolation
 2. Focused history and physical
 - a. History of present illness
 - (1) Onset - gradual or sudden
 - (2) Fever
 - (3) Antipyretic usage (ASA, APAP)
 - (4) Neck pain or rigidity
 - (5) Difficulty swallowing, secretions
 - (6) How did the most bothersome symptom change over time
 - b. Past medical history
 - (1) Chronic infections, inflammation
 - (2) Use of steroids, antibiotics
 - (3) Organ transplant and associated medicines
 - (4) Diabetes or other endocrine disorders
 - (5) COPD or respiratory complications
 3. Detailed history and physical
 - a. Assess skin for temperature, hydration, color (jaundice), mottling, rashes, and petechiae
 - b. Assess sclera for icterus
 - c. Assess patient reaction to neck flexion
 - d. Assess for lymphadenopathy in the neck
 - e. Assess breath sounds for consolidation
 - f. Assess for hepatomegaly, RUQ tenderness
 - g. Assess digits and extremities for purulent lesions
 - F. Upon disposition of the patient, dispose of supplies, especially sharps, appropriately, bag linen, disinfect ambulance and patient care equipment
 1. Reprocessing methods for EMS durable medical equipment
 - a. Sterilization
 - b. High-level disinfection
 - c. Intermediate-level disinfection
 - d. Low-level disinfection
- VII. Human immunodeficiency virus (HIV)
- A. Causative agent - human immunodeficiency virus (types 1 and 2), referred to as HIV-1 and HIV-2, retroviruses
 1. Both types are serologically and geographically distinct, but share similar epidemiological characteristics

2. HIV-1 is far more pathogenic than HIV-2, and most cases worldwide and in the U.S. are of HIV-1, Group M
 - a. The first case in the U.S. of an HIV-1, Group O infection was identified in the U.S. in June of 1996 (MMWR Synopsis, July 5, 1996)
 - (1) HIV-antibody tests in U.S. detect HIV-1, Group M with 99% accuracy, and 50-90% for HIV-1, Group O
 - (2) Increasing sensitivity to Group O would be most important for blood donor screening
 3. HIV-2 seems to be more restricted to W. Africa
- B. Body systems affected and potential secondary complications - generally related to opportunistic infections that arise as immune system compromise develops
1. Initial case definition was established by CDC in 1982
 2. In 1987 and 1993, case definition was expanded to include indicator diseases extra pulmonary and pulmonary tuberculosis, recurrent pneumonia, wasting syndrome, HIV dementia, and sensory neuropathy
 3. Nervous system - toxoplasmosis of CNS
 4. Immune system - major site of compromise
 5. Respiratory system - pneumocystis carinii pneumonia
 6. Integumentary system - Kaposi's sarcoma
 7. Modes of transmission
 - a. Sexual contact, sharing of HIV-contaminated needles and syringes, and the infusion of blood and blood products in transmission of HIV are well documented
 - b. Contact with semen, blood, vaginal fluids, and associated tissues is generally accepted as high risk
 - c. 13-30% transmission to infants born to HIV-infected mothers is estimated
 - d. Breastfeeding can result in HIV transmission
 - e. Virus has on occasion been found in saliva, tears, urine, and bronchial secretions, but no known cases have been documented relative to contact with these body fluids
 - f. Vector transmission by biting insects has not been known to occur
 - g. Risk of oral sex is not quantified, but believed to be low
 8. Health care workers - probability of infection following a very direct and specific exposure to blood containing the virus is 0.2 - 0.44% (Gerberding, NEJM, 1995)
 - a. Through June of 1995, number of paramedics infected globally reported to be 9 undocumented cases
 - b. A documented case would be defined by
 - (1) A positive source
 - (2) A worker testing positive after the generally recognized incubation phase, with consideration for the window phase
 - c. Health care worker risk increased when
 - (1) The exposure involves a large quantity of blood as when a device is visibly contaminated with blood, when care of the patient involves placing a needle in a vein or artery, and in deep injuries
 - (2) Needle size, type (hollow bore versus suture), and depth of penetration influence volume transferred to skin of health care worker (Mast et. al., J Infec Dis 1992)
 - (3) The exposure involved a source patient with a terminal illness, possibly

- d. Risk needs to be understood in terms of how the exposure occurred, and what factors were involved
 - e. Potential may appear to be high, but the probability may actually be quite low
 - C. Susceptibility and resistance
 1. Infectiousness may be high during initial period after infection and at end-stage
 2. Race and gender do not appear to be risk factors for susceptibility
 3. Coexisting STDs, especially with ulceration, appear to increase risk
 4. Penile foreskin may increase susceptibility
 5. No recovered cases have been documented
 - D. Signs and symptoms
 1. For out-of-hospital workers, HIV-infected patients generally relay that information to health care providers
 2. Within 4 -6 weeks after infection, infected people present with a mononucleosis-like illness which includes fever, sore throat, lymphadenopathy, splenomegaly, and fatigue lasting for a week or two
 3. Infected people often are asymptomatic for months or years, but may test positive
 4. Clinical manifestations of opportunistic and neurologic symptoms then appear gradually, often with seemingly benign symptoms similar to the initial mononucleosis-like illness
 - E. Patient management and personal protective measures
 1. Out-of-hospital care - supportive
 2. Isolation is unnecessary, ineffective and unjustified
 3. Body substance isolation (including gloves being worn according to the task being performed)
 4. Effective handwashing
 5. Use of eye protection, masks and gowns are highly recommended in situations where exposures to large volume of body fluids is possible
 6. Care in use of diagnostic and therapeutic equipment and supplies is mandatory, especially with sharps
 7. Disinfection of diagnostic/ therapeutic equipment and supplies is mandatory
 8. Early diagnosis of infection, treatment, and counselling for health care providers, as part of a comprehensive exposure control plan, is mandatory
 - F. No immunization yet exists for HIV infection
- VIII. Hepatitis A
- A. Causative agent - hepatitis A virus
 - B. Body systems affected and potential secondary complications
 1. Many infections are asymptomatic
 2. Liver may be affected
 - a. Often occurs without jaundice, especially in children
 - b. Only recognizable by liver function studies
 - C. Routes of transmission
 1. Found in the stool of persons with hepatitis A
 2. Contaminated water, ice or food
 3. Sexual and household contact can spread the virus
 4. Can survive on unwashed hands for 4 hours
 - D. Susceptibility and resistance
-

1. No clearly defined populations at increased risk
 2. 75% of persons infected with hepatitis A virus have symptoms
 3. In developing nations where sanitation is poor, infection and subsequent immunity is common; travelers from developed countries are therefore susceptible
 4. In developed nations, often associated with day care in which diaper changing occurs
- E. Signs and symptoms
1. Onset is abrupt with fever, weakness, anorexia, abdominal discomfort, nausea, and darkening of the urine, sometimes followed within a few days by jaundice/ icterus
 2. Mild severity lasting 2-6 weeks
 3. Rarely serious
- F. Patient management and protective measures
1. Care is supportive for maintenance of fluid status and prevention of shock
 2. A person is most infectious during the first week of symptoms
 3. BSI and gloves, combined with attention to not placing gloved hand close to the mouth, are mandatory
 4. Hand washing after each patient contact and safe/ effective disposal of items contaminated with feces
- G. Immunization
1. An inactivated hepatitis A vaccine is available
 2. Prophylactic IG may be administered within two weeks after exposure to hepatitis A
 3. Persons traveling to Africa, the Middle East, Central and South America, and Asia should be immunized
 4. FEMA team personnel should be offered vaccine if they travel out of the United States
- IX. Hepatitis B
- A. Causative agent - hepatitis B virus
- B. Organ affected and potential secondary complication - liver necrosis
- C. Routes of transmission
1. Blood, semen, vaginal fluids, and saliva are infectious
 2. Transmission has been known to occur during transfusion of blood and blood products, dialysis, needle and syringe sharing in IV drug use, tattooing, sexual contact, and acupuncture, and communally-used razors and toothbrushes
 3. HBV is stable on environmental surfaces with dried, visible blood for > 7 days
 4. Infection has also been demonstrated in household contacts in toddler-aged children who live in a family with members who carry certain HB antigens
 5. Transmission by biting insects and the fecal-oral route of hepatitis B has not been demonstrated
- D. Susceptibility and resistance
1. No populations appear to be at increased risk for infection
 2. Protective immunity develops if the HBV antigen disappears and HBV antibody is demonstrated in serum
 3. Probability of infection following exposure to blood containing the virus is 1.9 - 40%
- E. Signs and symptoms
1. Within 2-3 months, infected persons gradually develop non-specific symptoms such as anorexia, nausea and vomiting, fever, joint pain, generalized rashes, sometimes progressing to jaundice
 2. Risk of developing chronic infection varies inversely with age

- 3. 1% of hospitalized patients develop a full-blown liver crisis and die, with the mortality increasing > 40 years of age
 - 4. 5-10% of infected individuals become asymptomatic carriers
 - F. Patient management and protective measures
 - 1. Out-of-hospital care is supportive measures
 - 2. Body substance isolation
 - 3. Effective hand washing
 - 4. Care in use of diagnostic and therapeutic equipment and supplies is mandatory
 - 5. Careful handling of sharps
 - 6. High-level disinfection of diagnostic/ therapeutic equipment, especially laryngoscopy blades, is mandatory
 - G. Immunization
 - 1. Recombinant vaccines (Recombivax HB[®] and Engerix B[®]) are as effective as the previously available Heptavax[®] (derived from plasma) and do not carry the theoretical risk of HIV transmission or other viral illnesses
 - 2. Vaccines are given as initial, 1-month, and 6-month doses, and provide long lasting immunity 95-98% of the time
 - 3. Adverse reactions of vaccine include local injection site pain 15-20%, and rare fever, rash, or muscle pain (<3%)
- X. Hepatitis C
- A. Causative organism - hepatitis C virus
 - B. Organ affected - liver
 - C. Routes of transmission
 - 1. Health care workers - 2.7 to 10% probability of infection when exposed to blood containing the virus
 - 2. Transmission by household and sexual contact appear to be low
 - 3. Transmission cannot occur from food and water
 - D. Susceptibility and resistance
 - 1. General susceptibility
 - 2. Degree of immunity following infection is unknown, but a high percentage of infected individuals become carriers
 - E. Signs and symptoms
 - 1. Same as for hepatitis B, but with less progression to jaundice
 - 2. Chronic liver disease with elevated enzyme profile is common, with 80-85% developing chronic liver disease
 - 3. Apparent association between HCV infection and liver cell cancer
 - F. Patient management and protective measures
 - 1. Same as for hepatitis B
 - 2. BSI
 - 3. Effective hand washing
 - 4. Alpha-interferon (an experimental treatment) has been shown to be effective in 20% of cases
 - G. Immunization and control measures
 - 1. Prophylactic administration of IG is not supported by current data
 - 2. Post exposure testing is important
 - 3. Blood bank operations - blood with elevated liver enzymes and antibody against HCV is

not banked in most U.S. centers

- XI. Hepatitis non-ABC
- A. Causative agent
 - 1. Hepatitis D - the delta virus is not complete, but infects a cell with other hepatitis virus
 - 2. Hepatitis E (not bloodborne; is spread like Hepatitis A)
 - 3. Hepatitis G - newly identified hepatitis viruses
 - B. Organ affected - liver
 - C. Routes of transmission - similar to HBV
 - D. Susceptibility and resistance
 - 1. Hepatitis D - when the virus becomes active in people infected with hepatitis B virus, the resulting disease becomes extremely pathogenic
 - 2. Major epidemics have been documented in young adults, even in areas where enteric viruses are endemic (underdeveloped nations)
 - 3. Women in third trimester of pregnancy are particularly susceptible to fulminating liver disease
 - 4. Resistance unknown
 - 5. Presence of epidemics in young adults (see D1 above), who should have immunity, is paradoxical
 - E. Signs and symptoms
 - 1. Onset is abrupt, with signs and symptoms resembling HBV infection
 - 2. Always associated with HBV infection
 - 3. Often (25-50% of cases in U.S. and Europe) mistaken for HBV infection
 - F. Patient management and protective measures
 - 1. BSI
 - 2. Effective hand washing
 - 3. Particular attention to be paid to having clean potable water and disinfection procedures after exposure to flood waters
 - G. Immunization and control measures
 - 1. Hepatitis B vaccine can indirectly prevent Hepatitis D, but has no effect on Hepatitis E
 - 2. If you are effectively vaccinated against HBV, with a documented protective titer, then you are vaccinated against HDV

- XII. Tuberculosis
- A. Causative agent - mycobacterium tuberculosis
 - B. Body systems affected and secondary complications
 - 1. Initially affects respiratory system, including the larynx, which is a highly contagious form
 - 2. Left untreated, tuberculosis can spread to other organ systems and cause secondary and tertiary complications
 - C. Routes of transmission
 - 1. Exposure to causative agent in airborne droplet nuclei
 - 2. Prolonged close exposure to a person with active TB
 - 3. Direct invasion through mucous membranes or breaks in skin are known, but not common
 - 4. Reservoirs include some primates, cattle, badgers, and swine
 - D. Susceptibility and resistance
 - 1. Period of incubation is 4-12 weeks (CDC)
 - 2. Period for development of clinical disease is 6-12 months after infection

3. Risk of developing disease is highest in children < 3, lowest in later childhood, and high among adolescents, young adults, and aged
 4. High in immunocompromised patients, e.g. HIV-infected, underweight, and undernourished
 5. Incidence of reactivation of latent infections (seen in geriatric patients) implies that immune system is incapable of dealing with complex M. tuberculosis infection
- E. Signs and symptoms
1. First infection of mycobacterium tuberculosis is called primary tuberculosis and is usually a subclinical infection
 - a. Cell-mediated immunity walls off the bacteria and suppresses them
 - b. These bacteria lie dormant, but can reactivate into secondary tuberculosis
 - c. Symptomatic primary tuberculosis is rare and more commonly occurs in elderly, children, and immunocompromised
 2. Most common site of secondary or reactivation TB is in the apices of the lungs (M. tuberculosis is an aerobic organism and the oxygen tension is highest in the apices)
 - a. Patients present with chronic productive/ non- productive cough (persistent for 2-3 weeks), low-grade fevers, night sweats, weight loss, and symptoms related to the organ system involved
 - b. Hemoptysis often accompanies lung infection
 - c. Other organ systems
 - (1) Cardiovascular
 - (a) Pericardial effusions may develop
 - (b) Lymphatics - cervical nodes are usually involved
 - (2) Skeletal
 - (a) Generally affects the thoracic and lumbar spine, destroying intervertebral discs and adjacent vertebral bodies
 - (b) Chronic arthritis of one joint is common
 - (3) CNS - TB causes a subacute meningitis and forms granulomas in the brain
 - (4) Systemic - miliary tuberculosis
- F. Patient care and protective measures
1. Identification and early intervention are key
 2. Related to public education and routine evaluation of health care workers consisting of
 - a. PPD (Purified Protein Derivative)
 - b. Chest x-ray (CXR)
 - c. Sputum acid-fast stain and culture of bacteria
 - d. PCR testing provides a diagnosis in 6 hours with no need to wait for cultures
 3. EMS workers should remember that TB infection is communicable with prolonged exposures to infected individuals who discharge droplets into the air by coughing
 4. EMS workers should be alert to those populations that have significant prevalence of active TB in their jurisdictions (as reported by local public health authorities) and utilize NIOSH approved particulate filter respirators
 - a. Post-call disinfection should be at appropriate levels
 5. Drug therapy
 - a. Prophylactic (INH)
 - (1) Recommended routinely for persons < 35, who are PPD positive skin test boosters

- (2) Not routinely recommended for persons > 35 due to hepatic complications with INH unless one or more of the following is present
 - (a) Recent infection as evidenced by PPD skin test conversion
 - (b) Close or household contact with a current case
 - (c) Abnormal CXR
 - (d) Prolonged therapy with immunosuppressive drugs
 - (e) HIV or other immunosuppressive disease
- (3) Avoid alcohol when taking INH
- (4) Side effects include paresthesias, seizures (toxic reaction), orthostatic hypotension, nausea and vomiting, hepatitis, and hypersensitivity
- b. Therapeutic
 - (1) For pulmonary TB, positive to negative sputum conversion and results of culture are usually available 3-8 weeks after initiation of therapy
 - (2) In most areas of the U.S., a combination of drugs
 - (a) Isoniazid
 - (b) Rifampin
 - (c) Pyrazinamide
 - (d) Ethambutol
 - (e) Streptomycin may be used after antibiotic sensitivity tests
- G. EMS workers must be aware that the greatest danger from TB is from multidrug resistant strains of the bacterium, which can render antibiotics ineffective, and prolong the infectiousness of a patient

XIII. Meningococcal meningitis (spinal meningitis)

- A. Causative organism
 - 1. Neisseria meningitidis, meningococcus
 - 2. Other organisms are known to cause meningitis, but N. meningitidis is specifically identified at the beginning of this section because, like M. tuberculosis, it is an airborne pathogen
- B. Tissues affected
 - 1. Colonize the lining of the throat and spread easily through respiratory secretions
 - 2. Estimated that 2 -10% of the population may carry meningococci at any one time, but are prevented from invading the meninges, and gaining access to the rich culture medium of the CSF by the throat's epithelial lining
- C. Modes of transmission
 - 1. Direct contact with a patient's secretions during intubation, suctioning, CPR, etc.
 - 2. Prolonged, direct contact
 - a. Respiratory droplets from nose and throat of affected individuals
- D. Susceptibility and resistance
 - 1. Almost every human has been a carrier at some point in their life
 - 2. Conversion from carrier to clinical disease is rare in developed countries (3 in 100,000 in the U.S.), and occurs in clusters in developing nations
 - a. Risk factors for an epidemic affect an entire population, not just scattered individuals
 - b. General level of immunity in these populations, called herd immunity, might change in the population over time
 - c. One theory - non-pathogenic Neisseria lactamica, which is a relative of N.

- meningitidis, causes antibody production which may also be protective against N. meningitidis
- d. Population studies in the meningitis belt in Africa have yielded seasonal variations in meningitis epidemics, implying that environmental factors are involved
 - e. Researchers in England and France have noted that illness is most prevalent in midwinter months, when cold viruses are common (noted in spring and fall in high schools and colleges)
- E. Signs and symptoms
- 1. Onset is rapid and typical symptoms include fever, chills, joint pain, neck stiffness or nuchal rigidity (pronounced on flexion), petechial rash, projectile vomiting, and headache
 - 2. Roughly 10% of patients may develop septic shock (Waterhouse-Friderichsen Syndrome)
 - a. Acute adrenal insufficiency, DIC and coma may result
 - b. Death can ensue in 6-8 hours
 - 3. Pediatric patients - infants 6 months to 2 years are especially susceptible; maternal antibodies protect neonates to 6 months
 - a. Infants display nonspecific signs such as fever, vomiting, irritability, and lethargy
 - b. Bulging of an open anterior fontanelle may be found in neonates
 - c. In older children, positive Kernig's and Brudzinski's signs may be found
- F. Patient management and protective measures
- 1. Protective measures should include BSI with surgical masks applied to patients displaying suggestive signs/ symptoms
 - 2. Effective prophylactic drug treatments of intimate contacts are available, and include rifampin, minocycline, ciprofloxacin, ceftriaxone, and spiramycin to prevent infection from the patient's nasal discharges
- G. Immunization and control measures
- 1. Vaccines are effective, especially for older children and adults, and have been instrumental in preventing outbreaks among military recruits in the U.S., which, prior to 1971, was a common occurrence
 - 2. Vaccines have been developed which are effective against the A, C, Y, and W-135 strains of meningococcus
 - 3. Outbreaks in the U.S. have primarily been of the A, B, and C strains
 - 4. Duration of protection is limited in children aged 1-3
 - a. An effective vaccine has not been developed for the B strain since it is not known to generate a strong enough antibody response
 - b. Routine vaccination is not recommended
 - c. Should be considered in a discrete population exposed to a serogroup for which an effective vaccine exists, i.e. not serogroup B
 - 5. Post EMS exposure activities should be addressed as part of an agency Exposure Control Plan
- H. Other infectious agents known to cause meningitis
- 1. Streptococcus pneumoniae (bacteria)
 - a. Second most common cause of meningitis in adults
 - b. Most common cause of pneumonia in adults
 - c. Most common cause of otitis media in children
 - d. Spread by droplets, prolonged personal contact, or contact with linen soiled with respiratory discharges
 - e. Episodic contact by EMS personnel should rarely result in infection, however, BSI

- applies since causative organism is never known by EMS
- f. Protective measures for EMS workers
- 2. Hemophilus influenza type B (bacteria)
 - a. Gram-negative rods
 - b. Mode of transmission same as for N. meningitidis (therefore, same considerations for BSI)
 - c. Prior to introduction of vaccination for children in 1981, it was the leading cause of meningitis in children aged 6 months to 3 years
 - d. Although treatment with antibiotics is very effective, over 50% of all infected children will have long-term neurologic sequelae
 - e. Also implicated in pediatric epiglottitis, septic arthritis, and generalized sepsis
- 3. Viruses (causes syndromes sometimes referred to as aseptic meningitis)
 - a. There are a variety of viruses known to cause meningeal signs and symptoms
 - (1) Most associated with other specific diseases
 - (2) Seasonal variations may occur
 - b. Not considered communicable

XIV. Pneumonia

- A. Etiologic agents/ causative organisms
 - 1. Bacterial (Streptococcus pneumoniae, Mycoplasma pneumoniae, Staphylococcus aureus, H. influenzae, Klebsiella pneumoniae, Moraxella catarrhalis, Legionella)
 - 2. Viral
 - 3. Fungal
- B. Systems affected
 - 1. Respiratory - pneumonia
 - 2. CNS - meningitis
 - 3. ENT - otitis, pharyngitis media
- C. Routes of transmission
 - 1. Droplet spread
 - 2. Direct contact
 - 3. Contact with linens soiled by respiratory secretions
- D. Susceptibility and resistance
 - 1. Susceptibility is increased by processes that adversely affect the status of respiratory tissues, i.e., pulmonary edema, influenza, exposure to inhaled toxins, chronic lung disease, and aspiration of any form (post alcohol ingestion, near-drowning, gastric distension from BVM ventilation)
 - 2. Geriatric patients are highly susceptible
 - 3. Pediatric patients with low birth weight and malnourishment are very susceptible
 - 4. Patients with the following diseases have increased susceptibility
 - a. Sickle cell disease
 - b. Cardiovascular disease
 - c. Anatomic or functional asplenia
 - d. Diabetes mellitus
 - e. Chronic renal failure or other kidney disease
 - f. HIV infection
 - g. Organ transplantation
 - h. Multiple myeloma, lymphoma, Hodgkin's disease

- E. Signs and symptoms
 1. Onset of pneumonia may be sudden with chills, high-grade fevers, chest pain with respirations, and dyspnea
 2. In children, fever, tachypnea, and chest retractions are ominous signs
 3. Purulent alveolar exudates may develop in one or more lobes
 4. Patient may cough up yellow-green phlegm
 - F. Patient management and protective measures
 1. Several effective antibiotics exist to treat bacterial pneumonia
 2. Multi-drug resistant strains have been reported
 3. Patient isolation generally not warranted except in clinical facilities where patient with a resistant strain may be in contact with other patients who have increased susceptibility to infection
 4. Protective measures for EMS workers
 - G. Immunization
 1. Vaccine exists for some causes of pneumonia
 2. Immunization of contacts, i.e., exposed EMS workers, is generally not recommended
- XV. Tetanus
- A. Causative organism - Clostridium tetani
 - B. System affected - musculoskeletal
 - C. Mode of transmission
 1. Tetanus spores introduced into the body through wounds, burns, or other disruptions in the integument
 2. Puncture wounds introducing soil, street dust, and animal or human feces
 3. Dead or necrotic tissue is an indication of a favorable environment for C. tetani
 4. Infection has often developed in wounds considered too trivial for medical consultation
 - D. Susceptibility and resistance
 1. Susceptibility is general, which is why tetanus immunization is recommended for the general population
 2. Subsequent recovery from infection does not confer immunity
 - E. Signs and symptoms
 1. Muscular tetany
 2. Painful contractions, particularly of the masseter (trismus or lockjaw) and neck muscles, secondarily of trunk muscles
 3. In pediatrics, abdominal rigidity may be the first sign
 4. Painful spasms often occur, with a characteristic facial contortion known as risus sardonicus, a grotesque grinning expression
 5. Tetanus can lead to respiratory failure
 - F. Patient management and protective measures
 1. Temporary passive immunity is provided by post-exposure administration of tetanus immune globulin or tetanus antitoxin (equine origin)
 2. Generally followed by active tetanus immunization with a booster
 - a. EMS workers - keep immunizations up to date
 3. EMS providers, when dealing with patients who have wounds, counsel them and document warnings about post-injury tetanus prophylaxis and effective debriding of tissue at the site of the wound
 - a. Ask patient about immunization status

- G. Immunization
 - 1. Generally begun during childhood
 - 2. Booster before entry into elementary school
 - 3. Booster every ten years thereafter
 - 4. Administered as a DPT, with immunization against diphtheria (laryngitis, pharyngitis with discharges) and pertussis (whooping cough)
 - 5. Booster administered every 10 years confers effective active immunity

- XVI. Rabies
 - A. Causative organism - rabies virus of the genus Lyssavirus
 - B. System affected - nervous system
 - C. Route of transmission
 - 1. Virus-laden saliva from a bite or scratch of an infected animal
 - 2. Transmission from person-to-person is theoretically possible, but has never been documented
 - 3. Airborne spread has been documented in bat caves, but these are rare
 - 4. Hawaii is the only area in the U.S. that is rabies free
 - 5. Transmission from vampire bats to domestic animals is common in Latin America, less common in U.S.
 - 6. In U.S., wildlife rabies is common in skunks, raccoons, bats, foxes, dogs, wolves, jackals, mongoose, and coyotes
 - D. Susceptibility and resistance
 - 1. Mammals are highly susceptible
 - 2. Humans are especially susceptible when bitten by infected animals
 - 3. Incubation period is usually 3-8 weeks, as short as 9 days (rare), and as long as 7 years
 - 4. Infectivity governed by severity of the wound, richness of nerve supply close to the wound, distance to CNS, amount and strain of virus, degree of protective clothing, and other factors
 - E. Signs and symptoms
 - 1. Onset is heralded by a sense of apprehension, headache, fever, malaise, and poorly-defined sensory changes
 - 2. Disease progresses to weakness or paralysis, spasm of swallowing muscles (causing hydrophobia or fear of water), delirium, and convulsions
 - 3. Without medical intervention, the disease lasts 2-6 days, often resulting from death due to respiratory failure
 - F. Patient management and protective measures
 - 1. EMS workers - transmission from human patients to health care workers has never been documented
 - 2. Health care workers should protect themselves with BSI
 - 3. Prevention of rabies after bite
 - a. Thorough debridement of wound without sutures unless necessary for tissue-support
 - b. Free bleeding and drainage is necessary
 - c. Vigorously clean the wound with soap and water (saliva is a risk from the infected animal) and irrigate with 70% alcohol
 - d. Administration of human rabies immune globulin
 - e. Immunization with Human Diploid Cell Rabies Vaccine, or Rabies Vaccine

- f. Tetanus prophylaxis and antibiotics as needed
 - G. Immunization and control measures
 - 1. Immunization of contacts with open wounds or exposure of mucous membranes to saliva should receive treatment
 - 2. Immunization should be directed towards individuals with high probability of contacting animal reservoirs (animal care workers, animal shelter personnel, outdoor workers)
- XVII. Viral diseases of childhood
- A. Chickenpox
 - 1. Causative organism - varicella- zoster virus, a member of the Herpesvirus group
 - 2. System affected - primarily integumentary
 - a. Herpes zoster (shingles) is a local manifestation of reactivation of latent viral infection of dorsal root ganglia and displays distribution along nerve fibers on the skin
 - 3. Mode of transmission - mainly airborne
 - a. Exposure to linen tainted with vesicle or mucous membrane discharges of infected persons has been implicated
 - 4. Susceptibility and resistance - general
 - a. Incubation period - 10 to 21 days
 - b. Most people develop immunity for life after recovery
 - c. More severe form of disease in adults
 - 5. Signs and symptoms
 - a. Begins with respiratory symptoms, malaise and low-grade fever
 - b. Rash begins as small red spots that become raised blisters on a red base These fluid-filled vesicles eventually collapse and dry into scabs
 - (1) Rash is profuse on trunk, and less so on extremities and scalp
 - 6. Patient management and protective measures
 - a. Isolation of children from school, medical offices, emergency departments, and public places until all lesions are crusted and dry
 - b. Antiviral drugs exist that shortens the duration of symptoms and pain in the older patient
 - c. EMS workers should observe BSI, pay attention to handling soiled linen, and hand washing
 - d. EMS workers who have not had chickenpox should inquire with their agency about receiving the chickenpox vaccine
 - (1) Data indicate adult antibody production in 82% after one dose, and 92% after two doses
 - (2) Vaccine should not be given to individuals receiving high doses of systemic steroids in the past month
 - (3) 5% of patients develop rash and some develop frank chickenpox, which is very debilitating in adults
 - e. VZIG (Varicella Zoster immune globulin) is recommended for pregnant women with a substantial exposure (household contact, close indoor contact > 1 hour, or prolonged direct face-to-face contact with infected person) to chickenpox with no history of previous exposure to chickenpox
 - B. Mumps
 - 1. Causative organism - mumps virus, a member of the genus Paramyxovirus

2. Organs/ systems affected
 - a. Salivary glands - usually parotid, sometimes sublingual and submaxillary
 - b. CNS as aseptic meningitis
 3. Mode of transmission
 - a. By droplet spread and direct contact with saliva of infected persons
 - b. Incubation period - 12 to 25 days
 4. Susceptibility and resistance
 - a. Susceptibility - general
 - b. Immunity is generally conferred after recovery or even after subclinical infection
 5. Signs and symptoms
 - a. Fever, swelling and tenderness of salivary glands, especially parotid
 6. Patient management and protective measures
 - a. EMS workers should not be working without an established MMR immunity
 - b. EMS workers should have patients wear surgical mask and be scrupulous with hand and arm washing after patient contact
 - c. Contact with soiled linen and objects that come into contact with the patient's respiratory mucous membranes (i.e., thermometers, inhalation supplies) should be handled with appropriate caution
 7. Effective immunization against mumps is available as either a single vaccine or in combination with rubella and measles (MMR)
- C. Rubella
1. Causative agent - rubella virus, of the genus Rubivirus
 2. Systems/ tissues affected - RES, integumentary, musculoskeletal, lymph nodes
 3. Modes of transmission
 - a. From public health standpoint, maternal transmission to fetus is the gravest risk because the rubella virus can cause developmental defects such as congenital heart diseases, eye inflammations, retardation, and deafness ; 90% of neonates born to mothers infected in the first trimester develop congenital rubella syndrome (CRS)
 - b. Person-to-person contact is via nasopharyngeal secretions
 - c. Infants with CRS shed large quantities of virus in their secretions
 4. Susceptibility and resistance
 - a. Susceptibility is general after loss of maternal antibodies
 - b. Natural infection and immunization generally confer active immunity which is generally lifelong
 5. Signs and symptoms
 - a. Rubella is generally mild, beginning with fever and flu symptoms, followed by the development of a red maculopapular
 - b. A rash that spreads from forehead to face to torso to extremities, and lasts 3 days, not 6
 - c. Serious complications, such as encephalitis, which occur in measles, do not occur in Rubella
 - d. Younger females sometimes develop a self-limiting arthritis
 6. Patient management and protective measures
 - a. BSI, including mask
 - b. Effective hand washing
 - c. All EMS workers, especially females, should be screened for immunity to rubella,

- d. and be effectively immunized before working
 - d. Unimmunized pregnant females exposed to rubella during the first trimester are at risk for abnormal fetal development
 - e. There is no specific treatment for rubella
 - 7. Immunization
 - a. Immunization is known to be 98-99% effective
 - b. Frequently combined with mumps and measles vaccine
 - c. Immunization is not recommended for pregnant women; possibility of vaccine causing developmental defects is theoretical only
- D. Measles (rubeola, hard measles)
 - 1. Causative organism - measles virus, of the genus Morbilli virus, family Paramyxoviridae
 - 2. Systems, organs, tissues affected - respiratory, CNS, pharynx, eyes, systemic
 - 3. Mode of transmission - nasopharyngeal air droplets and direct contact
 - 4. Susceptibility and resistance - general
 - a. Period of communicability is before the prodromal period to four days after appearance of the rash
 - b. Immunity acquired after illness is permanent
 - 5. Signs and symptoms
 - a. Prodrome - conjunctivitis, swelling of the eyelids, photophobia, high fevers to 105 degrees, hacking cough, and malaise
 - b. A day or 2 before the rash, patients develop small, red-based lesions with blue-white centers in the mouth, called Koplik's spots, sometimes disappearing with the eruption of generalized skin rash
 - c. The rash is red, slightly bumpy (maculopapular) and spreads from the forehead to the face, neck, torso, and hits the feet by the third day
 - d. The rash, which usually lasts for six days, initially appears thicker over the heads and shoulder, clears up, and follows that pattern towards the feet
 - e. Pneumonia, eye damage and myocarditis are all possible sequelae, but the most life-threatening is subacute sclerosing panencephalitis in which a child or adolescent may develop slowly progressing neurological disease with deterioration of mental capacity and coordination
 - 6. Patient management and protective measures
 - a. BSI, including mask
 - b. Effective hand washing
 - c. EMS and other health care workers should be effectively immunized to prevent transmission to pediatric patients
 - d. There is no specific treatment
 - 7. Immunization
 - a. Effective immunization should be instituted for every person, and is available for combination with other vaccines and/ or toxoids (MMR)
 - b. Immunization in children is believed to confer 99% immunogenicity
- E. Pertussis (Whooping cough)
 - 1. Causative organism - Bordetella pertussis
 - 2. What affected - oropharynx
 - 3. Mode of transmission - direct contact with discharges mucous membranes contained in airborne droplets
 - 4. Susceptibility and resistance

- a. General susceptibility
 - b. Infection generally confers immunity
 - c. Subsequent attacks after immunization in older children and adults in U.S. indicates that immunity may wane over time
5. Signs and symptoms
- a. Insidious onset of cough which becomes paroxysmal in 1-2 weeks, and lasts 1-2 months
 - b. Paroxysms are violent, sometimes without an intervening inhalation, causing the crowing or high-pitched inspiratory whoop and end with expulsion of clear mucous and vomiting
 - c. Whoop often not present in infants < 6 months and adults
6. Patient management and protective measures
- a. EMS and other health care workers should be cautious about handling linens, supplies and equipment on patients, both pediatric and adult, with a recent onset of paroxysmal cough; observe BSI and mask patient with surgical mask
 - b. Communicable period is thought to be greatest before the onset of paroxysmal, violent coughing
 - c. Incubation period - 6 to 20 days
 - d. Erythromycin is known to decrease the period of communicability, but can only reduce symptoms if given during the incubation period, before the onset of paroxysmal coughing
7. Immunization
- a. Generally given with tetanus and diphtheria vaccines (DTP)
 - b. Booster doses are recommended
- XVIII. Other viral diseases
- A. Influenza
- 1. Causative organism - influenza viruses types A, B, and C
 - a. These types have subtypes based on several different antigenic sites (determinants) and mutate so often that the variants are named by geographical site of isolation/ the culture number/ year of isolation, e.g., A/Japan/305/57
 - 2. System affected - primarily respiratory
 - 3. Mode of transmission
 - a. Airborne spread in crowded spaces, i.e., public transportation
 - b. Direct contact
 - c. Influenza virus can persist for hours, especially in low humidity, cold temperatures
 - d. Incubation period - 1 to 3 days
 - 4. Susceptibility and resistance
 - a. Susceptibility - general
 - b. Resistance is normally conferred after recovery, but only to specific strain or variant
 - c. Influenza viruses mutate often, so immunity is a relative concept insofar as they are concerned
 - 5. Signs and symptoms
 - a. URI-type symptoms which last 2-7 days
 - b. Cough is often severe and protracted
 - 6. Patient management and protective measures

- a. Patient treatment is supportive, generally untreated
 - b. EMS workers observe BSI, have patient wear surgical mask, and be scrupulous with hand washing after patient contact
 - c. Contact with soiled linen and objects that come into contact with the patient's respiratory mucous membranes (e.g., thermometers, inhalation supplies) should be handled with appropriate caution
7. Immunization
- a. Health care workers are urged to be immunized by mid-September with current influenza vaccine before flu season (November to March in U.S.)
 - b. Amantadine (Symmetrel®, Symadine®) or rimantadine (Flumadine®) may be given to institutionalized patients for effective protection against influenza A, by preventing the uncoating of influenza A
- B. Mononucleosis
- 1. Causative organism - Epstein-Barr virus
 - 2. Body regions/ organs/ systems affected - oropharynx, tonsils, RES
 - 3. Modes of transmission
 - a. Person-to-person spread by oropharyngeal route and saliva
 - (1) Kissing implicated in spread among adults
 - (2) Transmission from care providers to young children is common
 - b. Blood transfusions can be mode of transmission , but resultant clinical disease is uncommon
 - 4. Susceptibility and resistance
 - a. General
 - b. Infection by EBV generally confers a high degree of resistance
 - 5. Signs and symptoms
 - a. Mononucleosis is characterized by fever, sore throat, oropharyngeal discharges, lymphadenopathy (especially posterior cervical), and splenomegaly
 - (1) Recovery usually occurs in a few weeks but some people take months to regain their former level of energy
 - 6. Patient management and protective measures
 - a. No specific treatment is recommended for EBV symptoms; NSAIDs may be of value in symptomatic relief only
 - b. EMS workers should observe BSI
 - c. Effective hand washing
 - 7. Immunization unavailable
- C. Herpes simplex virus type 1
- 1. Causative organism - Herpes simplex virus type 1g (HSV 1)
 - 2. What affected - oropharynx, face, lips, skin, fingers, and toes, CNS in infants
 - 3. Modes of transmission
 - a. From saliva of carriers
 - b. Infection on the hands, fingers of health care workers from patients shedding HSV 1 can result in herpetic whitlow
 - 4. Susceptibility and resistance
 - a. Universal
 - 5. Signs and symptoms
 - a. Often manifested by cold sores and fever blisters, which are generally found on the lips, face, conjunctiva, or oropharynx

- b. In a small number of newborns, a meningoencephalitis may occur, with a similar adult syndrome of aseptic meningitis (5% of cases)
- 6. Patient management and protective measures
 - a. BSI, including a mask
 - b. Lesions are highly contagious so wearing of gloves, even at home and especially when skin is not intact, is mandatory to prevent development of herpetic whitlow
 - c. Treatment with acyclovir (Zovirax®) is of benefit when used topically, IV, or orally
- 7. No immunization available
- D. Other viral respiratory diseases
 - 1. Acute afebrile viral respiratory disease (excluding influenza)
 - a. Disease entities
 - (1) Viral rhinitis, pharyngitis (common cold or URI), laryngitis
 - (2) Lower respiratory tract (below the epiglottis) - croup, bronchitis, bronchiolitis
 - b. Can cause bacterial complications, which has contributed to the non-judicious use of antibiotics and emergence of multi-drug resistant strains of bacteria
 - c. Children are most adversely affected
 - d. Large number of viruses involved, but bacterial infections (legionellosis, Q fever, Group A Streptococcus, mycoplasmal pneumonia), for which specific treatments may be available, must be considered
 - 2. Acute febrile respiratory disease
 - a. Pharyngitis, tonsillitis, laryngitis, croup, bronchitis, bronchiolitis, pneumonitis, with fever
 - b. Caused by
 - (1) Parainfluenza virus, types 1, 2, 3
 - (a) Major cause of croup and one of the major viral agents responsible for bronchiolitis
 - (2) Respiratory syncytial virus (RSV)
 - (a) Major viral respiratory pathogen of infants < 2
 - (b) Usually spread from November - April
 - (c) RespiGam™ (RSV immune globulin) is a consideration
 - 3. BSI when handling patients, with consideration for applying surgical mask to patients

XIX. Sexually transmitted diseases

A. Syphilis

- 1. Causative organism - Treponema pallidum, a spirochete
- 2. What affected - skin, CNS, eyes, joints & skeletal system, kidneys, cardiovascular
- 3. Modes of transmission
 - a. By direct contact with exudates from moist, early, obvious or concealed lesions of skin and mucous membranes, or semen, blood, saliva, vaginal discharges
 - b. Via blood transfusion and needlestick injury (low risk)
- 4. Susceptibility and resistance
 - a. Susceptibility is general, and it is estimated that 30% of exposures result in infection
 - b. Infection results in development of gradual immunity, however, aggressive treatment of primary and secondary stages interferes with natural antibody development

5. Signs and symptoms - occurs in 4 stages
 - a. Primary stage - painless lesion develops at point of entry called a chancre, 3-6 weeks after the initial contact
 - b. Secondary stage - bacteremia stage begins approximately 6 weeks after the chancre has healed
 - (1) Rash (small, red, flat lesions) on palms and soles of feet, lasts about 6 weeks
 - (2) Condyloma latum - painless, wart-like lesion found in moist, warm sites like the inguinal area; this lesion is extremely infectious, lasts about 6 weeks
 - (3) Skin infection in areas of hair growth results in bald spots and/ or loss of eyebrows
 - (4) CNS, eyes, bone and joints, or kidneys may become involved
 - c. Third stage - latent syphilis
 - (1) 25% may relapse and develop secondary stage symptoms again
 - (2) After 4 years, there are generally no more relapses
 - (3) 33% of patients will progress to tertiary syphilis, the rest will remain asymptomatic
 - d. Tertiary syphilis
 - (1) Granulomatous lesions called gummas found on skin and bones; skin gummas are painless with sharp borders; bone lesions cause a deep, gnawing pain
 - (2) Cardiovascular syphilis
 - (a) Occurs 10 years after primary infection
 - (b) Generally results in dissecting aneurysm of ascending aorta or aortic arch; antibiotics do not reverse this disease process
 - (3) Neurosyphilis
 - (a) Asymptomatic
 - (b) Develop meningitis
 - (c) Develop spinal cord disease that results in loss of reflexes and loss of pain and temperature sensation
 - (4) Spirochetes attack cerebral blood vessels and cause a cerebrovascular occlusion
 - (a) Develop general paresis (of the insane) - progressive disease of cerebral cells leading to mental deterioration and psychiatric symptoms
 6. Patient management and protective measures
 - a. EMS personnel should observe BSI so as to avoid contact with syphilis lesions
 - b. Continuation of BSI during equipment cleaning is highly recommended, with effective hand washing
 - c. T pallidum is extremely fragile and is easily killed by heat, drying, or soap and water
 - d. Treatment is effective with penicillin, erythromycin, and doxycycline
 7. No immunization is available
- B. Gonorrhea
1. Causative organism - Neisseria gonorrhoeae
 2. What affected - genital organs and associated structures

3. Mode of transmission - direct contact with exudates of mucous membranes, almost always from unprotected sexual intercourse
 4. Susceptibility and resistance
 - a. Susceptibility is general
 - b. Antibodies develop after exposure, but only to the specific strains of *N. gonorrhoeae* that have infected the patient
 - c. Subsequent reinfection by other strains can therefore occur
 5. Signs and symptoms
 - a. In males
 - (1) An initial inflammation of the urethra, with dysuria and a purulent urinary discharge, sometimes from the urinary meatus in the absence of urine
 - (2) This, left untreated, can progress to an epididymitis, prostatitis, and strictures of the urethra
 - b. In females
 - (1) Dysuria and purulent vaginal discharge may occur
 - (2) The majority of females have no pain and minimal urethral discharge
 - (3) Gonococcal infection of the cervix can progress to pelvic inflammatory disease, causing fever, lower abdominal pain, abnormal menstrual bleeding, and cervical motion tenderness upon vaginal exam
 - (4) Menstruation allows the bacteria to spread from the cervix to the upper genital tract, and results in 50% of PID cases occurring within 1 week of the onset of menstruation
 - (5) Females are at increased risk for sterility, ectopic pregnancy, abscesses of the fallopian tubes, ovaries, or peritoneum, and peritonitis after gonococcal infection
 - c. In rare instances, a systemic bacteremia can occur
 - d. A septic arthritis with fever, pain, and swelling of 1 or 2 joints can occur, which, left untreated, can cause progressive deterioration of the joints
 6. Patient management and protective measures
 - a. EMS personnel must observe BSI when handling linen, supplies and equipment used in the care of patients with suspected *N. gonorrhoeae* infection (i.e. females with PID, patients with dysuria) and further appreciate that many are asymptomatic
 - b. Effective hand washing is mandatory
 - c. Effective antibiotic regimens exist for the treatment of infection
 7. No immunization available
- C. Chlamydia
1. Causative organism - *Chlamydia trachomatis* a gram-negative bacterium that can only survive inside a host cell by using the host's ATP
 2. What affected - eyes, genital area and associated organs, respiratory system
 3. Modes of transmission
 - a. Sexual activity
 - b. Hand-to-hand transfer of infected eye secretions; children are therefore the major reservoir
 - c. Sharing of contaminated clothing or towels
 4. Susceptibility and resistance
 - a. Susceptibility is general; estimated that up to 25% of men may be carriers
-

- 5. b. No acquired immunity after infection has been reported
- 5. Signs and symptoms
 - a. Similar to gonorrhea
 - b. Symptomatology often makes differentiation from gonorrhea difficult
 - c. Conjunctivitis known to occur from *C. trachomatis* infection; it is the leading cause of preventable blindness in the world
 - d. Infant pneumonia is known to occur from *C. trachomatis* infection after transit through an infected birth canal
 - e. Gynecological sequelae of *C. trachomatis* infection are same as *N. gonorrhea*
- 6. Patient management and protective measures
 - a. EMS personnel must observe BSI and effective hand washing
 - b. Effective antibiotic regimens exist for the treatment of infection and include tetracycline, doxycycline, and erythromycin, and p.o. azithromycin
- 7. No immunization available
- D. Herpes simplex virus type 2 (genital herpes)
 - 1. Causative organism - Herpes simplex virus type 2 (HSV 2)
 - 2. What affected - regions, tissues, and structures associated with intimate contact
 - 3. Mode of transmission - sexual activity
 - 4. Susceptibility and resistance - general susceptibility
 - 5. Signs and symptoms
 - a. Males - lesions of the penis, anus, rectum, and/ or mouth depending on sexual practices
 - b. Females - Sometimes asymptomatic; lesions of the cervix, vulva, anus, rectum and mouth depending on sexual practices; recurrent disease generally affects the vulva, buttocks, legs, and perineal skin
 - c. Infants - via the birth canal
 - 6. Patient management and protective measures
 - a. EMS personnel should observe BSI when handling linen, supplies, and equipment used in the care of patients with possibility of infection; this is a negligible risk if the skin is intact; treatment with acyclovir (Zovirax[®]) is of benefit when used topically, IV, or orally for genital herpes
 - 7. No immunization available
- XX. Scabies and Lice
 - A. Scabies
 - 1. Etiologic agent - *Sarcoptes scabiei*, a mite; Norwegian scabies the most severe variety
 - 2. What affected - skin
 - 3. Modes of transmission
 - a. Direct skin-to-skin contact, including sexual contact
 - b. Bedding is infectious only if it has been in contact with infected person immediately beforehand (last 24 hours)
 - c. Mite can burrow into the skin in 2.5 minutes
 - 4. Susceptibility and host factors
 - a. Susceptibility is general, but people with previous exposure
 - (1) Develop less mites on successive exposures
 - (2) Develop symptoms 1-4 days after exposure, as opposed to 2-6 weeks for people without previous exposure

- b. Mites are communicable until all mites and eggs are destroyed, normally after one, probably two treatments, spaced one week apart
- 5. Signs and symptoms
 - a. Intense itching, especially at night, with vesicles, papules, and linear burrows which contain the mites and eggs
 - b. Males - lesions prominent around finger webs, anterior surfaces of wrists and elbows, armpits, belt line, thighs and external genitalia
 - c. Females - lesions prominent on nipples, abdomen, and lower portion of buttocks
 - d. Infants - head, neck, palms, and soles may be involved, and are generally not seen in older adults
 - e. Complications generally due to infection of lesions that are broken from scratching
- 6. Patient management and protective measures
 - a. EMS personnel should handle patients, underclothing, and home bedding observing BSI, separate bagging of exposed ambulance linen
 - b. Personal - laundering of underwear, clothing, and bed sheets used in the 48 hours prior to treatment in hot cycles of washer/ dryer is of questionable benefit, unlike head lice infestation; more important in Norwegian scabies infestation
 - c. Treatment normally consists of Kwell[®], lindane, or other agents selected based on patient age, with specific instructions for concurrent cleansing of linen and clothing; over treatment should be avoided out of concern for toxicity
 - d. Family education important relative to use of insecticides and emphasis on environmental issues of washing bedding and clothing
- 7. No immunization is available
- B. Lice (pediculosis and phthiriasis)
 - 1. Infesting agents
 - a. *Pediculus humanus capitis* (head louse)
 - b. *Pediculus humanus corporis* (body louse) - involved in outbreaks of epidemic typhus, trench fever (WWI), and relapsing fever
 - c. *Phthirus pubis* (crab louse)
 - 2. What infested - as in description of infesting agents above
 - 3. Modes of transmission and host factors
 - a. Head lice and body lice - direct contact with an infested person and objects used by them
 - b. Body lice - indirect contact with their personal belongings, especially shared clothing and headwear
 - c. Crab lice - sexual contact
 - d. Lice leave febrile hosts; therefore, fever and overcrowding favor transmission
 - e. Eggs of head lice do not hatch at temperatures < 72° F
 - f. 3-stage life cycle - eggs, nymphs, adults
 - (1) Eggs hatch in 7-10 days
 - (2) Nymph stage lasts about 7-13 days, depending on temperature
 - (3) Egg-to-egg cycle lasts 3 weeks
 - 4. Susceptibility is general; repeated skin infestations may result in hypersensitivity
 - 5. Signs and symptoms - itching
 - a. Infestation of head lice is of hair, eyebrows, and eyelashes, mustache, and beards

- b. Infestation of body lice is of clothing, especially along the seams of the inner surfaces of clothing
- 6. Patient management and protective measures
 - a. Personal treatment - use of appropriate body/ hair pediculicide is recommended, repeated 7-10 days later
 - b. EMS personnel should observe BSI and bag linen separately
 - c. EMS workers should spray the patient compartment of the ambulance with an insecticide that is known to be effective for lice and mites
 - (1) Most of the commercially available sprays that contain pyrethrins, Malathion, or carbamates are adequate
 - (2) Lice and mites are not known to jump great distances like fleas so spraying the floor, stretcher and immediate area around the head of the stretcher, where the patient's head was, should be sufficient
 - (3) Clean all areas sprayed with an appropriate solution to remove insecticide residues
 - (4) Wear gloves during all steps above and practice effective hand washing when finished
- 7. Prevention - personal hygiene + environmental sanitation

XXI. Lyme disease

- A. Causative organism - *Borrelia burgdorferi*, a spirochete like the causative organism of syphilis
- B. What affected - skin, CNS, cardiovascular system, joints
- C. Mode of transmission - tick (vector) borne, with reservoirs in mice and deer
- D. Susceptibility and resistance
 - 1. Susceptibility - all persons are susceptible
 - 2. Reinfection has occurred in those treated with antibiotics for early disease, so probably no immunity occurs
- E. Signs and symptoms - stages that, like syphilis, occurs in phases
 - 1. An early localized stage with a painless skin lesion at the site of the bite, called erythema migrans (EM), and a flu-like syndrome with malaise, myalgia, and stiff neck
 - a. EM starts off as a red, flat, round rash which spreads out; the outer border remains bright red, with the center becoming clear, blue, or even necrose and turn black
 - b. Incubation period until EM - 3 to 32 days post tick exposure
 - 2. Early disseminated stage in which *B. burgdorferi* invades the skin, nervous system, heart, and joints
 - a. Skin - multiple EM lesions
 - b. Nervous system
 - (1) Invades brain, causing meningitis
 - (2) Invades cranial nerves, especially the 7th, and creates a Bell's palsy
 - (3) Invades motor/ sensory nerves and creates a peripheral neuropathy
 - c. Cardiac abnormalities
 - (1) Atrioventricular block
 - (2) Myocarditis and left ventricular dysfunction are less common
 - d. Joint and muscle pain - arthritis can occur 6 months after infection
 - 3. Late stage
 - a. About 10% of untreated patients develop a chronic arthritis that lasts for more

- than a year, and involves large joints such as the knee
- b. An encephalopathy can develop characterized by cognitive deficits, depression, and sleep disorders
- F. Patient management and control measures
 - 1. EMS personnel who work, or treat/ transport patients in a wilderness environment, should be vigilant to the presence of ticks on themselves and their patients
 - a. EMS workers should spray the patient compartment of the ambulance with an insecticide that is known to be effective for ticks
 - 2. There is no evidence of natural transmission from person-to-person
 - 3. Effective antibiotic regimens exist for treatment of EM, neurologic abnormalities, and arthritis associated with *B. burgdorferi* infection
- G. No immunization is available

XXII. Gastroenteritis

- A. Causative organisms
 - 1. Rotavirus, Norwalk virus, and many others
 - 2. Parasites - Protozoa Giardia lamblia, Cryptosporidium parvum, and Cyclospora cayetanensis
 - a. Contracted via fecal-oral transmission, contaminated food and water
 - b. Cyclosporidium reported to be contracted by swimming in contaminated waters
 - 3. Bacteria
 - a. Escherichia coli
 - b. Klebsiella pneumoniae
 - c. Enterobacter
 - d. Campylobacter jejuni
 - e. Vibrio cholerae
 - f. Shigella - not part of normal intestinal flora
 - g. Salmonella - not part of normal intestinal flora
- B. System affected - GI system
- C. Modes of transmission
 - 1. Fecal-oral
 - 2. Ingestion of infected food or non-potable water
- D. Susceptibility and resistance
 - 1. Travelers into endemic areas are more susceptible
 - 2. Populations in disaster areas, where water supplies are contaminated, are susceptible
 - 3. Native populations in endemic areas are generally resistant
- E. Signs and symptoms - nausea, vomiting, fever, abdominal pain and cramping, anorexia, lassitude, and frank shock
 - 1. Diarrhea of enteric bacteria - December 17, 1997 intestinal invasion
 - 2. Chronic gastritis and ulcers with abdominal pain, nausea, and "heartburn" are caused by Helicobacter pylori infection
- F. Patient management and protective measures
 - 1. EMS personnel - do not work when ill if your job involves patient contact
 - 2. Focused on environmental health and development/ availability of clean water reservoirs, food preparation and sanitation
 - 3. Disaster workers and travelers to endemic areas must be vigilant in knowing the sources of their water supplies or drink hot beverages that have been brisk-boiled or disinfected

- 4. Health care workers treating gastroenteritis patients must be careful to avoid habits that facilitate fecal-oral/ mucous membrane transmission, observe BSI and effective hand washing
- 5. Selected organisms may be sensitive to antibiotics; epidemic treatment is normally symptomatic
- G. Immunizations are unavailable for many of the enteric bacteria, which are part of the normal intestinal flora

XXIII. Reporting an exposure to an infectious/ communicable disease

- A. What constitutes an exposure - any specific eye, mouth, other mucous membrane, non-intact skin, parenteral contact with blood, blood products, or other potentially infectious materials should be considered an exposure incident
- B. Why it is important to report
 - 1. Permits immediate medical follow up, permitting identification of infection and immediate intervention
 - 2. Enables the Designated Officer (DO) to evaluate the circumstances surrounding the incident and implement engineering or procedural changes to avoid a future exposure
 - 3. Facilitates follow up testing of the source individual if permission for testing can be obtained
 - a. Under provisions of the Ryan White Act, the exposed employee has the right to request the infection status of the source patient from the patient's health care provider, but neither the agency nor the employee can force testing of the source individual
 - b. Employers must, and should as part of an effective Exposure Control Plan, tell the employee what to do if an exposure incident occurs
- C. Who to report to
 - 1. Ryan White Act stipulates that an employer will designate a person or officer within the organization to whom exposed employees will report
 - 2. That officer will then initiate those elements of the Exposure Control Plan to comply with standards and guidelines relative to the exposure
 - 3. Local reporting requirements
- D. Medical evaluation and follow up
 - 1. Employers must, by law, provide free medical evaluation and treatment to exposed employees, to include
 - a. Counseling about the risks, signs and symptoms, probability of developing clinical disease, and how to prevent further spread of the potential infection
 - b. Prescribe appropriate treatment in line with current U.S. Public Health Service recommendations
 - c. Discuss medications offered, side effects, contraindications
 - d. Evaluate any reported illnesses to determine if the symptoms could be related to HIV or hepatitis
 - 2. Steps involved
 - a. Blood test of exposed employee, contingent upon employee agreement
 - (1) Employee has the option to give blood sample, but refuse permission for HIV testing at the time the sample is drawn
 - (2) Employer must maintain the blood sample for 90 days in case the employee changes his/ her mind about testing, should HIV or hepatitis-

- like symptoms develop
 - b. A health care provider, acting as an agent of the employer, must provide counseling to the employee based on test results, provide informed consent about prophylaxis or therapeutic regimens, and implement those regimens with the approval of the employee
 - c. Vaccines should be made available to the employee, and all employees who have occupational exposure to blood and other potentially infectious materials
- E. Written opinion and confidentiality
- 1. The health care provider will provide a written report to the Designated Officer (DO) of the employer, and simply identifies whether vaccination was recommended to the exposed employee, and whether or not the employee received vaccination
 - 2. The written report from the employee's health care provider must also note that the employee was informed of the results of the evaluation and told of any medical conditions resulting from the occupational exposure which may require further evaluation or treatment
 - a. A copy must be provided to the employee, and to the Designated Officer for the agency's files
 - 3. Any other elements of the medical record are confidential, and cannot be supplied to the employer
 - a. Employee must give written consent for anyone to see the records
 - b. Records must be maintained for the duration of employment plus 30 years to comply with OSHA standards on access to employee exposure and medical records
- F. Preventing disease transmission
- 1. Don't go to work
 - a. If you have diarrhea
 - b. If you have a draining wound or any type of wet lesions; wait until lesions are crusted and dry
 - c. If you are jaundiced
 - d. If you have been told you have mononucleosis
 - e. If you have not been treated with a medication and/ or shampoo for lice and scabies
 - f. Until you have been taking antibiotics for at least 24 hours for a strep throat
 - g. If you have a cold; if you must go to work, wear a surgical mask to protect your patients
 - h. Ensure that your immunization status is current relative to
 - (1) MMR
 - (2) Hepatitis B, A (if deemed appropriate by your agency)
 - (3) DPT
 - (4) Polio
 - (5) Chickenpox
 - (6) Influenza (seasonally)
 - (7) Rabies, if appropriate to your occupational/ recreational risk
 - i. Approach with caution, and the right attitude
 - j. Control the scene - an uncontrolled scene increases the likelihood for transmission of body fluids
 - k. Observe BSI

- (1) Always wear gloves
 - (2) If chance of splash, wear protective eyewear or face shield
 - (3) If large volumes of blood are possibility, go one step further and wear gown
 - (4) When contacting a possible TB patient, wear appropriate particulate mask
- l. Patients with coughs, headaches, general weakness, recent weight loss, stiff necks, high fevers, and taking medications suggestive of an infectious process are tipoffs in history-taking, with experience, the list will get longer for you
 - m. Develop your cognitive base so that you can recognize patients who may be immunocompromised
 - n. Don't treat your patient differently because you think there is the possibility of an infectious process
 - o. Don't avoid doing things for your patient because you think there is the possibility of an infectious process
 - p. After the call, disinfect your equipment and patient compartment of the ambulance with a disinfectant (1:100 Lysol®) that claims bactericidal activity against *M. tuberculosis*, which will kill the hepatitis viruses
 - (1) Any soap kills HIV
 - (2) Use high level disinfection on laryngoscope blades
 - q. If after a call with lice, scabies, ticks or other insect vectors
 - (1) Spray the stretcher and patient compartment with an insecticide, then wipe off/ mop up insecticide residue
 - (2) Bag the linen separately, and ensure that it not be taken home; bottom line is that it needs to be washed separately
 - (3) Report any infectious exposure to the designated officer/ manager of your agency identified as such
- 2. Effective hand washing, to include the webs of the hands
 - 3. The major infectious diseases that EMS personnel should have in-depth knowledge of for purposes of regulatory compliance
 - a. HIV
 - b. Hepatitis (all types that are bloodborne)
 - c. Tuberculosis
 - d. Meningococcal meningitis
 - 4. The major points of each infectious/ communicable disease
 - a. Identify causative organisms as bacteria, virus, or parasite, without necessarily knowing genus and species
 - b. Modes of transmission
 - c. Signs and symptoms
 - d. How to avoid infection
 - e. Understand the concept of occupational risk
 - (1) Appreciate that infectious agent mode of entry, virulence, dose, and host resistance factors combine to define risk, or potential for infection
 - (2) Just because there is risk, doesn't mean that you will become infected
 - (3) Not all infectious diseases are communicable and do not always pose risks to family members
 - (4) Risk and potential does not necessarily equate to probability; HIV is a

good example - risks for infection may appear to be high, but the probability of occupational exposure is very low (0.2-0.44%)

5. Identify what constitutes an exposure
 6. Identify the local protocols associated with reporting and recording an exposure
 7. Identify the paramedic's role and responsibility in reporting and documenting an exposure
 8. Identify other individuals' roles and responsibilities associated with the local protocols for reporting and recording an exposure
- G. Medical and legal aspects of reporting and recording an exposure

XXIV. Integration

- A. Out-of-hospital personnel deal with very few infectious disease emergencies, but must be vigilant about consequences to themselves, as well as their patients and coworkers, based on daily, often unknown exposures to infectious agents
- B. Universal/ standard precautions (applicable mostly to clinical and research facilities) for EMS personnel are superseded by body substance isolation guidelines, based upon the premise that all body fluids, in any situation, may be infectious

UNIT TERMINAL OBJECTIVE

5-12 At the end of this unit, the paramedic student will be able to describe and demonstrate safe, empathetic competence in caring for patients with behavioral emergencies.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 5-12.1 Define behavior and distinguish between normal and abnormal behavior. (C-1)
- 5-12.2 Define behavioral emergency. (C-1)
- 5-12.3 Discuss the prevalence of behavior and psychiatric disorders. (C-1)
- 5-12.4 Discuss the factors that may alter the behavior or emotional status of an ill or injured individual. (C-1)
- 5-12.5 Describe the medical legal considerations for management of emotionally disturbed patients. (C-1)
- 5-12.6 Discuss the pathophysiology of behavioral and psychiatric disorders. (C-1)
- 5-12.7 Describe the overt behaviors associated with behavioral and psychiatric disorders. (C-1)
- 5-12.8 Define the following terms: (C-1)
 - a. Affect
 - 2. Anger
 - 3. Anxiety
 - 4. Confusion
 - 5. Depression
 - 6. Fear
 - 7. Mental status
 - 8. Open-ended question
 - 9. Posture
- 5-12.9 Describe the verbal techniques useful in managing the emotionally disturbed patient. (C-1)
- 5-12.10 List the reasons for taking appropriate measures to ensure the safety of the patient, paramedic and others. (C-1)
- 5-12.11 Describe the circumstances when relatives, bystanders and others should be removed from the scene. (C-1)
- 5-12.12 Describe the techniques that facilitate the systematic gathering of information from the disturbed patient. (C-1)
- 5-12.13 List situations in which the EMT-P is expected to transport a patient forcibly and against his will. (C-1)
- 5-12.14 Identify techniques for physical assessment in a patient with behavioral problems. (C-1)
- 5-12.15 Describe methods of restraint that may be necessary in managing the emotionally disturbed patient. (C-1)
- 5-12.16 List the risk factors for suicide. (C-1)
- 5-12.17 List the behaviors that may be seen indicating that patient may be at risk for suicide. (C-1)
- 5-12.18 Integrate the pathophysiological principles with the assessment of the patient with behavioral and psychiatric disorders. (C-3)
- 5-12.19 Differentiate between the various behavioral and psychiatric disorders based on the assessment and history. (C-3)
- 5-12.20 Formulate a field impression based on the assessment findings. (C-3)
- 5-12.21 Develop a patient management plan based on the field impressions. (C-3)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

5-12.22 Advocate for empathetic and respectful treatment for individuals experiencing behavioral emergencies. (A-3)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

5-12.23 Demonstrate safe techniques for managing and restraining a violent patient. (P-1)

DECLARATIVE

- I. Introduction
 - A. Behavior
 - 1. Concept of normal behavior
 - a. Disagreement over what is "normal"
 - b. No clear definition or ideal model
 - c. Ideas of normal vary by culture/ ethnic group
 - d. Society accepts it
 - 2. Concept of abnormal behavior
 - a. Maladaptive behavior is more useful term
 - b. Deviates from society's norms and expectations
 - c. Interferes with well being and ability to function
 - d. Harmful to individual or group
 - 3. Concept of behavioral emergencies
 - a. Unanticipated behavioral episode
 - b. Behavior that is threatening to patient or others
 - c. Requires immediate intervention by emergency responders (police, EMS, etc.)
 - B. Behavioral and psychiatric disorders
 - 1. Description
 - a. Covers a broad range of conditions of varying severity
 - b. Group of disorders characterized by abnormal or maladaptive behavior
 - (1) Disturbance in normal functioning
 - (2) May be caused by emotional or physiologic conditions
 - (3) Create undesirable consequences
 - 2. Recognized types/ classifications
 - a. Cognitive disorders
 - b. Schizophrenia and other psychotic disorders
 - c. Mood disorders
 - d. Anxiety disorders
 - e. Substance related disorders
 - f. Somatoform disorders
 - g. Factitious disorders
 - h. Dissociative disorders
 - i. Eating disorders
 - j. Impulse control disorders
 - k. Personality disorders
 - C. Epidemiology
 - 1. Incidence/ magnitude of mental health problem
 - a. Estimates vary with some as high as 20% of population
 - b. Incapacitates more people than all other health problems combined
 - c. Some researchers estimate that 1 person out of every 7 will require treatment for an emotional disturbance
 - 2. Common misconceptions
 - a. Abnormal behavior is always bizarre
 - b. All mental patients are unstable and dangerous
 - c. Mental disorders are incurable
 - d. Having a mental disorder is cause for embarrassment and shame

II. General psychopathology, assessment and management

A. Psychopathology

1. Biological/ organic
 - a. Diseases/ toxins
 - (1) Metabolic diseases
 - (2) Infections, tumors
 - (3) Alcohol, drugs
 - b. Heredity
2. Psychosocial
 - a. Childhood trauma
 - b. Parental deprivation
 - c. Dysfunctional family structure
3. Socio-cultural
 - a. Environmental violence
 - (1) War, riots
 - (2) Rape, assault
 - b. Death of a loved one
 - c. Economic/ employment problems
 - d. Prejudice and discrimination
 - e. Cultural norms and expectations

B. Assessment

1. Scene size-up
 - a. Determine if a violent or potentially unsafe situation exists
 - (1) Highest priority
 - (2) Consider need for assistance from public safety personnel
 - (3) Avoid becoming a victim
 - b. In the absence of obvious danger, observe scene for information to assist with patient assessment and care
 - (1) Signs of violence
 - (2) Evidence of substance abuse
 - (3) General environmental condition
2. Initial assessment
 - a. Limit number of people around patient, isolate patient if necessary
 - b. Maintain alertness to danger
 - c. Determine presence of life threatening medical conditions
 - d. Rapid assessment of ABCs with intervention if required
 - e. Observe overt behavior (affect) of patient and body language (posture, gestures, etc.)
 - f. Note evidence of rage, elation, hostility, depression, fear, anger, anxiety, confusion, etc.
3. Focused history and physical examination
 - a. Remove patient from crisis or disturbing situation
 - b. Center questions on immediate problem
 - c. Establish rapport
 - (1) Utilize therapeutic interviewing techniques
 - (a) Engage in active listening
 - (b) Be supportive and empathetic
 - (c) Limit interruptions

- (d) Respect patient's territory, limit physical touch
- (2) Avoid threatening actions, statements and questions
- (3) Approach slowly and purposefully
- d. Note assessment findings
 - (1) Physical/ somatic complaints
 - (2) Intellectual functioning
 - (a) Orientation
 - (b) Memory
 - (c) Concentration
 - (d) Judgement
 - (3) Thought content
 - (a) Disordered thoughts
 - (b) Delusions, hallucinations
 - (c) Unusual worries, fears
 - (4) Language
 - (a) Speech pattern and content
 - (b) Garbled or unintelligible
 - (5) Mood
 - (a) Anxiety, depression, elation, agitation
 - (b) Level of alertness, distractibility
 - (6) Appearance, hygiene, dress
 - (7) Psychomotor activity
- 4. Management considerations
 - a. Treat existing medical problems
 - b. Maintain safety
 - c. Control violent situations
 - d. Medical legal considerations
 - (1) Standard of care
 - (2) Consent
 - (3) Limitations of legal authority
 - (4) Restraints
 - e. Remain with patient at all times
 - f. Avoid challenging personal space
 - g. Avoid judgements
 - h. Transport against patient's will when
 - (1) Patient presents threat to self or others
 - (2) Ordered by medical direction
 - (3) Implemented by law enforcement authorities, if at all possible
 - i. Types of restraints
 - (1) Wrist/ waist/ ankle leather or velcro straps
 - (2) Full jacket restraint
 - (3) Other

III. Specific behavioral/ psychiatric disorders

- A. Cognitive disorders
 - 1. Psychopathology
 - a. Organic etiology
 - (1) Disease processes
 - (a) Metabolic disorders
 - (b) Infections

- (c) Neoplastic disease/ tumors
 - (d) Endocrine disorders
 - (e) Degenerative diseases
 - (f) Cardiovascular disease
 - (2) Physical/ chemical injury
 - (a) Trauma
 - (b) Drug abuse
 - (c) Drug reaction
 - b. Disturbance of cognitive functioning
 - c. Types
 - (1) Delirium
 - (2) Dementia
 - 2. Delirium
 - a. Inattention
 - b. Memory impairment
 - c. Disorientation
 - d. Clouding of consciousness
 - e. Vivid visual hallucinations
 - 3. Dementia
 - a. Pervasive disturbance in cognitive functions
 - (1) Abstract thinking
 - (2) Judgement
 - b. Aphasia
 - c. Social impairments
 - 4. General management for cognitive disorders
 - a. Protect and support
 - b. Assess and treat co-existing emergency medical problems
 - c. Transport to appropriate facility
- B. Schizophrenia
- 1. Psychopathology
 - a. Gross distortions of reality
 - b. Withdrawal from social interaction
 - c. Disorganized thought, perception and emotion
 - d. Sub-types
 - (1) Schizophrenia
 - (2) Paranoia
 - (3) Others
 - 2. Assessment findings
 - a. Delusions
 - b. Hallucinations
 - c. Disorganized speech
 - d. High risk for suicidal and homicidal behavior
 - 3. Management
 - a. Protect patient and others
 - b. Maintain alertness for aggressive/ violent behavior
 - c. Appropriately restrain if needed
 - d. Manage existing medical emergencies
- C. Anxiety disorders
- 1. General psychopathology
 - a. Apprehension, fears and worry dominate psychological life
 - b. Affects 2-4% of population
 - c. Increased autonomic activity

- d. Types
 - (1) Panic disorders
 - (2) Phobias
 - (3) Posttraumatic syndrome
 - 2. Panic disorders
 - a. Assessment findings
 - (1) Recurrent attacks of sudden anxiety
 - (a) Surges of extreme dread
 - (b) Symptoms develop over a few minutes
 - (c) Unprovoked or related to particular stimulus
 - (2) Autonomic signs and symptoms
 - (a) Chest tightness, shortness of breath, hyperventilation
 - (b) Palpitations, dizziness, sweating
 - (3) May mimic a variety of medical emergencies
 - b. Management
 - (1) Assess for organic causes
 - (2) Provide empathetic reassurance
 - (3) Treat hyperventilation
 - (4) Consult medical direction for pharmacological intervention
 - 3. Phobias - exaggerated, sometimes disabling, frequently inexplicable fear
 - a. Assessment findings
 - b. Management
 - 4. Posttraumatic syndrome
 - a. Assessment findings
 - (1) Anxiety reaction to a severe psychosocial event
 - (a) Usually life threatening, i.e., military service, rape
 - (b) Repetitive, intrusive memories
 - (2) Depression, sleep disturbances, nightmares
 - (3) Survivor guilt
 - (4) Frequently complicated by substance abuse
 - b. Management
 - (1) Support and protect
 - (2) Transport for psychiatric assistance
- D. Mood disorders
- 1. Psychopathology and assessment
 - a. Depression
 - (1) Impaired normal functioning
 - (2) One of the most prevalent major psychiatric condition - affects 10-15% of general population
 - (3) Episodic with periods of remission
 - (a) Gradual or rapid onset
 - (b) Clustering of episodes
 - (4) Major cause of suicide - 15% risk
 - (5) Signs and symptoms of depression
 - (a) Persistent, unrelenting sadness
 - (b) Inability to experience pleasure
 - (c) Loss of normal activity
 - (d) Sleep disturbances, loss of appetite

- (e) Psychomotor agitation or retardation
 - (6) Potential for suicide
 - (a) Recent depression
 - (b) Recent loss (example - family member death, financial setback, divorce, etc.)
 - (c) One of the leading causes of death in 15-45 year olds
 - (d) Women attempt suicide more frequently than men
 - (e) Men actually commit suicide more frequently than women
 - (f) Older men - over 55 years of age - are most likely to succeed at suicide
 - (g) Thoughts about and plans for suicide
 - (h) The more detailed a plan for suicide, the greater the risk
 - (i) Alcohol ingestion frequently occurs with suicide gestures
 - b. Bipolar
 - (1) Alternating periods of depression with manic behavior
 - (2) Elation or irritability
 - (3) Expansive, energetic, gregarious
 - (4) Quickly becomes argumentative and hostile if thwarted
 - (5) Depressive periods greater than manic episodes
 - (6) Decreased need to sleep
 - (7) Racing thoughts, speech
 - (8) Delusional
 - (a) Grandiose ideas
 - (b) Unrealistic plans
 - 2. Management
 - a. Protect and support
 - b. Maintain supportive, calm environment
 - c. Avoid confrontational comments if patient is manic
 - d. Do not leave alone if patient is depressed or suicidal
 - e. Treat existing medical emergencies
 - E. Substance related disorders
 - 1. Dependence
 - 2. Abuse
 - 3. Intoxication
 - F. Somatoform disorders
 - 1. Somatization
 - 2. Conversion disorder
 - G. Factitious disorders
 - H. Dissociative disorders
 - I. Eating disorders
 - 1. Anorexia nervosa
 - 2. Bulimia nervosa
 - J. Impulse control disorders
 - K. Personality disorders
- IV. Special behavioral problems
- A. The suicidal patient
 - B. The violent patient

C. Behavioral problems in children

UNIT TERMINAL OBJECTIVE

- 5-13 At the end of this unit, the paramedic student will be able to utilize gynecological principles and assessment findings to formulate a field impression and implement the management plan for the patient experiencing a gynecological emergency.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 5-13.1 Review the anatomic structures and physiology of the female reproductive system. (C-1)
- 5-13.2 Identify the normal events of the menstrual cycle. (C-1)
- 5-13.3 Describe how to assess a patient with a gynecological complaint. (C-1)
- 5-13.4 Explain how to recognize a gynecological emergency. (C-1)
- 5-13.5 Describe the general care for any patient experiencing a gynecological emergency. (C-1)
- 5-13.6 Describe the pathophysiology, assessment, and management of specific gynecological emergencies. (C-1)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 5-13.7 Value the importance of maintaining a patient's modesty and privacy while still being able to obtain necessary information. (A-2)
- 5-13.8 Defend the need to provide care for a patient of sexual assault, while still preventing destruction of crime scene information. (A-3)
- 5-13.9 Serve as a role model for other EMS providers when discussing or caring for patients with gynecological emergencies. (A-3)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 5-13.10 Demonstrate how to assess a patient with a gynecological complaint. (P-2)
- 5-13.11 Demonstrate how to provide care for a patient with: (P-2)
 - 1. Excessive vaginal bleeding
 - a. Abdominal pain
 - b. Sexual assault

DECLARATIVE

- I. Introduction
 - A. Disorders in the female reproductive system can lead to gynecological emergencies
 - B. Etiology
 - 1. Acute or chronic infection
 - 2. Hemorrhage
 - 3. Rupture
 - 4. Ectopic pregnancy
 - C. Some conditions can be life-threatening without prompt intervention

- II. Review of the anatomy and physiology of the female reproductive system
 - A. Identification and physiology of specific body parts
 - 1. External genitalia (vulva)
 - a. Mons pubis
 - b. Labia
 - (1) Majora
 - (2) Minora
 - c. Prepuce
 - d. Clitoris
 - e. Vestibule
 - f. Urinary meatus
 - g. Orifice of urethra
 - h. Vaginal orifice
 - i. Hymen
 - j. Perineum
 - k. Anus
 - 2. Internal genitalia
 - a. Vagina
 - b. Cervix
 - (1) Cervical canal
 - c. Uterus
 - (1) Fundus
 - (2) Body
 - (3) Uterine cavity
 - (4) Endometrium
 - (5) Myometrium
 - d. Fallopian tubes
 - e. Ovaries
 - (1) Corpus luteum
 - (2) Follicles

- (3) Oocytes
- B. Normal physiology
 - 1. Menstruation
 - a. Normal discharge
 - (1) Blood, mucous, cellular debris from uterine mucosa
 - b. Approximately every 28 days
 - c. Menarche
 - (1) Initial onset occurring during puberty
 - d. Menopause
 - (1) Cessation of ovarian function
 - (2) Cessation of menstrual activity
 - (3) Average age late 40s
 - 2. Ovulation
 - a. Egg (ovum) released from ovary following breaking of follicle
 - b. Usually occurs 14 days after the beginning of the menstrual cycle
 - 3. Menstrual and ovarian cycles
 - a. Proliferative phase
 - (1) Increase in endometrium thickness
 - (a) stimulated by estrogen increase
 - (2) Anterior pituitary hormones released
 - (a) Stimulates cells producing estrogen
 - (b) Initiates ovarian cycle
 - (3) Phase maintained by increased estrogen production
 - b. Secretory phase
 - (1) Follows ovulation
 - (2) Influenced by estrogen and progesterone
 - (3) Prepares the endometrium for gestation
 - (a) Gestation - period from fertilization until birth
 - c. Menstrual phase
 - (1) Occurs when ovum is not fertilized
 - (2) Discharge lasts on average 4-6 days
 - (3) Flow averages 25-60 ml
 - (4) Absent during pregnancy

III. General assessment findings of the patient with a gynecological emergency

- A. History of present illness
 - 1. SAMPLE
 - a. Associated symptoms

- (1) Febrile
- (2) Diaphoresis
- (3) Syncope
- (4) Diarrhea
- (5) Constipation
- (6) Urinary cramping
- 2. Check for pain or discomfort
 - a. OPQRST
 - b. Abdominal
 - c. Dysmenorrhea - painful menstruation
 - d. Aggravation
 - (1) During ambulation
 - (2) Dyspareunia - pain during intercourse
 - (3) Defecation
 - e. Alleviation
 - (1) Positioning
 - (2) Ceasing activity
- 3. Present health
 - a. Note any preexisting conditions
- B. Obstetric history
 - 1. Gravida
 - a. Number of pregnancies
 - 2. Para
 - a. Number of pregnancies carried to term
 - 3. Previous cesarean sections
 - 4. Last menstrual period
 - a. Date
 - b. Duration
 - c. Normalcy
 - d. Bleeding between periods
 - e. Regularity
 - 5. Possibility of pregnancy
 - a. Missed or late period
 - b. Breast tenderness
 - c. Urinary frequency
 - d. Morning sickness
 - (1) Nausea and/ or vomiting
 - e. Sexually active
 - (1) Unprotected sex
 - 6. History of previous gynecological problems
 - a. Infections
 - b. Bleeding
 - c. Miscarriage
 - d. Abortion

- e. Ectopic pregnancy
- 7. Present blood loss
 - a. Color
 - b. Amount
 - (1) Pads per hour
 - c. Duration
- 8. Vaginal discharge
 - a. Color
 - b. Amount
 - c. Odor
- 9. Use and type of contraceptive
 - a. Birth control pills
 - b. Intrauterine device
 - c. Spermicides
 - d. Condoms
 - e. Diaphragm
 - f. Withdrawal
 - g. Rhythm
 - h. Tubal ligation
 - i. Depo-provera
 - j. Norplant
- 10. History of trauma to the reproductive system
- 11. Emotional distress
 - a. Degree
- C. Physical examination
 - 1. Comforting attitude
 - a. Protect modesty
 - b. Maintain privacy
 - c. Be considerate of reasons for patient discomfort
 - 2. Level of consciousness
 - 3. General appearance
 - a. Skin and mucous membrane color
 - (1) Cyanosis
 - (2) Pallor
 - (3) Flushed
 - b. Vital signs
 - (1) Orthostatic measurement discrepancies
 - c. Check for bleeding and discharge
 - (1) Color
 - (2) Amount
 - (3) Evidence of clots and/ or tissue
 - d. Auscultate the abdomen
 - (1) Absence of bowel sounds
 - (2) Hyperactive bowel sounds

- e. Palpate the abdomen
 - (1) Masses
 - (2) Areas of tenderness
 - (3) Guarding
 - (4) Distention
 - (5) Rebound tenderness

IV. General management

A. Support airway, breathing

- 1. Oxygen
 - a. High flow PRN
 - b. Ventilate as necessary
- 2. Circulation
 - a. Intravenous access
 - (1) Typically not necessary
 - (2) If patient is demonstrating signs of impending shock or has excessive vaginal bleeding
 - (a) Large bore IV in a large vein
 - (b) Normal saline or lactated Ringers
 - (c) Flow rate based on patient presentation
 - (d) Consider a second line
 - b. Monitor and evaluate for serious bleeding
 - (1) Do not pack dressings in vagina
 - (2) Discourage use of tampon
 - (3) Keep count of pads used
 - c. Shock impending
 - (1) Trendelenburg
 - (2) Consider use of PASG
- 3. Non-pharmacological intervention
 - a. Position of comfort and care
 - (1) Based on patient's presentation
 - (2) Left lateral recumbent
 - (3) Knee/ chest
 - (4) Hips raised/ knees bent
 - b. Cardiac monitoring PRN
 - c. Consider possibility of pregnancy
 - (1) Be prepared for delivery
 - (2) Consider ectopic pregnancy
- 4. Pharmacological intervention
 - a. Analgesia typically not appropriate
 - (1) Masks symptoms for medical diagnosis
 - (2) May mask deteriorating condition (e.g. emergent shock)

5. Transport consideration
 - a. Physician evaluation necessary
 - b. Surgical intervention may be necessary
 - c. Consider emergency transport to an appropriate facility
 6. Psychological support
 - a. Calm approach
 - b. Maintain modesty/ privacy
 - c. Gentle care
- V. Specific gynecological emergencies
- A. Non traumatic abdominal pain
 1. Pelvic inflammatory disease
 - a. Incidence
 - (1) Affects about 1 million women annually
 - b. Cause
 - (1) Acute or chronic infection
 - (a) Gonorrhea
 - (b) C. Trachomatis
 - (c) Chlamydia
 - (d) Staphylococci
 - (e) Streptococci
 - c. Organs affected by PID
 - (1) Initial access through vagina, ascends to other organs
 - (a) Cervix
 - (b) Uterus/ endometrium
 - (c) Fallopian tubes
 - (d) Ovaries
 - (e) Uterine and ovarian support structures
 - (f) Liver
 - d. Complications
 - (1) Sepsis
 - (2) Infertility
 - e. Specific assessment findings
 - (1) Lower abdominal pain
 - (2) Fever may be present
 - (3) Vaginal discharge
 - (4) Dyspareunia
 - (5) Patient doubled over when ambulating
 - (6) Abdominal guarding
 - (7) Acute onset typically within approximately one week of menstrual period
 - (8) Ill appearance

- f. Management
 - (1) See "general management"
- 2. Ruptured ovarian cyst
 - a. Incidence
 - (1) Typically spontaneous
 - (2) May be associated with mild abdominal injury, intercourse, or exercise
 - b. Cause
 - (1) Typically a benign cyst
 - (2) Thin walled fluid filled sac
 - c. Organs affected
 - (1) Develops on ovary
 - d. Complications
 - (1) Significant internal bleeding could occur, but is rare
 - e. Specific assessment findings
 - (1) May have sudden onset of severe lower abdominal pain
 - (2) Typically affects one side, may radiate to back
 - (3) Rupture may result in some vaginal bleeding
 - f. Management
 - (1) See "general management"
- 3. Cystitis
 - a. Incidence
 - (1) Frequent
 - b. Cause
 - (1) Infection (usually bacterial)
 - c. Organs affected
 - (1) Bladder and ureters
 - d. Complications
 - (1) If untreated, may lead to pyelonephritis
 - e. Specific assessment findings
 - (1) Suprapubic tenderness
 - (2) Frequency of urination
 - (3) Dysuria - painful urination
 - (4) Blood in urine
 - f. Management
 - (1) See "general management"
- 4. Mittelschmerz
 - a. Incidence
 - (1) Typically midway into menstrual cycle
 - b. Cause
 - (1) Pain occurring at time of ovulation

- (2) Possibly related to peritoneal irritation secondary to follicular leakage/ bleeding during ovulation
 - c. Organs affected
 - (1) Ovary
 - (2) Follicles
 - d. Complications
 - (1) Typically not immediate life-threat
 - (2) Requires physician evaluation
 - e. Specific assessment findings
 - (1) Unilateral lower quadrant abdominal pain
 - (2) Low grade fever
 - (3) Symptoms similar to ruptured ovarian cyst
 - f. Management
 - (1) See "general management"
5. Endometritis
- a. Incidence
 - (1) Occurs most often after childbirth or abortion
 - b. Cause
 - (1) Infection, resulting in inflammation of the endometrial lining
 - c. Organs affected
 - (1) Uterus
 - (2) Fallopian tubes
 - d. Complications
 - (1) If untreated, may lead to sepsis and death
 - (2) Sterility
 - e. Specific assessment findings
 - (1) Lower abdominal pain
 - (2) Purulent vaginal discharge
 - f. Management
 - (1) See section "management of non-traumatic abdominal pain"
6. Endometriosis
- a. Incidence
 - (1) Most common in women who defer pregnancy
 - (2) Average women in her late 30s
 - b. Cause
 - (1) Growth of endometrial tissue outside of uterus
 - c. Organs affected
 - (1) Fallopian tubes
 - (2) Pelvic organs

- (3) Bowel
- (4) Bladder
- (5) Ligaments
- d. Complications
 - (1) Painful intercourse
 - (2) Painful menstruation
 - (3) Painful bowel movements
- e. Specific assessment findings
 - (1) Severe pain during and immediately following intercourse and bowel movement
- f. Management
 - (1) See "general management"
- 7. Ectopic pregnancy
 - a. Incidence
 - (1) Consider possibility for any female of reproductive age with abdominal pain (see obstetrics unit for detail)
- 8. Vaginal bleeding
 - a. Incidence
 - (1) Rarely a 9-1-1 call unless severe
 - b. Causes
 - (1) Menstruation
 - (a) Never assume that your emergency call for vaginal hemorrhage is due to normal menstruation
 - (b) Menorrhagia (heavy vaginal bleeding)
 - (2) Abortion/ miscarriage
 - (a) Assume always during first and second trimester of known or possible pregnancy
 - (b) Consider if last menstrual period > 60 days
 - (c) May have history of similar events
 - (d) Note particularly any tissue or large clots
 - i) If possible, collect material for pathological review
 - (e) Emotional support extremely important
 - (3) Placenta previa/ placenta abruption
 - (a) Vaginal bleeding in third trimester
 - (b) Always a serious emergency
 - (4) Other causes
 - (a) Lesion
 - (b) PID

- (c) Trauma
 - (d) Onset of labor
 - c. Organs affected
 - (1) Female sexual organs
 - d. Complications
 - (1) May be life-threatening
 - (2) May lead to hypovolemic shock and death
 - e. Specific assessment findings
 - (1) Onset of symptoms
 - (2) Additional physical examination
 - (a) Check for impending shock; orthostatic vital signs
 - (b) Presence and volume of vaginal blood
 - f. Management
 - (1) See "general management"
 - B. Traumatic abdominal pain
 - 1. Vaginal bleeding
 - a. Incidence
 - (1) Increasing
 - b. Causes
 - (1) Straddle injuries
 - (2) Blows to the perineum
 - (3) Blunt force to lower abdomen
 - (a) Assault
 - (b) Seat belt injuries
 - (4) Foreign bodies inserted into the vagina
 - (5) Abortion attempts
 - (6) Soft tissue injury
 - c. Organs affected
 - (1) Any or all of the pelvic organs
 - d. Complications
 - (1) Severe bleeding
 - (2) Organ rupture
 - (3) Hypovolemic shock
 - e. Specific assessment findings
 - (1) Consistent with severe internal injuries
 - f. Management
 - (1) See "general management"

VI. Sexual assault

- A. General findings and management
 - 1. History
 - a. Do not inquire regarding the patient's sexual history or practices

- b. Do not ask questions that may cause patient to have guilt feelings
- 2. Common reactions
 - a. May range from anxiety to withdrawal and silence
 - b. Denial, anger and fear are normal behavior patterns
- 3. Assessment
 - a. Examine the genitalia only if necessary
 - (1) Presence of severe injury
 - b. Explain all procedures before doing an examination
 - c. Avoid touching the patient without permission
 - d. Maintain the patient's privacy/ modesty
 - e. Check for other physical injury
- 4. Management
 - a. Psychological support is very important
 - b. Provide a safe environment
 - c. Respond to victim's wishes to talk or not to talk
 - d. Do not use invasive procedures unless the situation is critical
 - e. This is a crime scene - preserve any evidence
 - (1) Handle clothing as little as possible
 - (2) Paper bag each item separately
 - (3) Ask the patient not to change clothes, bathe, or douche
 - (4) Do not disturb the scene if possible
 - (5) Do not clean wounds unless absolutely necessary
 - (6) Do not allow the patient to drink or brush their teeth
 - f. Maintain a non-judgmental/ professional attitude
 - (1) Be aware of your own feelings and prejudices
 - g. Have female personnel attend to the female patient whenever possible
 - (1) Ask if female personnel are preferred
 - h. Provide reassurance to patient of such
 - (1) Confidentiality is critical

UNIT TERMINAL OBJECTIVE

- 5-14 At the completion of this unit, the paramedic student will be able to apply an understanding of the anatomy and physiology of the female reproductive system to the assessment and management of a patient experiencing normal or abnormal labor.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 5-14.1 Review the anatomic structures and physiology of the reproductive system. (C-1)
- 5-14.2 Identify the normal events of pregnancy. (C-1)
- 5-14.3 Describe how to assess an obstetrical patient. (C-1)
- 5-14.4 Identify the stages of labor and the paramedic's role in each stage. (C-1)
- 5-14.5 Differentiate between normal and abnormal delivery. (C-3)
- 5-14.6 Identify and describe complications associated with pregnancy and delivery. (C-1)
- 5-14.7 Identify predelivery emergencies. (C-1)
- 5-14.8 State indications of an imminent delivery. (C-1)
- 5-14.9 Explain the use of the contents of an obstetrics kit. (C-2)
- 5-14.10 Differentiate the management of a patient with predelivery emergencies from a normal delivery. (C-3)
- 5-14.11 State the steps in the predelivery preparation of the mother. (C-1)
- 5-14.12 Establish the relationship between body substance isolation and childbirth. (C-3)
- 5-14.13 State the steps to assist in the delivery of a newborn. (C-1)
- 5-14.14 Describe how to care for the newborn. (C-1)
- 5-14.15 Describe how and when to cut the umbilical cord. (C-1)
- 5-14.16 Discuss the steps in the delivery of the placenta. (C-1)
- 5-14.17 Describe the management of the mother post-delivery. (C-1)
- 5-14.18 Summarize neonatal resuscitation procedures. (C-1)
- 5-14.19 Describe the procedures for handling abnormal deliveries. (C-1)
- 5-14.20 Describe the procedures for handling complications of pregnancy. (C-1)
- 5-14.21 Describe the procedures for handling maternal complications of labor. (C-1)
- 5-14.22 Describe special considerations when meconium is present in amniotic fluid or during delivery. (C-1)
- 5-14.23 Describe special considerations of a premature baby. (C-1)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 5-14.24 Advocate the need for treating two patients (mother and baby). (A-2)
- 5-14.25 Value the importance of maintaining a patient's modesty and privacy during assessment and management. (A-2)
- 5-14.26 Serve as a role model for other EMS providers when discussing or performing the steps of childbirth. (A-3)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 5-14.27 Demonstrate how to assess an obstetric patient. (P-2)
- 5-14.28 Demonstrate how to provide care for a patient with: (P-2)
 - 1. Excessive vaginal bleeding
 - 2. Abdominal pain
 - 3. Hypertensive crisis
- 5-14.29 Demonstrate how to prepare the obstetric patient for

- delivery. (P-2)
- 5-14.30 Demonstrate how to assist in the normal cephalic delivery of the fetus. (P-2)
- 5-14.31 Demonstrate how to deliver the placenta. (P-2)
- 5-14.32 Demonstrate how to provide post-delivery care of the mother. (P-2)
- 5-14.33 Demonstrate how to assist with abnormal deliveries. (P-2)
- 5-14.34 Demonstrate how to care for the mother with delivery complications. (P-2)

DECLARATIVE

I. Introduction

- A. Pregnancy results from ovulation and fertilization
 - 1. Most pregnancies are uncomplicated
 - 2. Complications can occur
 - a. Eclampsia/ pre-eclampsia
 - b. Diabetes
 - c. Hypotension/ hypertension
 - d. Cardiac disorders
 - e. Abortion
 - f. Trauma
 - g. Placenta abnormalities
- B. Childbirth involves labor and delivery
 - 1. Childbirth is a natural process, often only requiring basic assistance
 - 2. Throughout the process, the paramedic is caring for two patients, not one
 - 3. Complications can occur
 - a. Breech/ limb presentation
 - b. Multiple births
 - c. Umbilical cord problems
 - d. Disproportion
 - e. Excessive bleeding
 - f. Pulmonary embolism
 - g. Neonate requiring resuscitation
 - h. Preterm labor

II. Review of the anatomy and physiology of the female reproductive system

- A. Normal events of pregnancy
 - 1. Ovulation
 - 2. Fertilization
 - a. Occurs in distal third of fallopian tube
 - 3. Implantation
 - a. Occurs in the uterus
- B. Accessory structures of pregnancy
 - 1. Placenta
 - a. Transfer of gases
 - (1) Oxygen and carbon dioxide
 - b. Transport other nutrients
 - (1) Glucose
 - (2) Potassium, sodium, chloride
 - c. Excretion of wastes

- (1) Urea, uric acid, creatine diffuse into maternal blood
- d. Hormone production
 - (1) Placenta acts as temporary endocrine gland
 - (2) Secretes estrogen, progesterone, etc.
 - (a) Prevents menses
 - (b) Causes anatomical changes in preparation of childbirth
- e. Protection
 - (1) Provides partial barrier against harmful substances
 - (2) Does not protect against steroids, narcotics, some antibiotics
- 2. Umbilical cord
 - a. Connects placenta to fetus
 - b. Contains two arteries and one vein
- 3. Amniotic sac and fluid
 - a. Membrane surrounding fetus
 - b. Fluid originates from fetal sources - urine, secretions
 - c. Between 500 and 1000 ccs of fluid after 20 weeks
 - d. Rupture of the membrane produces watery discharge
- C. Fetal growth process
 - 1. End of 3rd month
 - a. Sex may be distinguished
 - b. Heart is beating
 - c. Every structure found at birth is present
 - 2. End of 5th month
 - a. Fetal heart tones can be detected
 - b. Fetal movement may be felt by the mother
 - 3. End of 6th month
 - a. May be capable of survival if born prematurely
 - 4. Approximately middle of 10th month
 - a. Considered to have reached full term
 - b. Expected date of confinement (EDC)
- D. Obstetric terminology
 - 1. Antepartum - before delivery
 - 2. Postpartum - after delivery
 - 3. Prenatal - existing or occurring before birth
 - 4. Natal - connected with birth
 - 5. Gravida - number of pregnancies
 - 6. Para - number of pregnancies carried to full term
 - 7. Primigravida - a woman who is pregnant for the first time

8. Primipara - a woman who has given birth to her first child
9. Multiparous - a woman who has given birth multiple times
10. Gestation - period of time for intrauterine fetal development

III. General assessment of the obstetric patient

- A. Initial assessment
- B. History of present illness
 1. SAMPLE
 - a. Pertinent medical history
 - (1) Diabetes
 - (2) Heart disease
 - (3) Hypertension/ hypotension
 - (4) Seizures
 2. Current health of patient
 - a. Pre-existing conditions
 - b. Prenatal care
 - (1) None
 - (2) Physician
 - (3) Nurse midwife
- C. Obstetrical history
 1. Length of gestation
 2. Primipara or multiparous
 3. Previous cesarean sections
 4. Previous gynecologic or obstetric complications
 5. Contractions
 6. Patient states that "the baby is coming"
 7. Anticipating normal delivery (versus multiple births, etc.)
 8. Pain
 - a. OPQRST
 9. Vaginal bleeding
 - a. Presence
 - b. Amount
 - c. Color
 - d. Duration
 10. Vaginal discharge
 - a. Presence
 - b. Amount
 - c. Color
 - d. Duration
- D. Physical examination

1. Comforting attitude and approach
 - a. Protect patient modesty
 - b. Maintain privacy
 - c. Be considerate of reasons for patient discomfort
2. Recognition of pregnancy
 - a. Breast tenderness
 - b. Urinary frequency
 - c. Amenorrhea
 - d. Nausea, vomiting (morning sickness)
 - e. Uterine
3. Evaluating uterine size
 - a. Between weeks 12 and 16
 - (1) Visually and by palpation to be above the symphysis pubis
 - b. 20 weeks
 - (1) At the level of the umbilicus
 - c. At term
 - (1) Near the xiphoid process
4. Presence of fetal movements
 - a. By observation
 - b. By questioning the patient
5. Presence of fetal heart tones
 - a. Audible at approximately the 20th week
 - b. May be detected earlier with fetal doppler
 - c. Normal rate 120 to 160 beats per minute
6. Vital signs
 - a. Consider orthostatic
7. Genital inspection
 - a. When indicated
 - b. Visually inspect for crowning and/ or vaginal bleeding

IV. General management of the obstetric patient

- A. Basic treatment modalities
 1. Airway, breathing, circulation
 2. Administer oxygen
 - a. High-flow, high-concentration PRN
 3. Non-pharmacologic intervention
 - a. Position of comfort and care
 - (1) Left lateral recumbent after the 24th week, if not in active labor
 - b. Monitor cardiac rhythm
 - c. Evaluate the fetus status if possible
 - d. Treat for hypotension if necessary

4. Pharmacological intervention
 - a. IV access
 - (1) Large bore
 - (2) Volume expander
 - (3) Consider second line
 - b. Analgesia may be appropriate
 - (1) Consider the possibility of masking symptoms or a deteriorating condition
 - (2) Consider potential fetal impact
 - (3) Nitrous oxide is the analgesia of choice
 5. Transport the patient emergently
 6. Psychological support
 - a. Calm approach
 - b. Maintain modesty/ privacy
- V. Specific complications of pregnancy
- A. Trauma
 1. Minor trauma common in the obstetric patient
 - a. Reasons
 - (1) Syncopal episodes
 - (2) Diminished coordination
 - (3) Loosening of the joints
 2. Major trauma
 - a. Susceptible to a life-threatening episode due to increased vascularity
 - (1) May deteriorate suddenly
 3. Abdominal trauma
 - a. Premature separation of the placenta
 - b. Premature labor
 - c. Abortion
 - d. Rupture of the uterus
 - e. Fetal death
 - (1) Death of the mother
 - (2) Separation of the placenta
 - (3) Maternal shock
 - (4) Uterine rupture
 - (5) Fetal head injury
 - B. Vaginal bleeding
 1. Abortion/ miscarriage
 - a. Classifications
 - (1) Complete
 - (a) Uterus completely evacuates fetus, placenta, and decidual lining
 - (2) Incomplete

- (a) Some placental tissue remaining in uterus after expulsion of fetus
- (3) Spontaneous
 - (a) Occur before 20th week, due to maternal or ovular defects
- (4) Criminal
 - (a) Intentional ending of pregnancy under any condition not allowed by law
- (5) Therapeutic
 - (a) End pregnancy as thought necessary by a physician
- (6) Threatened
 - (a) Vaginal bleeding during first half of pregnancy
- (7) Inevitable
 - (a) Severe cramping and cervix effacement and dilation
 - (b) Attempts to maintain pregnancy are useless; changes are irreversible
- b. Incidence
 - (1) Assume during first and second trimester of known pregnancy
- c. Specific assessment findings
 - (1) Additional history
 - (a) Statement that she has recently passed tissue vaginally
 - (b) Complaint of abdominal pain and cramping
 - (c) History of similar events
 - (2) Additional physical examination
 - (a) Evaluate impending shock - check orthostatic vital signs
 - (b) Presence and volume of vaginal blood
 - (c) Presence of tissue or large clots
- d. Additional management
 - (1) Collect and transport any passed tissue, if possible
 - (2) Emotional support extremely important
- 2. Ectopic pregnancy
 - a. Incidence
 - (1) Approximately 1 of every 200 pregnancies
 - (2) Most are symptomatic and/or detected 2-12 weeks gestation
 - b. Cause

- (1) Ovum develops outside the uterus
 - (a) Previous surgical adhesions
 - (b) Pelvic inflammatory disease
 - (c) Tubal ligation
 - (d) Use of an IUD
- c. Organs affected
 - (1) Fallopian tube
- d. Complications
 - (1) May be life-threatening
 - (2) May lead to hypovolemic shock and death
- e. Specific assessment findings
 - (1) Severe abdominal pain, may radiate to back
 - (2) Amenorrhea - absence of monthly blood flow and discharge
 - (3) Vaginal bleeding absent or minimal
 - (4) Upon rupture, bleeding may be excessive
 - (5) Shock signs and symptoms
 - (6) Additional history
 - (a) Previous surgical adhesions
 - (b) Pelvic inflammatory disease
 - (c) Tubal ligation
 - (d) Use of an IUD
 - (e) Previous ectopic pregnancy
 - (7) Additional physical examination
 - (a) Check for impending shock - orthostatic vital signs
 - (b) Presence and volume of vaginal blood
- f. Additional management:
 - (1) See "general management"
 - (2) Second large bore IV line
 - (3) Trendelenburg, if shock impending
 - (4) Emergency transport to nearest surgically capable facility
- 3. Placenta previa
 - a. Incidence
 - (1) About 1 in 300
 - (2) Higher in preterm births
 - b. Cause
 - (1) Placenta implantation in lower uterus; covering cervix opening
 - (2) Associate with increasing age, multiparity, previous cesarean sections, intercourse
 - c. Organs affected
 - (1) Placenta, uterus

- d. Complications
 - (1) Placental insufficiency and fetal hypoxia
- e. Specific assessment findings
 - (1) Bright red blood flow without pain or uterine contractions
- f. Additional management
 - (1) Emergency transport to appropriate facility
 - (2) Definitive treatment is cesarean section
- 4. Abruptio placenta
 - a. Incidence
 - (1) Occurs in up to 2% of pregnancies
 - (2) Occurs in 1 in 200 deliveries
 - (3) 1 out of 400 fetal deaths
 - (4) Typically a third trimester complication
 - (5) Associated with hypertension, preeclampsia, trauma, multiparity
 - b. Cause
 - (1) Premature separation of placenta from uterus
 - c. Organs affected
 - (1) Placenta, uterus
 - d. Complications
 - (1) Fetal hypoxia and death
 - e. Specific assessment findings
 - (1) Third trimester bleeding
 - (2) Acute alteration in the contraction pattern
 - (3) Uterus becomes tender
 - (4) Uterus becomes board-like if hemorrhage retained
 - (5) Symptoms of shock inconsistent with amount of visible bleeding
 - f. Additional management
 - (1) Assess fetal heart tones often
 - (2) Transport in LLR position unless Trendelenburg is indicated
 - (3) Emergency transport of patient to an appropriate facility
 - (a) Definitive treatment is a cesarean section
- C. Complications of pregnancy
 - 1. Exacerbation of pre-existing medical conditions
 - a. Diabetes
 - (1) May become unstable during pregnancy
 - (2) Higher incidence of coma
 - b. Hypertension

- (1) May be complicated by pre-eclampsia/
eclampsia
 - (2) More susceptible to additional complications
 - (a) Cerebral hemorrhage
 - (b) Cardiac failure
 - (c) Renal failure
 - c. Neuromuscular disorders
 - (1) May be aggravated by pregnancy
 - d. Cardiac disorders
 - (1) Additional stress on the heart
 - (a) Cardiac output increases 30% by week 34
2. Medical complications of pregnancy
- a. Toxemia (pre-eclampsia/ eclampsia)
 - (1) Incidence
 - (a) Serious condition
 - (b) Pregnancy induced hypertension (PIH)
 - i) Hypertension, with albuminuria
and/ or edema
 - ii) After the 20th week of gestation
 - (2) Cause
 - (a) Associated with first birth, multiple
births, excessive amniotic fluid
 - (b) Pre-existing conditions
 - i) Hypertension
 - ii) Renal disease
 - iii) Diabetes
 - (3) Organs affected
 - (4) Complications
 - (a) Convulsions seriously threaten the
fetus by abruptio placenta
 - (5) Specific assessment findings
 - (a) Occurs in the last trimester of
pregnancy
 - (b) Pre-eclampsia is non-convulsive state
of toxemia
 - (c) Pre-eclampsia has two of the following
three signs
 - i) Hypertension (B/P > 140/90 - acute
systolic rise > 20 and diastolic
rise > 10)
 - ii) Fluid retention with excessive
weight gain
 - iii) Proteinuria
 - (d) Eclampsia includes convulsions

- (e) Additional history
 - i) Hypertension
 - ii) Excessive weight gain with edema and/ or seizures
- (f) Additional physical exam
 - i) Headaches and/ or epigastric pain; possible seizure
 - ii) Visual problems
- (6) Additional management
 - (a) If a seizure has not occurred
 - i) Keep patient calm and quiet
 - ii) IV access
 - iii) Darken ambulance
 - iv) Position patient left lateral recumbent
 - v) Transport gently
 - vi) Minimize stimuli to avoid precipitating seizure
 - vii) Consider magnesium sulfate
 - (b) If a seizure is occurring
 - i) IV access
 - ii) Consider the administration of 5 to 10 mg of diazepam IV push
 - iii) Administer 2 to 5 grams of magnesium sulfate diluted in 50 to 100 ccs of D₅W, slow IV push
 - (c) If a seizure has recently occurred, but no longer active
 - i) Consider magnesium sulfate
 - (d) Definitive treatment is cesarean section
- b. Diabetes
 - (1) Can be caused by pregnancy
- c. Supine-hypotensive syndrome
 - (1) Incidence
 - (a) Occurs near term
 - (2) Cause
 - (a) Abdominal mass compresses the inferior vena cava
 - i) Reduces pre-load, and thereby cardiac output
 - (3) Organs affected
 - (4) Complications
 - (5) Specific assessment findings

- (a) Check to see if volume depletion is the problem
- (b) Additional history
 - i) Recent medical history including diarrhea, vomiting
 - ii) Problem coincidental to supine positioning
- (c) Additional physical exam
 - i) Orthostatic vital signs
 - ii) Tenting of skin
- (6) Additional management
 - (a) If not volume depletion
 - i) Transport left lateral recumbent
 - (b) If possibility of volume depletion
 - i) Consider 2 large bore IVs
 - ii) Volume replacement
 - iii) Transport left lateral recumbent as precaution
- 3. Braxton-Hicks contractions
 - a. Incidence
 - (1) Benign phenomenon that simulates labor
 - (2) Usually occurs after the third month of pregnancy
 - b. Specific assessment findings
 - (1) Contractions are generally painless and may be helped by walking
 - c. Additional management
 - (1) None
- 4. Preterm labor
 - a. Incidence
 - (1) Labor that begins prior to 38 weeks gestation
 - (2) Incidence varies with age, presence of multiple gestations and other risk factors
 - b. Causes
 - (1) Physiologic abnormalities (multiple factors)
 - (2) Uterine or cervical anatomical abnormalities
 - (3) Premature rupture of membranes
 - (4) Multiple gestations
 - (5) Intrauterine infections
 - c. Complications
 - (1) Premature delivery of infant
 - d. Specific assessment findings
 - (1) Contractions that result in the progressive

- dilation or effacement of the cervix (not a field assessment)
 - (2) May be difficult to differentiate labor from Braxton-Hicks contractions (false labor)
 - e. Additional management
 - (1) Requires transport for evaluation and treatment by an appropriate health care provider
 - (2) Consideration of tocolysis if not contraindicated
 - (a) Rest
 - (b) Fluids (IV or even PO in some cases)
 - (c) Sedation
 - (d) May require administration of a tocolytic at the receiving facility (magnesium sulfate, a beta agonist or indocin)
- VI. VI Normal childbirth
- A. Characteristics of labor
 - 1. Discomfort in the back and/ or the abdomen
 - 2. Contractions occurring at regular intervals
 - a. Increasing frequency and intensity of contractions
 - b. Time from the beginning of one contraction to the beginning of the next
 - B. Stages of labor
 - 1. Stage I (Dilatation Stage)
 - a. Onset of regular uterine contractions to complete cervical dilation
 - b. Average time
 - (1) 12.5 hours in primipara
 - (2) 7 hours in multipara
 - 2. Stage II (Expulsion Stage)
 - a. Full dilatation of the cervix to the delivery of the newborn
 - b. Average time
 - (1) 80 minutes in a primipara
 - (2) 30 minutes in a multipara
 - 3. Stage III (Placental Stage)
 - a. Immediately following delivery of the baby until expulsion of the placenta
 - b. Average time
 - (1) 5 to 20 minutes

- C. Progression of labor
 - 1. First stage of labor
 - a. Contractions
 - (1) Typically begin short and gently
 - (2) Occur at intervals of ten to fifteen minutes
 - b. Effacement
 - (1) Thinning and shortening of the cervix
 - c. Cervical dilation
 - (1) Stretching of the opening of the cervix to accommodate baby
 - 2. Second stage of labor
 - a. Contractions
 - (1) Stronger and longer
 - (2) Lasting 50-70 seconds
 - (3) Occurring at intervals of 2-3 minutes
 - b. Amniotic sac typically ruptures
 - c. Urge to bear down or push becomes very strong
 - d. Crowning
 - (1) Largest part of the fetal head is visible
- D. Delivery process
 - 1. The decision to transport
 - a. Related to the imminence of delivery
 - (1) Number of pregnancies
 - (a) Labor is shortened with multiparity
 - (2) Frequency of contractions
 - (a) Two minutes apart may signal imminent delivery
 - (3) Maternal urge to push
 - (a) Desire to push signals imminent delivery
 - (4) Crowning of the presenting part
 - (a) Imminent delivery
 - b. Related to the presence of complications
 - (1) Abnormal presentations
 - (2) Fetal distress
 - (3) Multiple births
 - 2. Delivery of the newborn
 - a. Prepare a delivery area
 - (1) Clean, adequate space
 - b. Provide oxygen to the mother
 - (1) Nonrebreather or nasal cannula
 - c. Establish an IV
 - (1) KVO/ TKO rate
 - d. Position mother on her back and drape

- appropriately
- e. Monitor the fetal heart rate, if time allows
- f. Coach the mother in breathing patterns
- g. Encourage mother to push with contractions
- h. Establish body substance isolation practices
- i. Control the delivery of the fetal head
 - (1) Apply gentle hand pressure on the head
 - (2) Beware of fontanelle
 - (3) Support the head as it delivers
- j. Tear amniotic sac if it continues to cover the baby's head
 - (1) Permits escape of amniotic fluid
 - (2) Allows the newborn to start breathing
- k. Check for the presence of the umbilical cord wrapped around the neck
 - (1) Carefully remove it
- l. Suction the neonate's mouth and nose
- m. Provide support as the head rotates and the shoulders deliver
 - (1) Keep the neonate's head above the level of the vagina
- n. Clamp the umbilical cord
 - (1) First clamp approximately 4 inches from neonate
 - (2) Second clamp approximately 6 inches from the neonate
 - (3) Cut the cord between the two clamps
- o. Support and evaluate the neonate following delivery
- 3. Delivery of the placenta
 - a. Usually occurs 5-20 minutes after delivery of neonate
 - b. Do not delay transport to wait for the delivery of the placenta
 - c. If it delivers, place the placenta in a plastic bag
- E. Additional care
 - 1. Care for the mother
 - a. Excessive bleeding
 - (1) Perform fundal massage of the uterus
 - (a) Stimulates contraction
 - (b) Breast feeding stimulates contraction of the uterus
 - (2) Manage any perineal tears by direct pressure

- b. Observe and monitor the mother
 - (1) Signs of hemorrhage and stability of pulse and blood pressure
- 2. Neonate care

VII. Routine care of the neonate (for more detail, see neonatology unit)

- A. Care within first minute following delivery
 - 1. Support
 - a. Newborns are slippery
 - b. Use both hands to support the head and torso
 - c. Work closely to surface of the stretcher, bed, floor
 - 2. Dry
 - 3. Maintain warmth
 - a. Hypothermia is a major concern
 - b. Prevent heat loss by quickly drying and then covering the newborn, especially the head
 - 4. Positioning
 - a. Position the newborn on his/her side
 - b. Place on warm clean object, such as sterile towels
 - 5. Clear airway
 - a. Repeat suction of the nose and mouth
 - b. Wipe away secretions with sterile gauze
 - 6. Tactile stimulation
 - a. Usually adequately done through drying and clearing the airway
 - b. Purpose to initiate respirations
 - c. Slap or flick soles of feet or rub newborn's back for additional stimulation
- B. Care following first minute
 - 1. Evaluation
 - a. Apgar scoring
 - (1) Completed at 1 and 5 minute intervals
 - (2) Based on assigning 0-2 values for 5 elements
 - (a) Appearance (color)
 - i) Blue/ pale
 - ii) Pink body/ blue extremities
 - iii) Completely pink
 - (b) Pulse
 - i) Absent
 - ii) Slow (< 100 bpm)
 - iii) Over 100 bpm

- (c) Grimace (reflex irritability to stimulation)
 - i) No response
 - ii) Grimace
 - iii) Cries
 - (d) Activity (muscle tone)
 - i) Limp
 - ii) Some extremity flexion
 - iii) Active movement
 - (e) Respiration
 - i) Absent
 - ii) Slow/ irregular
 - iii) Good strong cry
 - (3) Scores average 8-10
 - (4) Score of less than 6 requires resuscitation
 - (5) Do not delay any resuscitation efforts to assign Apgar scores
2. Resuscitation
- a. Incidence
 - (1) Approximately 6% of hospital newborns require resuscitation
 - (2) Believed to be higher for out-of-hospital deliveries
 - b. Causes
 - (1) Premature birth
 - (2) Pregnancy and delivery complications
 - (3) Inadequate prenatal care
 - (4) Maternal health problems
 - c. Begun when tactile stimulation fails to initiate adequate respirations
 - (1) Do not need to wait to complete Apgar
 - d. Positive pressure ventilation
 - (1) Pediatric BVM and supplemental oxygen
 - (2) 40-60 ventilations per minute
 - e. Assess heart rate
 - (1) Stethoscope
 - (2) Palpate brachial artery/ umbilical cord
 - f. Circulatory support
 - (1) Chest compressions if rate <80 bpm, and not responding to ventilations
 - g. Fluid and medication access
 - (1) Umbilical
 - (2) Peripheral IV
 - (3) Intraosseous

- (4) Endotracheal (not for fluid administration)
 - h. Common medications and fluids
 - (1) Epinephrine
 - (2) Naloxone
 - (3) Volume expanders
 - (a) Normal saline/ lactated Ringers
 - C. Continued care
 - 1. Neonatal transport
 - a. Manage airway, breathing, circulation
 - b. Maintain warmth
- VIII. Abnormal deliveries
- A. Breech presentation
 - 1. Incidence
 - a. Most common in premature births and uterine abnormalities
 - 2. Assessment
 - a. Feet or buttocks are presenting part
 - 3. Management
 - a. Shoulders, not the head are normally the difficult part to deliver
 - b. If delivering
 - (1) Allow neonate to deliver to the umbilicus
 - (2) With the legs clear, support the body in palm
 - (3) Extract approximately 4-6 inch loop of umbilical cord
 - (4) Rotate neonate for anterior-posterior shoulder positioning
 - (5) Apply gentle traction until axilla visible
 - (6) Guide neonate upward and deliver posterior shoulder
 - (7) Guide neonate downward to deliver anterior shoulder
 - (8) Ease the head out, do not apply excessive manipulation
 - c. If head does not deliver
 - (1) Form "V" with fingers on sides of neonate's nose
 - (a) Creates airway
 - B. Umbilical cord presentation
 - 1. Incidence
 - a. Approximately 1 in 200 pregnancies
 - b. Suspect when fetal distress present

- c. Contributing factors include breech birth, multiple births, large fetus
 - 2. Assessment
 - a. Portion of cord visible, protruding through vagina
 - 3. Management
 - a. Position mother with hips elevated
 - (1) Trendelenburg
 - (2) Knee-chest
 - b. Mother should pant with contractions to avoid bearing down
 - c. Use gloved hand to hold fetus in vagina
 - d. Keep pressure off cord
- C. Limb presentation
 - 1. Incidence
 - 2. Assessment
 - a. Limb presents through vagina
 - 3. Management
 - a. Emergency transport
 - b. Cesarean section delivery
- D. Multiple births
 - 1. Incidence
 - a. Twins occur in about 1 in every 90 births
 - b. Approximately 40% of twin deliveries are premature
 - 2. Assessment
 - a. Mother may not know
 - b. First sign may be additional contractions and need to push
 - 3. Management
 - a. Deliver in same manner as individual delivery
 - b. Need additional supplies
- E. Cephalopelvic disproportion
 - 1. Incidence
 - a. Small pelvis
 - b. Fetal abnormalities
 - c. Mother often primigravida
 - 2. Assessment
 - a. Lack of progress through stages of delivery
 - b. Frequent, prolonged contractions
 - 3. Management
 - a. Cesarean delivery necessary to avoid uterine rupture
 - b. Oxygenation, ventilation, circulatory support

- c. Emergency transport
- F. Meconium staining
 - 1. Incidence
 - a. Between 8 and 30% of deliveries
 - b. Increased perinatal mortality
 - c. Meconium in amniotic fluid
 - (1) Could be aspirated
 - 2. Assessment
 - a. Color varies from yellow, light green, or dark green ("pea soup")
 - b. The thicker and darker the fluid, the higher the risk of morbidity
 - 3. Management
 - a. Prepare for intubation
 - b. Clear airway/ thoroughly suction
 - (1) Mouth, pharynx, nose
 - (2) Direct visualization and suction of hypopharynx
 - c. Intubate
 - (1) Suction proximal end of endotracheal tube
- G. Maternal complications of labor and delivery
 - 1. Postpartum hemorrhage
 - a. Incidence
 - (1) Loss of more than 500 ccs of blood immediately following delivery
 - (2) May be caused by
 - (a) Lack of uterine tone
 - (b) Vaginal or cervical tears
 - (c) Retained pieces of the placenta
 - (d) Clotting disorders
 - b. Assessment
 - (1) History to include
 - (a) Large infant
 - (b) Multiple births have occurred
 - (c) The patient has had placenta previa
 - (d) The patient has had abruptio placenta
 - (e) The patient has had prolonged labor
 - (2) Physical examination
 - (a) Treat the patient The paramedic must rely on the patient's clinical appearance and vital signs
 - (b) The uterus feels soft on palpation
 - (c) Inspect the external genitalia for injury resulting in excessive bleeding

- (d) Observe signs and symptoms of hypovolemic shock
- c. Management
 - (1) ABCs
 - (2) High flow, high concentration oxygen
 - (3) Place the infant at the mother's breast if just delivered
 - (4) Provide uterine massage
 - (5) Consider 2 large-bore IVs for volume replacement
 - (6) Administer oxytocin per physician's order
 - (a) Indications
 - i) To stimulate immediate postpartum contraction of the uterus and to control postpartum uterine bleeding, especially if uterine massage is ineffective or the patient is in shock
 - (b) Administration - injectable oxytocin contains 10 USP units (20mg) per milliliter
 - i) IV dosage
 - a) Ten to twenty USP units in 1000 ccs crystalloid (normal saline)
 - b) Flow rate of 100-125 cc/hr., titrated to the severity of hemorrhage and uterine response
 - ii) IM dosage
 - a) Ten USP units (1 ml) IM
 - b) Only if unable to start an IV
 - (7) Do not attempt to force delivery of the placenta
 - (8) Do not pack the vagina
 - (9) Emergent transport of the patient
- 2. Uterine rupture
 - a. Incidence
 - (1) Rare, but serious
 - (2) Extremely high mortality for mother and fetus
 - (3) Most common after labor onset
 - (4) Associated with previous cesarean, operative scar, obstructed labor, fetal abnormalities

- (5) Partial or complete
- b. Assessment
 - (1) Severe, sudden, shearing pain during strong contraction
 - (2) Absent fetal heart tones or movement
 - (3) Complete rupture - pain subsides
 - (4) Uterus palpated as hard mass next to fetus
 - (5) Rapid shock onset
 - (6) Minimal external bleeding do to concealed bleeding
- c. Management
 - (1) Treat for shock
 - (2) Emergency transport
- 3. Uterine inversion
 - a. Incidence
 - (1) Infrequent, but serious
 - (2) 1 in approximately 2100 deliveries
 - (3) Turning the uterus inside out
 - (4) Occurs following contraction or with abdominal pressure
 - (a) Coughing, sneezing
 - (b) Improper fundal massage
 - (5) Occurs as a result of umbilical cord traction
 - (6) Protrusion of uterine fundus beyond cervix
 - b. Assessment
 - (1) Profuse postpartum bleeding
 - (2) Severe, sudden lower abdominal pain
 - c. Management
 - (1) Oxygenation, ventilation, circulatory support
 - (2) Emergency transport
 - (3) Do not attempt to deliver placenta
 - (4) Cover protruding tissue with moist, sterile dressings
 - (5) Replace protruding tissue upward into cervix
 - (a) Discuss with medical direction physician
- 4. Pulmonary embolism
 - a. Incidence
 - (1) Most common cause of maternal death
 - (2) Result of blood clot in pelvic circulation
 - (3) More common with cesarean
 - b. Assessment

- (1) Sudden dyspnea
- (2) Sharp, localized chest pain
- c. Management
 - (1) Oxygenation, ventilation
 - (2) Positioning
 - (3) Cardiac monitoring
 - (4) Emergency transport

UNIT TERMINAL OBJECTIVE

6-1.1 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for a neonatal patient.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 6-1.2 Define the term newborn.(C-1)
- 6-1.3 Define the term neonate. (C-1)
- 6-1.4 Identify important antepartum factors that can affect childbirth. (C-1)
- 6-1.5 Identify important intrapartum factors that can term the newborn high risk. (C-1)
- 6-1.6 Identify the factors that lead to premature birth and low birth weight newborns. (C-1)
- 6-1.7 Distinguish between primary and secondary apnea. (C-3)
- 6-1.8 Discuss pulmonary perfusion and asphyxia. (C-1)
- 6-1.9 Identify the primary signs utilized for evaluating a newborn during resuscitation. (C-1)
- 6-1.10 Formulate an appropriate treatment plan for providing initial care to a newborn. (C-3)
- 6-1.11 Identify the appropriate use of the APGAR score in caring for a newborn.(C-1)
- 6-1.12 Calculate the APGAR score given various newborn situations. (C-3)
- 6-1.13 Determine when ventilatory assistance is appropriate for a newborn. (C-1)
- 6-1.14 Prepare appropriate ventilation equipment, adjuncts and technique for a newborn. (C-1)
- 6-1.15 Determine when chest compressions are appropriate for a newborn. (C-1)
- 6-1.16 Discuss appropriate chest compression techniques for a newborn. (C-1)
- 6-1.17 Assess patient improvement due to chest compressions and ventilations. (C-1)
- 6-1.18 Determine when endotracheal intubation is appropriate for a newborn. (C-1)
- 6-1.19 Discuss appropriate endotracheal intubation techniques for a newborn. (C-1)
- 6-1.20 Assess patient improvement due to endotracheal intubation. (C-1)
- 6-1.21 Identify complications related to endotracheal intubation for a newborn. (C-1)
- 6-1.22 Determine when vascular access is indicated for a newborn. (C-1)
- 6-1.23 Discuss the routes of medication administration for a newborn. (C-1)
- 6-1.24 Determine when blow-by oxygen delivery is appropriate for a newborn. (C-1)
- 6-1.25 Discuss appropriate blow-by oxygen delivery devices and technique for a newborn. (C-1)
- 6-1.26 Assess patient improvement due to assisted ventilations. (C-1)
- 6-1.27 Determine when an orogastric tube should be inserted during positive-pressure ventilation. (C-1)
- 6-1.28 Discuss the signs of hypovolemia in a newborn. (C-1)
- 6-1.29 Discuss the initial steps in resuscitation of a newborn. (C-1)
- 6-1.30 Assess patient improvement due to blow-by oxygen delivery. (C-1)
- 6-1.31 Discuss the effects maternal narcotic usage has on the newborn. (C-1)
- 6-1.32 Determine the appropriate treatment for the newborn with narcotic depression. (C-1)
- 6-1.33 Discuss appropriate transport guidelines for a newborn. (C-1)
- 6-1.34 Determine appropriate receiving facilities for low and high risk newborns. (C-1)
- 6-1.35 Describe the epidemiology, including the incidence, morbidity/ mortality, risk factors and prevention strategies for meconium aspiration. (C-1)
- 6-1.36 Discuss the pathophysiology of meconium aspiration. (C-1)
- 6-1.37 Discuss the assessment findings associated with meconium aspiration. (C-1)
- 6-1.38 Discuss the management/ treatment plan for meconium aspiration. (C-1)
- 6-1.39 Describe the epidemiology, including the incidence, morbidity/ mortality, risk factors and prevention strategies for apnea in the neonate. (C-1)
- 6-1.40 Discuss the pathophysiology of apnea in the neonate. (C-1)

- 6-1.41 Discuss the assessment findings associated with apnea in the neonate. (C-1)
- 6-1.42 Discuss the management/ treatment plan for apnea in the neonate. (C-1)
- 6-1.43 Describe the epidemiology, pathophysiology, assessment findings, management/ treatment plan for diaphragmatic hernia. (C-1)
- 6-1.44 Describe the epidemiology, including the incidence, morbidity/ mortality and risk factors for bradycardia in the neonate. (C-1)
- 6-1.45 Discuss the pathophysiology of bradycardia in the neonate. (C-1)
- 6-1.46 Discuss the assessment findings associated with bradycardia in the neonate. (C-1)
- 6-1.47 Discuss the management/ treatment plan for bradycardia in the neonate. (C-1)
- 6-1.48 Describe the epidemiology, including the incidence, morbidity/ mortality and risk factors for premature infants
- 6-1.49 Discuss the pathophysiology of premature infants. (C-1)
- 6-1.50 Discuss the assessment findings associated with premature infants. (C-1)
- 6-1.51 Discuss the management/ treatment plan for premature infants. (C-1)
- 6-1.52 Describe the epidemiology, including the incidence, morbidity/ mortality and risk factors for respiratory distress/ cyanosis in the neonate. (C-1)
- 6-1.53 Discuss the pathophysiology of respiratory distress/ cyanosis in the neonate. (C-1)
- 6-1.54 Discuss the assessment findings associated with respiratory distress/ cyanosis in the neonate. (C-1)
- 6-1.55 Discuss the management/ treatment plan for respiratory distress/ cyanosis in the neonate. (C-1)
- 6-1.56 Describe the epidemiology, including the incidence, morbidity/ mortality and risk factors for seizures in the neonate. (C-1)
- 6-1.57 Discuss the pathophysiology of seizures in the neonate. (C-1)
- 6-1.58 Discuss the assessment findings associated with seizures in the neonate. (C-1)
- 6-1.59 Discuss the management/ treatment plan for seizures in the neonate. (C-1)
- 6-1.60 Describe the epidemiology, including the incidence, morbidity/ mortality and risk factors for fever in the neonate. (C-1)
- 6-1.61 Discuss the pathophysiology of fever in the neonate. (C-1)
- 6-1.62 Discuss the assessment findings associated with fever in the neonate. (C-1)
- 6-1.63 Discuss the management/ treatment plan for fever in the neonate. (C-1)
- 6-1.64 Describe the epidemiology, including the incidence, morbidity/ mortality and risk factors for hypothermia in the neonate. (C-1)
- 6-1.65 Discuss the pathophysiology of hypothermia in the neonate. (C-1)
- 6-1.66 Discuss the assessment findings associated with hypothermia in the neonate. (C-1)
- 6-1.67 Discuss the management/ treatment plan for hypothermia in the neonate. (C-1)
- 6-1.68 Describe the epidemiology, including the incidence, morbidity/ mortality and risk factors for hypoglycemia in the neonate. (C-1)
- 6-1.69 Discuss the pathophysiology of hypoglycemia in the neonate. (C-1)
- 6-1.70 Discuss the assessment findings associated with hypoglycemia in the neonate. (C-1)
- 6-1.71 Discuss the management/ treatment plan for hypoglycemia in the neonate. (C-1)
- 6-1.72 Describe the epidemiology, including the incidence, morbidity/ mortality and risk factors for vomiting in the neonate (C-1)
- 6-1.73 Discuss the pathophysiology of vomiting in the neonate. (C-1)
- 6-1.74 Discuss the assessment findings associated with vomiting in the neonate. (C-1)
- 6-1.75 Discuss the management/ treatment plan for vomiting in the neonate. (C-1)
- 6-1.76 Describe the epidemiology, including the incidence, morbidity/ mortality and risk factors for diarrhea in the neonate. (C-1)
- 6-1.77 Discuss the pathophysiology of in diarrhea the neonate. (C-1)
- 6-1.78 Discuss the assessment findings associated with diarrhea in the neonate. (C-1)

- 6-1.79 Discuss the management/ treatment plan for diarrhea in the neonate. (C-1)
- 6-1.80 Describe the epidemiology, including the incidence, morbidity/ mortality and risk factors for common birth injuries in the neonate. (C-1)
- 6-1.81 Discuss the pathophysiology of common birth injuries in the neonate. (C-1)
- 6-1.82 Discuss the assessment findings associated with common birth injuries in the neonate. (C-1)
- 6-1.83 Discuss the management/ treatment plan for common birth injuries in the neonate. (C-1)
- 6-1.84 Describe the epidemiology, including the incidence, morbidity/ mortality and risk factors for cardiac arrest in the neonate. (C-1)
- 6-1.85 Discuss the pathophysiology of cardiac arrest in the neonate. (C-1)
- 6-1.86 Discuss the assessment findings associated with cardiac arrest in the neonate. (C-1)
- 6-1.87 Discuss the management/ treatment plan for cardiac arrest in the neonate. (C-1)
- 6-1.88 Discuss the pathophysiology of post arrest management of the neonate. (C-1)
- 6-1.89 Discuss the assessment findings associated with post arrest situations in the neonate. (C-1)
- 6-1.90 Discuss the management/ treatment plan to stabilize the post arrest neonate. (C-1)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 6-1.91 Demonstrate and advocate appropriate interaction with a newborn/ neonate that conveys respect for their position in life. (A-3)
- 6-1.92 Recognize the emotional impact of newborn/ neonate injuries/ illnesses on parents/ guardians. (A-1)
- 6-1.93 Recognize and appreciate the physical and emotional difficulties associated with separation of the parent/ guardian and a newborn/ neonate. (A-3)
- 6-1.94 Listen to the concerns expressed by parents/ guardians. (A-1)
- 6-1.95 Attend to the need for reassurance, empathy and compassion for the parent/ guardian. (A-1)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 6-1.96 Demonstrate preparation of a newborn resuscitation area. (P-2)
- 6-1.97 Demonstrate appropriate assessment technique for examining a newborn. (P-2)
- 6-1.98 Demonstrate appropriate assisted ventilations for a newborn. (P-2)
- 6-1.99 Demonstrate appropriate endotracheal intubation technique for a newborn. (P-2)
- 6-1.100 Demonstrate appropriate meconium aspiration suctioning technique for a newborn. (P-2)
- 6-1.101 Demonstrate appropriate insertion of an orogastric tube. (P-2)
- 6-1.102 Demonstrate needle chest decompression for a newborn or neonate. (P-2)
- 6-1.103 Demonstrate appropriate chest compression and ventilation technique for a newborn. (P-2)
- 6-1.104 Demonstrate appropriate techniques to improve or eliminate endotracheal intubation complications. (P-2)
- 6-1.105 Demonstrate vascular access cannulation techniques for a newborn. (P-2)
- 6-1.106 Demonstrate the initial steps in resuscitation of a newborn. (P-2)
- 6-1.107 Demonstrate blow-by oxygen delivery for a newborn. (P-2)

DECLARATIVE

- I. Introduction
 - A. Newborn
 - 1. A recently born infant; usually considered the first few hours of life
 - B. Neonate
 - 1. Considered the first 28 days of life

- II. General pathophysiology, assessment and management
 - A. Epidemiology
 - 1. Incidence
 - a. Approximately 6% of deliveries require life support
 - b. Incidence of complications increases as birth weight decreases
 - 2. Morbidity/ mortality
 - a. Neonatal mortality risk can be determined via graphs based on birth weight and gestational age
 - b. Resuscitation is required for about 80% of the 30,000 babies who weigh less than 1500 grams at birth
 - 3. Risk factors
 - a. Antepartum factors
 - (1) Multiple gestation
 - (2) Inadequate prenatal care
 - (3) Mother's age <16 or >35
 - (4) History of perinatal morbidity or mortality
 - (5) Post-term gestation
 - (6) Drugs/ medications
 - (7) Toxemia, hypertension, diabetes
 - b. Intrapartum factors
 - (1) Premature labor
 - (2) Meconium-stained amniotic fluid
 - (3) Rupture of membranes greater than 24 hours prior to delivery
 - (4) Use of narcotics within four hours of delivery
 - (5) Abnormal presentation
 - (6) Prolonged labor or precipitous delivery
 - (7) Prolapsed cord
 - (8) Bleeding
 - 4. Treatment strategies
 - a. Preparation of resuscitation equipment
 - b. Determine appropriate destination
 - B. Pathophysiology
 - 1. Transition from fetal to neonatal circulation
 - 2. Respiratory system must suddenly initiate and maintain oxygenation
 - 3. Infants are very sensitive to hypoxia
 - 4. Permanent brain damage will occur with hypoxemia
 - 5. Apnea in newborns
 - 6. Congenital anomalies
 - a. Diaphragmatic hernia
 - b. Choanal atresia

- c. Pierre Robin Syndrome
 - d. Cleft lip
 - e. Exposed abdominal contents
- C. Assessment
- 1. Time of delivery
 - 2. Normal/ abnormal vital signs
 - 3. Airway and ventilation
 - a. Respiratory rate
 - b. Respiratory effort
 - 4. Circulation
 - a. Heart rate
 - (1) Normal
 - b. Color/ cyanosis
 - (1) Normal
 - (2) Central versus peripheral
 - (3) Mucosal membranes
 - c. End organ perfusion
 - (1) Compare strength of central pulses versus peripheral
 - (2) Capillary refill
 - 5. APGAR
 - a. Appearance - skin color
 - (1) Completely pink - 2
 - (2) Body pink, extremities blue - 1
 - (3) Blue, pale - 0
 - b. Pulse rate
 - (1) Above 100 - 2
 - (2) Below 100 - 1
 - (3) Absent - 0
 - c. Grimace - irritability
 - (1) Cries - 2
 - (2) Grimaces - 1
 - (3) No response - 0
 - d. Activity - muscle tone
 - (1) Active motion - 2
 - (2) Some flexion of extremities - 1
 - (3) Limp - 0
 - e. Respiratory - effort
 - (1) Strong cry - 2
 - (2) Slow and irregular - 1
 - (3) Absent - 0
- D. Treatment
- 1. Prior to delivery, prepare environment and equipment
 - 2. During delivery, suction mouth and nose as head delivers
 - 3. After delivery
 - a. Airway and ventilation
 - (1) Drying
 - (a) Head and face
 - (b) Body

- (2) Warming
 - (a) Appropriate techniques
- (3) Position
- (4) Suction
 - (a) Technique
 - i) Mouth first, than nares
 - ii) Nasal suctioning is a stimulus to breathe
 - (b) Equipment
 - i) Bulb suction
 - ii) Suction catheters
 - iii) Meconium aspirator
- (5) Stimulation
 - (a) Flicking soles of feet
 - (b) Stroking back
- (6) Blow-by oxygen
 - (a) Never withhold oxygen
 - (b) Oxygen should be warmed
 - (c) Use when
 - i) Newborn is cyanotic and
 - ii) Heart rate > 100 and
 - iii) Adequate respiratory rate and effort
 - (d) 5 liters/ minute maximum
 - i) Complications due to hypothermia
 - (e) Appropriate techniques
- (7) Oral airways - rarely used for neonates
 - (a) Necessary to keep mouth open for ventilation
 - (b) Bilateral choanal atresia
 - (c) Pierre Robin Syndrome
- (8) Bag-valve-mask
 - (a) Mask characteristics
 - i) Appropriate size
 - ii) Minimize dead-space
 - (b) Bag characteristics
 - i) Pop-off valve should be disabled
 - (c) Use when
 - i) Apneic
 - ii) Inadequate respiratory rate or effort
 - iii) Heart rate less than 100
 - (d) Technique
 - i) Initial ventilations require higher pressure to expand lungs
- (9) Intubation
 - (a) Indications
 - i) Prolonged positive pressure ventilation
 - ii) Bag and mask ventilations ineffective
 - iii) Tracheal suctioning required
 - iv) Diaphragmatic hernia suspected
 - (b) Technique

- i) Equipment
 - a) Suction equipment
 - b) Laryngoscope
 - c) Blades-straight
 - #1- full term
 - #0- preterm
 - d) Endotracheal tubes
 - 2.5 to 4.0 mm ID
 - e) Shoulder roll
 - f) Adhesive tape
 - (c) Confirmation
 - i) Visualization
 - a) Tube passing through the cords
 - Vocal cord guide should stop at the level of the cords
 - b) Chest expansion with ventilation
 - ii) Auscultation
 - a) Laterally and high on the chest wall
 - b) Epigastric region
 - iii) Patient improvement
 - (d) PEEP
- (10) Gastric decompression
 - (a) Abdominal distention is impeding ventilation
 - (b) Presence of diaphragmatic hernia
- b. Circulation
 - (1) Vascular access
 - (a) Indications
 - i) To administer fluids
 - ii) To administer medications
 - (b) Peripheral vein cannulation
 - (c) Umbilical vein cannulation
 - (d) Intraosseous cannulation
 - (2) Chest compression (in addition to assisted ventilation with BVM)
 - (a) Indications
 - i) Heart rate less than 60
 - ii) Heart rate between 60 and 80 and not increasing with adequate oxygenation
 - (b) Technique
 - i) Two finger technique
 - ii) Thumb technique
 - (c) Rate
 - i) 120 per minute
 - (d) Depth
 - i) 1/2 - 3/4 inches
 - (e) Compression-to-ventilation ratio
 - i) 3 compressions to 1 ventilation
- c. Pharmacological
 - (1) Bradycardia

- (2) Low blood volume
- (3) Respiration depression secondary to narcotics
- (4) Metabolic acidosis
- d. Non-pharmacological
 - (1) Temperature control
 - (2) Positioning
- e. Transport consideration
 - (1) Rapid transportation of the distressed infant
 - (2) Position newborn on their side to prevent aspiration
- f. Psychological support/ communication strategies
 - (1) Allow healthy newborn to bond with mother if possible

III. Specific situations

A. Meconium stained amniotic fluid

- 1. Epidemiology
 - a. Incidence
 - (1) Approximately 10 - 15% of deliveries
 - (2) May occur either in utero or intrapartum
 - (3) Mostly in post-term and small-for-gestational-age newborns
 - b. Morbidity/ mortality
 - (1) High mortality
 - (2) Hypoxemia
 - (3) Aspiration pneumonia
 - (4) Pneumothorax
 - (5) Pulmonary hypertension
 - c. Risk factors
 - (1) Fetal distress during labor and delivery
 - (2) Post-term infants
- 2. Anatomy and physiology review
- 3. Pathophysiology
 - a. Hypoxia or physiologic cause
 - b. Aspiration of meconium stained amniotic fluid
 - (1) Airway obstruction
 - (a) Complete
 - i) Atelectasis
 - ii) Right-to-left shunt across the foramen ovale
 - (b) Incomplete
 - i) Ball valve type obstruction
 - ii) Developing pneumothorax
 - c. Patient deterioration
 - (1) Hypoxia
 - (2) Hypercapnia
 - (3) Acidosis
- 4. Assessment findings
 - a. Thin and watery
 - b. Thick and particulate
 - (1) Dark green-black amniotic fluid
- 5. Management considerations for thick or particulate meconium

- a. Airway and ventilation
 - (1) Do not stimulate the infant to breathe
 - (2) Tracheal suction under direct visualization
 - (a) End point considerations
 - i) Airway is clear
 - ii) Infant breathes on own
 - iii) Bradycardia
 - (3) Ventilate with 100% oxygen
 - b. Circulation
 - (1) Assure adequate perfusion
 - c. Pharmacological
 - (1) If hypotensive, administer fluid challenge
 - d. Non-pharmacological
 - (1) Needle decompression may be required
 - (2) Hypothermia prevention
 - e. Transport consideration
 - (1) Identify facility to handle high-risk newborn
 - f. Psychological support/ communication strategies
 - (1) Do not discuss "chances of survival" with family
 - (2) Explain what is being done for the newborn
- B. Apnea in the neonate
- 1. Epidemiology
 - a. Incidence
 - (1) Common finding in preterm infants
 - b. Morbidity/ mortality
 - (1) If prolonged, can lead to hypoxemia and bradycardia
 - c. Risk factors
 - (1) Prematurity
 - (2) In newborn, prolonged or difficult labor and delivery
 - (3) Drug exposure
 - 2. Anatomy and physiology review
 - 3. Pathophysiology
 - a. Usually due to hypoxia or hypothermia
 - b. May be due to other causes
 - (1) Narcotics or central nervous system depressant
 - (2) Airway and respiratory muscle weakness
 - (3) Oxyhemoglobin dissociation curve shift
 - (4) Septicemia
 - (5) Metabolic disorder
 - (6) Central nervous system disorders
 - 4. Assessment findings
 - a. Failure to breathe spontaneously after stimulation
 - b. Respiratory pauses greater than 20 seconds
 - 5. Management considerations
 - a. Airway and ventilation
 - (1) Stimulate the baby to breathe
 - (a) Flicking the soles of the feet
 - (b) Rubbing the back

- (2) Ventilate with BVM
 - (a) Disable pop-off valve
 - (b) Subsequent ventilations with minimal pressure to cause chest rise
- (3) Suction as needed
- (4) Intubation
 - (a) Indications
 - i) Heart rate less than 60 with adequate BVM ventilation and chest compressions
 - ii) Prolonged positive-pressure ventilations
 - iii) Prolonged apnea
 - iv) Central cyanosis despite adequate ventilations
 - (b) Complications
 - i) Tube dislodgement
 - ii) Tube occlusion by mucous or meconium
 - iii) Pneumothorax
- b. Circulation
 - (1) Monitor heart rate continuously
 - (2) Circulatory access
 - (a) Umbilical vein cannulation in newborn
 - (b) Peripheral IV
 - (c) Intraosseous
- c. Pharmacological
 - (1) Consider narcotic antagonists if narcotic administered within four hours of delivery
 - (2) NO narcotic antagonist should be utilized if mother is a drug abuser
 - (3) Consider dextrose (D10) administration if hypoglycemic
- d. Non-pharmacological
 - (1) Hypothermia preventions
- e. Transport consideration
 - (1) Identify facility to handle high-risk newborn
- f. Psychological support/ communication strategies
 - (1) Relatively good outcome if treated early and aggressively
 - (2) Explain what is being done for the infant
- C. Diaphragmatic hernia in the neonate
 - 1. Epidemiology
 - a. Incidence
 - (1) Occurs in 1 in 2200 live births
 - (2) Most commonly (90%) on the left side
 - b. Morbidity/ mortality
 - (1) Survival for infant who require mechanical ventilation in the first 18 to 24 hours of life is approximately 50%
 - (2) If no respiratory distress within the first 24 hours of life survival approaches 100%
 - c. Risk factors
 - (1) Bag and mask ventilation can worsen condition
 - 2. Anatomy and physiology review
 - 3. Pathophysiology

- a. Abdominal contents are displaced into the thorax
- b. Heart may be displaced
- 4. Assessment findings
 - a. Little to severe distress
 - b. May have cyanosis unresponsive to ventilations
 - c. Scaphoid (flat) abdomen
 - d. Bowel sounds heard in chest
 - e. Heart sounds displaced to right
- 5. Management considerations
 - a. Airway and ventilation
 - (1) Assure adequate oxygen
 - (2) Place an orogastric tube and apply low, intermittent suction
 - (3) Endotracheal intubation may be necessary
 - b. Circulation
 - (1) Monitor heart rate continuously
 - c. Pharmacological
 - (1) None indicated for primary problem
 - d. Non-pharmacological
 - (1) Surgical repair required
 - e. Transport consideration
 - (1) Identify facility to handle high-risk newborn
 - f. Psychological support/ communication strategies
 - (1) Explain what is being done for the infant
- D. Bradycardia in the neonate
 - 1. Epidemiology
 - a. Incidence
 - (1) Most commonly caused by hypoxia
 - (2) Increased intracranial pressure
 - (3) Hypothyroidism
 - (4) Acidosis
 - b. Morbidity/ mortality
 - (1) Minimal risk if hypoxia is corrected quickly
 - c. Risk factors
 - (1) Treatment via pharmacological measures alone
 - (2) Prolonged suction or airway instrumentation
 - 2. Anatomy and physiology review
 - 3. Pathophysiology
 - a. Primarily caused by hypoxia
 - 4. Assessment findings
 - a. Assess upper airway for obstruction
 - (1) Secretions
 - (2) Tongue and soft tissue positioning
 - (3) Foreign body
 - b. Assess patient for hypoventilation
 - c. Palpate umbilical stump or brachial artery
 - 5. Management considerations
 - a. Airway and ventilation
 - (1) Suction

- (2) Positive pressure ventilation with 100% oxygen
 - (3) Endotracheal intubation
 - b. Circulation
 - (1) Heart rate less than 100
 - (a) BVM ventilation with 100% oxygen and reassess
 - (2) Heart rate less than 60
 - (a) Begin chest compressions
 - (3) Heart rate between 60 and 80 but not responding to assisted ventilations with BVM
 - (a) Begin chest compressions
 - (4) Discontinue chest compressions when heart rate reaches 100
 - c. Pharmacological
 - (1) Epinephrine
 - d. Non-pharmacological
 - (1) Maintain temperature
 - e. Transport consideration
 - (1) Identify facility to handle high-risk newborn
 - f. Psychological support/ communication strategies
 - (1) Explain what is being done for the infant
- E. Premature infants
- 1. Epidemiology
 - a. Incidence
 - (1) Born prior to 37 weeks gestation
 - (2) Weight ranges from .6-2.2 kg
 - b. Morbidity/ mortality
 - (1) Healthy premature infants weighing greater than 1700 g have a survivability and outcome approximately that of full-term infants
 - (2) Respiratory suppression
 - (3) Hypothermia risk
 - (4) Head/ brain injury
 - (a) Hypoxemia
 - (b) Change in blood pressure
 - (c) Intraventricular hemorrhage
 - (d) Fluctuations in serum osmolarity
 - c. Risk factors
 - (1) Mortality decreases weekly with gestation beyond the onset of viability (currently around 23-24 weeks of gestation)
 - 2. Anatomy and physiology review
 - 3. Pathophysiology
 - a. Retinopathy of prematurity
 - (1) Result of long term oxygen use
 - (2) Extreme prematurity
 - (3) Should not be a factor in short term management
 - (4) Hypoxemia causes irreparable brain damage
 - 4. Assessment findings
 - a. Degree of immaturity determines the physical characteristics
 - b. Generally a large trunk and short extremities
 - c. Skin is transparent and less wrinkles

- d. Less subcutaneous fat
- 5. Management considerations
 - a. Attempt resuscitation if the infant has any sign of life
 - b. Airway and ventilation
 - (1) Suction
 - (2) Assure adequate oxygenation
 - c. Circulation
 - (1) Chest compressions if indicated
 - d. Pharmacological
 - (1) Epinephrine
 - e. Non-pharmacological
 - (1) Maintain body temperature
 - f. Transport consideration
 - (1) Transport to a facility with special services for low birth weight newborns
 - g. Psychological support/ communication strategies
 - (1) Explain what is being done for the infant
- F. Respiratory distress/ cyanosis in the neonate
 - 1. Epidemiology
 - a. Incidence
 - (1) Prematurity is the single most common factor
 - (2) Occurs most frequently in infants less than 1200 grams and 30 weeks gestation
 - (3) Multiple gestations increase risk
 - (4) Prenatal maternal complications increase risk
 - b. Morbidity/ mortality
 - (1) Premature infants have a immature central respiratory control center
 - (2) Easily affected by environmental or metabolic changes
 - c. Risk factors
 - (1) Associated respiratory diseases/ complications affect oxygenation
 - 2. Anatomy and physiology review
 - 3. Pathophysiology
 - a. Lung or heart disease
 - b. Primary pulmonary hypertension
 - c. CNS disorders
 - d. Mucous obstruction of nasal passages
 - e. Spontaneous pneumothorax
 - f. Choanal atresia
 - g. Meconium aspiration
 - h. Amniotic fluid aspiration
 - i. Lung immaturity
 - j. Pneumonia
 - k. Shock and sepsis
 - l. Metabolic acidosis
 - m. Diaphragmatic hernia
 - n. Can lead to cardiac arrest
 - 4. Assessment findings
 - a. Tachypnea
 - b. Paradoxical breathing

- c. Periodic breathing
- d. Intercostal retractions
- e. Nasal flaring
- f. Expiratory grunt
- 5. Management considerations
 - a. Airway and ventilation
 - (1) Suction
 - (2) High concentration oxygen
 - (3) BVM
 - (4) Consider intubation
 - b. Circulation
 - (1) Chest compressions if indicated
 - c. Pharmacological
 - (1) Sodium bicarbonate may be helpful for prolonged resuscitation per medical direction
 - (2) D10 administration if hypoglycemic
 - d. Non-pharmacological
 - (1) Maintain normal body temperature
 - e. Transport consideration
 - f. Psychological support/ communication strategies
 - (1) Explain what is being done for the infant
- G. Seizures in the neonate
 - 1. Epidemiology
 - a. Incidence
 - (1) Occur in a very small percentage of all newborns
 - b. Morbidity/ mortality
 - (1) Represent relative medical emergencies as they are usually a sign of an underlying abnormality
 - c. Risk factors
 - (1) Prolonged and frequent multiple seizures may result in metabolic changes and cardiopulmonary difficulties
 - 2. Anatomy and physiology review
 - 3. Pathophysiology
 - a. Types of seizures
 - (1) Subtle seizure
 - (a) Eye deviation, blinking, sucking, swimming movements of the arms, pedaling movements of the legs, apnea
 - (2) Tonic seizure
 - (a) Tonic extension of the limbs
 - (b) Less commonly, flexion of the upper extremities and extension of the lower extremities
 - (c) More common in premature infants, especially in those with intraventricular hemorrhage
 - (3) Multi focal seizure
 - (a) Clonic activity in one extremity
 - (b) Randomly migrates to another area of the body
 - (c) Occur primarily in full-term infants
 - (4) Focal clonic seizure

- (a) Clonic localized jerking
 - (b) Occur in both full-term and premature infants
 - (5) Myoclonic seizure
 - (a) Flexion jerks of the upper or lower extremities
 - (b) May occur singly or in a series of repetitive jerks
 - b. Causes
 - (1) Hypoglycemia
 - (2) Other
 - (a) Hypoxic-ischemic encephalopathy
 - (b) Intracranial hemorrhage
 - (c) Metabolic disturbances
 - (d) Meningitis or encephalopathy
 - (e) Developmental abnormalities
 - (f) Drug withdrawal
 - 4. Assessment findings
 - a. Decreased level of consciousness
 - b. Seizure activity
 - 5. Management considerations
 - a. Airway and ventilation
 - (1) Maintain oxygen saturation
 - b. Circulation
 - c. Pharmacological
 - (1) Consider D₁₀ for hypoglycemia
 - (2) Consider anticonvulsant
 - (3) Consider benzodiazepine for status epilepticus
 - d. Non-pharmacological
 - (1) Maintain normal body temperature
 - e. Transport consideration
 - (1) Identify facility to handle high-risk newborn
 - f. Psychological support/ communication strategies
 - (1) Explain what is being done for the infant
- H. Fever in the neonate
 - 1. Epidemiology
 - a. Incidence
 - (1) Rectal temperature \geq 100.4 F (38.0 degrees C)
 - (2) Average normal temperature - 99.5 degrees F (37.5 degrees C)
 - b. Morbidity/ mortality
 - (1) Limited ability to control body temperature
 - c. Risk factors
 - (1) Dehydration may contribute to hyperthermia
 - 2. Anatomy and physiology review
 - 3. Pathophysiology
 - a. Increased use of glucose to maintain normal body temperature
 - b. Anaerobic metabolism results due to a lack of glucose
 - 4. Assessment findings
 - a. Mental status changes (irritability/ somnolence)
 - b. Decreased intake
 - c. Caretaker history

- d. Feels warm
- e. Observe patient for rashes, petechia
- f. Term newborns will produce beads of sweat on their brow but not over the rest of their body
- g. Premature infants will have no visible sweat
- 5. Management considerations
 - a. Airway and ventilation
 - (1) Assure adequate oxygenation and ventilation
 - b. Circulation
 - (1) Perform chest compressions if indicated
 - c. Pharmacological
 - (1) Administration of antipyretic agent is questionable in the prehospital setting
 - d. Non-pharmacological
 - e. Transport consideration
 - f. Psychological support/ communication strategies
 - (1) Explain what is being done for the infant
- I. Hypothermia in the neonate
 - 1. Epidemiology
 - a. Incidence
 - (1) Body temperature drops below 35 degrees C
 - b. Morbidity/ mortality
 - (1) Infants may die of cold exposure at temperatures adults find comfortable
 - c. Risk factors
 - (1) Four method of heat loss need to be controlled
 - (a) Evaporation
 - (b) Conduction
 - (c) Convection
 - (d) Radiation
 - 2. Anatomy and physiology review
 - 3. Pathophysiology
 - a. Increased surface-to-volume relation makes newborns extremely sensitive to environmental conditions, especially when they are wet after delivery
 - b. Can be an indicator of sepsis in the neonate
 - c. Increased metabolic demand can cause metabolic acidosis, pulmonary hypertension and hypoxemia
 - 4. Assessment findings
 - a. Pale color
 - b. Cool to touch, particular in extremities
 - c. Acrocyanosis
 - d. Respiratory distress
 - e. Apnea
 - f. Bradycardia
 - g. Central cyanosis
 - h. Irritability initially
 - i. Lethargy in late stage
 - j. Generally do not shiver
 - 5. Management considerations

- a. Airway and ventilation
 - (1) Assure adequate oxygenation and ventilation
 - b. Circulation
 - (1) Perform chest compressions if indicated
 - c. Pharmacological
 - (1) D10 if hypoglycemic
 - (2) Warm IV fluids
 - d. Non-pharmacological
 - (1) Environmental conditions should be 24 to 26.5 degrees C
 - (2) Warm hands prior to touching patient
 - e. Transport consideration
 - (1) Identify facility to handle high-risk newborn
 - f. Psychological support/ communication strategies
 - (1) Explain what is being done for the infant
- J. Hypoglycemia in the neonate
- 1. Epidemiology
 - a. Incidence
 - (1) Blood glucose concentration should be determined on all sick infants
 - (2) May be due to inadequate glucose intake or increased utilization of glucose
 - b. Morbidity/ mortality
 - (1) Persistent low blood glucose levels may have catastrophic effects on the brain
 - c. Risk factors
 - (1) Asphyxia, toxemia, smaller twin, CNS hemorrhage, sepsis
 - 2. Anatomy and physiology review
 - 3. Pathophysiology
 - a. A blood glucose screening test less than 45 mg/dl indicates hypoglycemia
 - b. Glycogen stores are sufficient to meet glucose requirements for 8 to 12 hours
 - c. Body releases counter-regulatory hormones including Glucagon, epinephrine, cortisol and growth hormone
 - d. Hormones may cause symptoms of hyperglycemia that last for several hours
 - 4. Assessment findings
 - a. Twitching or seizures, limpness, lethargy, eye-rolling, high pitched cry, apnea, irregular respirations and possible cyanosis
 - 5. Management considerations
 - a. Airway and ventilation
 - (1) Assure adequate oxygenation and ventilation
 - b. Circulation
 - (1) Perform chest compressions if indicated
 - c. Pharmacological
 - (1) Administer D10
 - d. Non-pharmacological
 - (1) Maintain normal body temperature
 - e. Transport consideration
 - (1) Identify facility to handle high-risk newborn
 - f. Psychological support/ communication strategies
 - (1) Explain what is being done for the infant

- K. Vomiting in the neonate
 - 1. Epidemiology
 - a. Incidence
 - (1) Persistent vomiting is a warning sign
 - (2) Vomiting mucous, occasionally blood streaked, in the first few hours of life is not uncommon
 - b. Morbidity/ mortality
 - (1) Vomiting in the first 24 hours of life suggests obstruction in the upper digestive tract or increased intracranial pressure
 - (2) Vomitus containing dark blood is usually a sign of a life-threatening illness
 - c. Risk factors
 - (1) Aspiration of vomitus can cause respiratory insufficiencies or obstruction of the airway
 - 2. Anatomy and physiology review
 - 3. Pathophysiology
 - a. Vomiting of non-bile-stained fluid
 - (1) Anatomic or functional obstruction at or above the first portion of the duodenum
 - (2) Gastroesophageal reflux
 - b. Vomiting of bile-stained fluid
 - (1) Obstruction below the opening of the bile duct
 - 4. Assessment findings
 - a. Distended stomach
 - b. Infection
 - c. Increased ICP
 - d. Drug withdrawal
 - 5. Management considerations
 - a. Airway and ventilation
 - (1) Maintain a patent airway
 - (2) Suction/ clear vomitus from airway
 - (3) Assure adequate oxygenation
 - b. Circulation
 - (1) Bradycardia may be caused by vagal stimulus
 - c. Pharmacological
 - (1) Fluid administration may be required
 - d. Non-pharmacological
 - (1) Provide supportive measures
 - e. Transport consideration
 - (1) Place infant on side
 - (2) Identify facility to handle high-risk newborn
 - 6. Psychological support/ communication strategies
 - a. Explain what is being done for the infant
- L. Diarrhea in the neonate
 - 1. Epidemiology
 - a. Incidence
 - (1) Normal - five to six stools per day, especially if breast feeding
 - b. Morbidity/ mortality

- (1) Severe cases can cause dehydration
 - (2) Bacterial or viral infection may be involved
 - c. Risk factors
 - (1) Severe loss can cause electrolyte imbalance
 - 2. Anatomy and physiology review
 - 3. Pathophysiology
 - a. Gastroenteritis
 - b. Lactose intolerance
 - c. Phototherapy
 - d. Neonatal abstinence syndrome
 - e. Thyrotoxicosis
 - f. Cystic fibrosis
 - 4. Assessment findings
 - a. Loose stools
 - b. Decreased urinary output
 - c. Signs of dehydration
 - 5. Management considerations
 - a. Airway and ventilation
 - (1) Assure adequate oxygenation
 - b. Circulation
 - (1) Perform chest compressions if indicated
 - c. Pharmacological
 - (1) Fluid therapy may be indicated
 - d. Non-pharmacological
 - (1) BSI procedures
 - e. Transport consideration
 - (1) Identify facility to handle high-risk newborn
 - f. Psychological support/ communication strategies
 - (1) Explain what is being done for the infant
- M. Common birth injuries in the newborn
 - 1. Epidemiology
 - a. Incidence
 - (1) Used to denote avoidable and unavoidable mechanical and anoxic trauma incurred by the infant during labor and delivery
 - (2) Estimated to occur in 2 to 7 of every 1,000 live births
 - b. Morbidity/ mortality
 - (1) 5 to 8 of every 100,000 infants die of birth trauma
 - (2) 25 of every 100,000 die of anoxic injuries
 - (3) Such injuries account for 2 - 3% of infant deaths
 - c. Risk factors
 - (1) Explosive delivery
 - 2. Anatomy and physiology review
 - 3. Pathophysiology
 - a. Cranial injuries
 - (1) Molding of the head and overriding of the parietal bones
 - (2) Erythema, abrasions, ecchymosis and subcutaneous fat necrosis can occur with forceps delivery

- (3) Subconjunctival and retinal hemorrhage
 - (4) Subperiosteal hemorrhage
 - (5) Fracture of the skull
 - b. Intracranial hemorrhage
 - (1) May result from trauma or asphyxia
 - c. Spine and spinal cord
 - (1) Strong traction exerted when the spine is hyperextended or pull is lateral
 - d. Peripheral nerve injury
 - e. Liver
 - f. Rupture of the spleen
 - g. Adrenal hemorrhage
 - h. Fracture
 - (1) Clavicle
 - (2) Extremities
 - i. Hypoxia-ischemia
 - 4. Assessment findings
 - a. Diffuse, sometimes ecchymotic, edematous swelling of the soft tissues of the scalp
 - b. Paralysis below the level of spinal cord injury
 - c. Paralysis of the upper arm with or without paralysis of the forearm
 - d. Diaphragmatic paralysis
 - e. Movement on only one side of the face when the newborn cries
 - f. Does not move arm freely on side of fractured clavicle
 - g. Lack of spontaneous movement of the affected extremity
 - h. Hypoxia
 - i. Shock
 - 5. Management considerations
 - a. Airway and ventilation
 - (1) Assure adequate oxygenation and ventilation
 - b. Circulation
 - (1) Perform chest compressions if indicated
 - c. Pharmacology
 - (1) Provide if indicated
 - d. Non-pharmacological
 - (1) Provide supportive measures
 - e. Transport consideration
 - (1) Identify facility to handle high-risk newborn
 - f. Psychological support/ communication strategies
 - (1) Explain what is being done for the newborn
- IV. Neonatal resuscitation and post resuscitation and stabilization
 - A. Neonatal cardiac arrest management
 - 1. Epidemiology
 - a. Incidence
 - (1) Primarily related to hypoxia
 - b. Morbidity/ mortality
 - (1) Outcome is poor if interventions are not initiated quickly
 - (2) Increased likelihood of brain and organ damage

- c. Risk factors
 - (1) Intrauterine asphyxia
 - (2) Prematurity
 - (3) Drugs administered to or taken by the mother
 - (4) Congenital neuromuscular diseases
 - (5) Congenital malformations
 - (6) Intrapartum hypoxemia
- 2. Anatomy and physiology review
- 3. Pathophysiology
 - a. Primary apnea
 - b. Secondary apnea
 - c. Bradycardia
 - d. Persistent fetal circulation
 - e. Pulmonary hypertension
- 4. Assessment findings
 - a. Peripheral cyanosis
 - b. Inadequate respiratory effort
 - c. Ineffective or absent heart rate
- 5. Management considerations
 - a. Airway and ventilation
 - (1) Assure adequate oxygenation and ventilation
 - (a) Blow-by oxygenation is required if peripheral cyanosis is present and despite adequate respiratory effort and heart rate greater than 100 beats/ min
 - (b) Ventilations are required if respiratory effort is inadequate, ineffective or absent or heart rate is less than 80 beats/ min
 - (c) Ventilate at a rate of 40 to 60 breaths per minute
 - (d) Administer a tidal volume sufficient to expand the chest
 - (e) Intubation required if bag-valve-mask ventilations are ineffective, tracheal suctioning is required or prolonged positive-pressure ventilation is necessary
 - b. Chest compressions are indicated if pulse is less than 60 beats/ minute, or between 60 and 80 beats/ minute and not improving despite assisted ventilations with BVM
 - (1) Suction airway thoroughly
 - c. Circulation
 - (1) Perform chest compression
 - d. Pharmacological
 - (1) Epinephrine
 - (2) Normal saline or Ringer's lactate
 - (3) Sodium bicarbonate
 - (4) Naloxone
 - (5) Dextrose (D10)
 - e. Non-pharmacological
 - (1) Maintain normal body temperature
 - f. Transport consideration
 - (1) Identify facility to handle high-risk newborn
 - g. Psychological support/ communication strategies

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UNIT TERMINAL OBJECTIVE

6-2.1 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the pediatric patient.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 6-2.2 Discuss the paramedic's role in the reduction of infant and childhood morbidity and mortality from acute illness and injury. (C-1)
- 6-2.3 Identify methods/ mechanisms that prevent injuries to infants and children. (C-1)
- 6-2.4 Describe Emergency Medical Services for Children (EMSC). (C-1)
- 6-2.5 Discuss how an integrated EMSC system can affect patient outcome. (C-2)
- 6-2.6 Identify key growth and developmental characteristics of infants and children and their implications. (C-2)
- 6-2.7 Identify key anatomical and physiological characteristics of infants and children and their implications. (C-2)
- 6-2.8 Describe techniques for successful assessment of infants and children. (C-1)
- 6-2.9 Describe techniques for successful treatment of infants and children. (C-1)
- 6-2.10 Identify the common responses of families to acute illness and injury of an infant or child. (C-1)
- 6-2.11 Describe techniques for successful interaction with families of acutely ill or injured infants and children. (C-1)
- 6-2.12 Outline differences in adult and childhood anatomy and physiology. (C-3)
- 6-2.13 Identify "normal" age group related vital signs. (C-1)
- 6-2.14 Discuss the appropriate equipment utilized to obtain pediatric vital signs. (C-1)
- 6-2.15 Determine appropriate airway adjuncts for infants and children. (C-1)
- 6-2.16 Discuss complications of improper utilization of airway adjuncts with infants and children. (C-1)
- 6-2.17 Discuss appropriate ventilation devices for infants and children. (C-1)
- 6-2.18 Discuss complications of improper utilization of ventilation devices with infants and children. (C-1)
- 6-2.19 Discuss appropriate endotracheal intubation equipment for infants and children. (C-1)
- 6-2.20 Identify complications of improper endotracheal intubation procedure in infants and children. (C-1)
- 6-2.21 List the indications and methods for gastric decompression for infants and children. (C-1)
- 6-2.22 Define respiratory distress. (C-1)
- 6-2.23 Define respiratory failure. (C-1)
- 6-2.24 Define respiratory arrest. (C-1)
- 6-2.25 Differentiate between upper airway obstruction and lower airway disease. (C-3)
- 6-2.26 Describe the general approach to the treatment of children with respiratory distress, failure, or arrest from upper airway obstruction or lower airway disease. (C-3)
- 6-2.27 Discuss the common causes of hypoperfusion in infants and children. (C-1)
- 6-2.28 Evaluate the severity of hypoperfusion in infants and children. (C-3)
- 6-2.29 Identify the major classifications of pediatric cardiac rhythms. (C-1)
- 6-2.30 Discuss the primary etiologies of cardiopulmonary arrest in infants and children. (C-1)
- 6-2.31 Discuss age appropriate vascular access sites for infants and children. (C-1)
- 6-2.32 Discuss the appropriate equipment for vascular access in infants and children. (C-1)
- 6-2.33 Identify complications of vascular access for infants and children. (C-1)
- 6-2.34 Describe the primary etiologies of altered level of consciousness in infants and children. (C-1)
- 6-2.35 Identify common lethal mechanisms of injury in infants and children. (C-1)
- 6-2.36 Discuss anatomical features of children that predispose or protect them from certain injuries. (C-1)
- 6-2.37 Describe aspects of infant and children airway management that are affected by potential cervical spine injury. (C-1)

- 6-2.38 Identify infant and child trauma patients who require spinal immobilization. (C-1)
- 6-2.39 Discuss fluid management and shock treatment for infant and child trauma patient. (C-1)
- 6-2.40 Determine when pain management and sedation are appropriate for infants and children. (C-1)
- 6-2.41 Define child abuse. (C-1)
- 6-2.42 Define child neglect. (C-1)
- 6-2.43 Define sudden infant death syndrome (SIDS). (C-1)
- 6-2.44 Discuss the parent/ caregiver responses to the death of an infant or child. (C-1)
- 6-2.45 Define children with special health care needs. (C-1)
- 6-2.46 Define technology assisted children. (C-1)
- 6-2.47 Discuss basic cardiac life support (CPR) guidelines for infants and children. (C-1)
- 6-2.48 Identify appropriate parameters for performing infant and child CPR. (C-1)
- 6-2.49 Integrate advanced life support skills with basic cardiac life support for infants and children. (C-3)
- 6-2.50 Discuss the indications, dosage, route of administration and special considerations for medication administration in infants and children. (C-1)
- 6-2.51 Discuss appropriate transport guidelines for infants and children. (C-1)
- 6-2.52 Discuss appropriate receiving facilities for low and high risk infants and children. (C-1)
- 6-2.53 Describe the epidemiology, including the incidence, morbidity/ mortality, risk factors and prevention strategies for respiratory distress/ failure in infants and children. (C-1)
- 6-2.54 Discuss the pathophysiology of respiratory distress/ failure in infants and children. (C-1)
- 6-2.55 Discuss the assessment findings associated with respiratory distress/ failure in infants and children. (C-1)
- 6-2.56 Discuss the management/ treatment plan for respiratory distress/ failure in infants and children. (C-1)
- 6-2.57 Describe the epidemiology, including the incidence, morbidity/ mortality, risk factors and prevention strategies for hypoperfusion in infants and children. (C-1)
- 6-2.58 Discuss the pathophysiology of hypoperfusion in infants and children. (C-1)
- 6-2.59 Discuss the assessment findings associated with hypoperfusion in infants and children. (C-1)
- 6-2.60 Discuss the management/ treatment plan for hypoperfusion in infants and children. (C-1)
- 6-2.61 Describe the epidemiology, including the incidence, morbidity/ mortality, risk factors and prevention strategies for cardiac dysrhythmias in infants and children. (C-1)
- 6-2.62 Discuss the pathophysiology of cardiac dysrhythmias in infants and children. (C-1)
- 6-2.63 Discuss the assessment findings associated with cardiac dysrhythmias in infants and children. (C-1)
- 6-2.64 Discuss the management/ treatment plan for cardiac dysrhythmias in infants and children. (C-1)
- 6-2.65 Describe the epidemiology, including the incidence, morbidity/ mortality, risk factors and prevention strategies for neurological emergencies in infants and children. (C-1)
- 6-2.66 Discuss the pathophysiology of neurological emergencies in infants and children. (C-1)
- 6-2.67 Discuss the assessment findings associated with neurological emergencies in infants and children. (C-1)
- 6-2.68 Discuss the management/ treatment plan for neurological emergencies in infants and children. (C-1)
- 6-2.69 Describe the epidemiology, including the incidence, morbidity/ mortality, risk factors and prevention strategies for trauma in infants and children. (C-1)
- 6-2.70 Discuss the pathophysiology of trauma in infants and children. (C-1)
- 6-2.71 Discuss the assessment findings associated with trauma in infants and children. (C-1)
- 6-2.72 Discuss the management/ treatment plan for trauma in infants and children. (C-1)
- 6-2.73 Describe the epidemiology, including the incidence, morbidity/ mortality, risk factors and prevention strategies for abuse and neglect in infants and children. (C-1)
- 6-2.74 Discuss the pathophysiology of abuse and neglect in infants and children. (C-1)
- 6-2.75 Discuss the assessment findings associated with abuse and neglect in infants and children. (C-1)
- 6-2.76 Discuss the management/ treatment plan for abuse and neglect in infants and children, including documentation and reporting. (C-1)
- 6-2.77 Describe the epidemiology, including the incidence, morbidity/ mortality, risk factors and prevention

- strategies for SIDS infants. (C-1)
- 6-2.78 Describe the epidemiology, including the incidence, morbidity/ mortality, risk factors and prevention strategies for children with special health care needs including technology assisted children. (C-1)
- 6-2.79 Discuss the pathophysiology of children with special health care needs including technology assisted children. (C-1)
- 6-2.80 Discuss the assessment findings associated for children with special health care needs including technology assisted children. (C-1)
- 6-2.81 Discuss the management/ treatment plan for children with special health care needs including technology assisted children. (C-1)
- 6-2.82 Describe the epidemiology, including the incidence, morbidity/ mortality, risk factors and prevention strategies for SIDS infants. (C-1)
- 6-2.83 Discuss the pathophysiology of SIDS in infants. (C-1)
- 6-2.84 Discuss the assessment findings associated with SIDS infants. (C-1)
- 6-2.85 Discuss the management/ treatment plan for SIDS in infants. (C-1)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 6-2.86 Demonstrate and advocate appropriate interactions with the infant/ child that conveys an understanding of their developmental stage. (A-3)
- 6-2.87 Recognize the emotional dependence of the infant/ child to their parent/ guardian. (A-1)
- 6-2.88 Recognize the emotional impact of the infant/ child injuries and illnesses on the parent/ guardian. (A-1)
- 6-2.89 Recognize and appreciate the physical and emotional difficulties associated with separation of the parent/ guardian of a special needs child (A-3)
- 6-2.90 Demonstrate the ability to provide reassurance, empathy and compassion for the parent/ guardian. (A-1)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 6-2.91 Demonstrate the appropriate approach for treating infants and children. (P-2)
- 6-2.92 Demonstrate appropriate intervention techniques with families of acutely ill or injured infants and children. (P-2)
- 6-2.93 Demonstrate an appropriate assessment for different developmental age groups. (P-2)
- 6-2.94 Demonstrate an appropriate technique for measuring pediatric vital signs. (P-2)
- 6-2.95 Demonstrate the use of a length-based resuscitation device for determining equipment sizes, drug doses and other pertinent information for a pediatric patient. (P-2)
- 6-2.96 Demonstrate the appropriate approach for treating infants and children with respiratory distress, failure, and arrest. (P-2)
- 6-2.97 Demonstrate proper technique for administering blow-by oxygen to infants and children. (P-2)
- 6-2.98 Demonstrate the proper utilization of a pediatric non-rebreather oxygen mask. (P-2)
- 6-2.99 Demonstrate proper technique for suctioning of infants and children. (P-2)
- 6-2.100 Demonstrate appropriate use of airway adjuncts with infants and children. (P-2)
- 6-2.101 Demonstrate appropriate use of ventilation devices for infants and children. (P-2)
- 6-2.102 Demonstrate endotracheal intubation procedures in infants and children. (P-2)
- 6-2.103 Demonstrate appropriate treatment/ management of intubation complications for infants and children. (P-2)
- 6-2.104 Demonstrate appropriate needle cricothyroidotomy in infants and children. (P-2)
- 6-2.105 Demonstrate proper placement of a gastric tube in infants and children. (P-2)

- 6-2.106 Demonstrate an appropriate technique for insertion of peripheral intravenous catheters for infants and children. (P-2)
- 6-2.107 Demonstrate an appropriate technique for administration of intramuscular, inhalation, subcutaneous, rectal, endotracheal and oral medication for infants and children. (P-2)
- 6-2.108 Demonstrate an appropriate technique for insertion of an intraosseous line for infants and children. (P-2)
- 6-2.109 Demonstrate appropriate interventions for infants and children with a partially obstructed airway. (P-2)
- 6-2.110 Demonstrate age appropriate basic airway clearing maneuvers for infants and children with a completely obstructed airway. (P-2)
- 6-2.111 Demonstrate proper technique for direct laryngoscopy and foreign body retrieval in infants and children with a completely obstructed airway. (P-2)
- 6-2.112 Demonstrate appropriate airway and breathing control maneuvers for infant and child trauma patients. (P-2)
- 6-2.113 Demonstrate appropriate treatment of infants and children requiring advanced airway and breathing control. (P-2)
- 6-2.114 Demonstrate appropriate immobilization techniques for infant and child trauma patients. (P-2)
- 6-2.115 Demonstrate treatment of infants and children with head injuries. (P-2)
- 6-2.116 Demonstrate appropriate treatment of infants and children with chest injuries. (P-2)
- 6-2.117 Demonstrate appropriate treatment of infants and children with abdominal injuries. (P-2)
- 6-2.118 Demonstrate appropriate treatment of infants and children with extremity injuries. (P-2)
- 6-2.119 Demonstrate appropriate treatment of infants and children with burns. (P-2)
- 6-2.120 Demonstrate appropriate parent/ caregiver interviewing techniques for infant and child death situations. (P-2)
- 6-2.121 Demonstrate proper infant CPR. (P-2)
- 6-2.122 Demonstrate proper child CPR. (P-2)
- 6-2.123 Demonstrate proper techniques for performing infant and child defibrillation and synchronized cardioversion. (P-2)

DECLARATIVE

1. Introduction
 - A. Epidemiology of EMS incidents involving pediatric patients
 - B. Paramedic role in treating infants and children
 1. Care of the pediatric patient
 - a. Prehospital care (primary transport)
 - b. Interfacility transfer (secondary transport)
 2. Maintain and improve pediatric knowledge and clinical skills
 - a. Continuing education programs
 - (1) Pediatric Advanced Life Support
 - (2) Pediatric Basic Trauma Life Support
 - (3) Advanced Pediatric Life Support
 - (4) Pediatric Emergencies for Paramedics
 - (5) Regional conferences and seminars
 - b. Clinical application
 - (1) Pediatric emergency department
 - (2) Pediatric hospital
 - (3) Pediatric department of a community hospital
 - (4) Pediatrician office
 - c. Textbooks and journals
 - d. Teaching Resource for Instructors of Prehospital Pediatrics (TRIPP)
 3. Reduction of mortality and morbidity
 - a. Educational programs
 - (1) Schools
 - (2) Community
 - (1) Parents
 - b. Prevention
 - (1) Community involvement
 - (2) Safety inspections
 - c. Documentation
 - (1) Prehospital and trauma registries
 - (2) Epidemiological research and surveillance
 - C. Emergency Medical Services for Children (EMSC)
 1. Coordinated national effort to improve the health of pediatric patients who suffer potentially life-threatening illness or injury
 2. Specific areas of pediatric health care concern have been identified
 - a. System approach
 - b. Education

- c. Data collection
 - d. Quality improvement
 - e. Injury prevention
 - f. Access
 - g. Prehospital care
 - h. Emergency care
 - i. Definitive care
 - j. Rehabilitation
 - k. Finance
 - l. On-going health care from birth to young adulthood
- D. Definitions
- 1. Newborn
 - a. First few hours of life (perinatal period)
 - b. Resuscitation follows Neonatal Advanced Life Support (NALS) guidelines
 - 2. Infant
 - a. Neonatal period (first 28 days of life) is included
 - b. First month after birth to approximately 12 months of age
 - c. Resuscitation follows Pediatric Advanced Life Support (PALS) guidelines
 - 3. Toddler
 - a. A child between 12 and 36 months of age
 - 4. Preschool
 - a. A child between three and five years of age
 - 5. School age
 - a. The child between 6 and 12 years of age
 - 6. Adolescent
 - a. The period between the end of childhood and adulthood (18 years)
 - (1) Early (puberty)
 - (2) Middle (junior high school/ high school age)
 - (3) Late (high school/ college age)
 - b. End of childhood is usually defined as the beginning of puberty
 - (1) Highly child specific
 - (2) Male child average 13 years
 - (3) Female child average 11 years
2. Growth and development review
- A. Infant

1. Physical development
 - a. Neonate (first month of life)
 - (1) Weight
 - (2) Crying
 - (a) Typical causes
 - (b) Persistent crying may indicate physiologic distress
 - (3) Movements
 - (4) Sleep
 - b. Infant (2-12 months)
 - (1) Weight
 - (2) Crying
 - (a) Gradually decreases throughout infancy
 - (b) Persistent crying may indicated physiological distress
 - (3) Movements
 - (a) Young infant
 - (b) Older infant
 - (4) Sleep
 2. Cognitive development
 - a. Neonate (first month of life)
 - b. Infant (2-12 months)
 - (1) Young infant
 - (2) Older infant
 3. Emotional development
 - a. Neonate (first month of life)
 - b. Infant (2-12 months)
 4. Paramedic implications
 - a. Keep the patient warm and dry
 - b. Handle patient gently, supporting head and neck
 - c. Speak quietly
 - d. Involve caregivers in treatment whenever possible
 1. Persistent crying, irritability, or inability to console or arouse patient may indicate physiologic distress
 - e. Foreign body airway obstruction risk begins at approximately 6 months and increases
- B. Toddler
1. Physical development
 - a. Weight
 - b. Movements
 2. Cognitive development
 3. Emotional development

4. Paramedic implications
 - a. Keep the patient warm
 - b. Handle patient gently
 - c. Speak quietly and use simple words
 - d. Distract patient with interesting objects (toy) during exam
 - e. Avoid procedures on the dominant hand/ arm
 - f. Involve caregivers in treatment whenever possible
 - g. Try not to separate child from the caregiver
 - h. Allow child to hold transitional objects (blanket, stuffed animal, etc.)
 2. Persistent irritability, and inability to console or arouse patient may indicate physiologic distress
 - i. Foreign body airway obstruction continues to be a risk
- C. Preschool
 1. Physical development
 - a. Weight
 - b. Movements
 2. Cognitive development
 3. Emotional development
 4. Paramedic implications
 - a. Keep the patient warm
 - b. Handle patient gently
 - c. Speak quietly in clear and unambiguous language; avoid baby talk
 - d. Offer the patient treatment choices if possible
 - e. Involve caregivers in treatment whenever possible
 3. Persistent irritability, or inability to arouse patient may indicate physiologic distress
 - f. Foreign body airway obstruction risk continues
 - g. Respect patient modesty
 - h. Avoid frightening or misleading comments
- D. School age
 1. Physical development
 - a. Weight
 - b. Movement
 2. Cognitive development
 3. Emotional development
 4. Paramedic implications
 - a. Keep the patient warm
 - b. Speak in clear and unambiguous language

- c. Be honest about procedures inducing pain
 - d. Involve the patient in treatment whenever possible
 - 4. Persistent irritability, or inability to arouse patient may indicate physiologic distress
 - e. Respect patient modesty
 - f. Reassure patient of body integrity
 - g. Address preoccupations about death when appropriate
- E. Adolescent
- 1. Physical development
 - 2. Cognitive development
 - 3. Emotional development
 - 4. Paramedic implications
 - a. Explain things clearly and honestly
 - b. Involve the patient in treatment whenever possible
 - c. Respect patient modesty
 - d. Address patient concerns of body integrity/disfigurement
 - e. Deal with patient tactfully and fairly
 - f. Vital signs approach adult values
 - g. Consider the possibility of substance abuse, endangerment of self or others
3. Anatomy and physiology review
- A. Head
- 1. Proportionally larger size
 - 2. Larger occipital region
 - 3. Fontanelles open in infancy
 - 4. Face is small in comparison to size of head
 - 5. Paramedic implications
 - a. Higher proportion of blunt trauma involves the head
 - b. Different airway positioning techniques
 - (1) Place thin layer of padding under back of seriously injured child < 3 years of age to obtain neutral position
 - (2) Place folded sheet under occiput of medically ill child > 3 years of age to obtain sniffing position
 - c. Examine fontanelle in infants

- (1) Bulging fontanelle suggests increased intracranial pressure
 - (2) Sunken fontanelle suggests dehydration
- B. Airway
- 1. Narrower at all levels
 - 2. Infants are obligate nasal breathers
 - 3. Jaw is proportionally smaller in young children
 - 4. Larynx is higher (C 3-4) and more anterior
 - 5. Cricoid ring is the narrowest part of the airway in young children
 - 6. Tracheal cartilage softer
 - 7. Trachea smaller in both length and diameter
 - 8. Epiglottis
 - a. Omega shaped in infants
 - b. Extends at a 45 degree angle into airway
 - c. Epiglottic folds have softer cartilage, therefore are more floppy, especially in infants
 - 9. Paramedic implications
 - a. Keep nares clear in infants < 6 months of age
 - b. Narrower upper airways are more easily obstructed
 - (1) Flexion or hyperextension
 - (2) Particulate matter
 - (3) Soft tissue swelling (injury, inflammation)
 - c. Differences in intubation technique
 - (1) Gentler touch
 - (2) Straight blade
 - (3) Lift epiglottis
 - (4) Uncuffed tube
 - (5) Precise placement
- C. Chest and lungs
- 1. Ribs are positioned horizontally
 - 2. Ribs are more pliable and offer less protection to organs
 - 3. Chest muscles immature and fatigue easily
 - 4. Lung tissue is more fragile
 - 5. Mediastinum is more mobile
 - 6. Thin chest wall allows for easily transmitted breath sounds
 - 7. Paramedic implications
 - a. Infants and children are diaphragmatic breathers
 - b. Infants and children are prone to gastric distention
 - c. Rib fractures are less frequent but not uncommon

- in child abuse and trauma
 - d. Greater energy transmitted to underlying organs following trauma, therefore, significant internal injury can be present without external signs
 - e. Pulmonary contusions are more common in major trauma
 - f. Lungs prone to pneumothorax following barotrauma
 - g. Mediastinum has greater shift with tension pneumothorax
 - h. Easy to miss a pneumothorax or misplaced intubation due to transmitted breath sounds
- D. Abdomen
 - 1. Immature abdominal muscles offer less protection
 - 2. Abdominal organs are closer together
 - 3. Liver and spleen proportionally larger and more vascular
 - 4. Paramedic implications
 - a. Liver and spleen more frequently injured
 - b. Multiple organ injuries more common
- E. Extremities
 - 1. Bones are softer and more porous until adolescence
 - 2. Injuries to growth plate may disrupt bone growth
 - 3. Paramedic implications
 - a. Immobilize any "sprain" or "strain" as it is likely a fracture
 - b. Avoid piercing growth plate during intraosseous needle insertion
- F. Skin and body surface area (BSA)
 - 1. Thinner and more elastic
 - 2. Thermal exposure results in deeper burn
 - 3. Less subcutaneous fat
 - 4. Larger surface area to body mass
 - 5. Paramedic implications
 - a. More easily and deeply burned
 - b. Larger losses of fluid and heat
- G. Respiratory system
 - 1. Tidal volume proportionally similar to that of adolescents and adults
 - 2. Metabolic oxygen requirements of infants and children are approximately double those of adolescents and adults
 - 3. Proportionally smaller functional residual capacity therefore proportionally smaller oxygen reserves

4. Paramedic implications
 - a. Hypoxia develops rapidly because of increased oxygen requirements and decreased oxygen reserves
- H. Cardiovascular system
 1. Cardiac output is rate dependent in infants and small children
 2. Vigorous but limited cardiovascular reserves
 3. Bradycardia is a response to hypoxia
 4. Can maintain blood pressure longer than an adult
 5. Circulating blood volume is proportionally larger than in an adult
 6. Absolute blood volume is smaller than in an adult
 7. Paramedic implications
 - a. Smaller absolute volume of fluid/ blood loss needed to cause shock
 - b. Larger proportional volume of fluid/ blood loss needed to cause shock
 - c. Hypotension is a late sign of shock
 - d. A child may be in shock despite normal blood pressure
 - e. Shock assessment is based upon clinical signs of tissue perfusion
 - f. Carefully assess for shock if tachycardia is present
 - g. Monitor carefully for development of hypotension
- I. Nervous system
 1. Develops throughout childhood
 2. Developing neural tissue is more fragile
 3. Brain and spinal cord are less well protected by skull and spinal column
 4. Paramedic implications
 - a. Brain injuries are more devastating in young children
 - b. Greater force transmitted to underlying brain of young children
 - c. Spinal cord injury can occur without spinal column injury
- J. Metabolic differences
 1. Infants and children have a limited glycogen and glucose stores
 2. Significant volume loss can result from vomiting and diarrhea
 3. Prone to hypothermia due to increased body surface

- area
- 4. Newborns and neonates are unable to shiver to maintain body temperature
- 5. Paramedic implications
 - a. Keep child warm during treatment and transport
 - b. Cover the head to minimize heat loss
- 4. Assessment
 - A. General considerations
 - 1. Many components of the initial patient evaluation can be done by observing the patient
 - 1. Utilize the parent/ guardian to assist in making the infant or child more comfortable as appropriate
 - 2. Interacting with parents and family
 - a. Normal responses to acute illness and injury
 - b. Parent/ guardian and child interaction
 - c. Intervention techniques
 - B. Physical exam
 - 1. Scene survey
 - a. Observe the scene for hazards or potential hazards
 - b. Observe the scene for mechanism of injury/ illness
 - (1) Ingestion
 - (a) Pills, medicine bottles, household chemicals, etc.
 - (2) Child abuse
 - (a) Injury and history do not coincide, bruises not where they should be for mechanism of injury, etc.
 - (3) Position patient found
 - c. Observe the parent/ guardian/ caregiver interaction with the child
 - (1) Do they act appropriately
 - (2) Is parent/ guardian/ caregiver concerned
 - (3) Is parent/ guardian/ caregiver angry
 - (4) Is parent/ guardian/ caregiver indifferent
 - 2. Initial assessment
 - a. General impression
 - (1) General impression of environment
 - (2) General impression of parent/ guardian and child interaction
 - (3) General impression of the patient/ Pediatric

Assessment Triangle

- (a) A structure for assessing the pediatric patient
 - (b) Focuses on the most valuable information for pediatric patients
 - (c) Used to ascertain if any life-threatening condition exists
 - (d) Components
 - i) Appearance
 - a) Mental status
 - b) Muscle tone
 - ii) Work of breathing
 - a) Respiratory rate
 - b) Respiratory effort
 - iii) Circulation
 - a) Skin signs
 - b) Skin color
- (4) Initial triage decisions
- (1) Urgent - proceed with rapid ABC assessment, treatment and transport
 - (e) Non urgent - proceed with focused history, detailed physical exam after initial assessment
- b. Vital functions
- (1) Determine level of consciousness
 - (a) AVPU scale
 - i) Alert
 - ii) Responds to verbal stimuli
 - iii) Responds to painful stimuli
 - iv) Unresponsive
 - (b) Modified Glasgow Coma Scale
 - (c) Signs of inadequate oxygenation
 - (2) Airway
 - (a) Determine patency
 - (3) Breathing
 - (a) Adequate chest rise and fall
 - (b) Use of accessory muscles
 - (c) Nasal flaring
 - (d) Tachypnea
 - (e) Bradypnea
 - (f) Irregular breathing pattern
 - (g) Head bobbing
 - (h) Grunting

- (i) Absent breath sounds
 - (j) Abnormal sounds
 - (4) Circulation
 - (a) Pulse
 - i) Central
 - ii) Peripheral
 - iii) Quality of pulse
 - (b) Blood pressure
 - i) Measuring blood pressure is not necessary in children < 3 years of age
 - (c) Skin color
 - (d) Active hemorrhage
 - (5) Vital signs
 - (a) Infant
 - (b) Toddler
 - (c) Preschool
 - (d) School aged
 - (e) Adolescent
3. Transition phase
- 2. Utilized to allow the infant or child to become familiar with you and your equipment
 - c. Use of transition phase depends on the seriousness of the patient's condition
 - d. For the conscious, non-acutely ill child
 - e. For the unconscious, acutely ill child do not perform the transition phase but proceed directly to the treatment and transport
4. Focused history
- a. Approach
 - (1) For infant, toddler, and preschool age patient, obtain from parent/ guardian
 - (2) For school age and adolescent patient, most information may be obtained from the patient
 - (3) For older adolescent patient question the patient in private regarding sexual activity, pregnancy, illicit drug and alcohol use
 - b. Content
 - (1) Chief complaint
 - (a) Nature of illness/ injury
 - (b) How long has the patient been sick/ injured

- (c) Presence of fever
- (d) Effects on behavior
- (e) Bowel/ urine habits
- (f) Vomiting/ diarrhea
- (g) Frequency of urination
- (2) Past medical history
 - (a) Infant or child under the care of a physician
 - (b) Chronic illnesses
 - (c) Medications
 - (d) Allergies
- 5. Detailed physical exam
 - a. Examine all body regions
 - (1) Head-to-toe in older child
 - (2) Toe-to-head in younger child
 - b. Some or all of the following may be appropriate, depending on the situation
 - (1) Pupils
 - (2) Capillary refill
 - (a) Normal - two seconds or less
 - (b) Valuable to assess on patients less than six years of age
 - (c) Less reliable in cold environment
 - (d) Blanch nailbed, base of the thumb, sole of the feet
 - (3) Hydration
 - (a) Skin turgor
 - (b) Sunken or flat fontanelle in an infant
 - (c) Presence of tears and saliva
 - (4) Pulse oximetry
 - (1) Should be utilized on any moderately injured or ill infant or child
 - (d) Hypothermia and shock can alter reading
 - (5) Cardiac monitor
- 6. On-going exam - continually monitor the following
 - a. Respiratory effort
 - b. Color
 - c. Mental status
 - d. Pulse oximetry
 - e. Vital signs
 - f. Patient temperature
- C. General management
 - 1. Airway management in pediatric patients

- a. Basic airway management
 - (1) Manual positioning
 - (a) Allow medical patients to assume position of comfort
 - (b) Support under the torso for trauma patients less than 3 year old
 - (2) Occipital elevation for supine medical patients 3 years of age or older
 - (2) Foreign body airway obstruction - basic clearing methods
 - (a) Infants
 - i) Back blows
 - ii) Chest thrusts
 - (b) Children
 - i) Abdominal thrusts
 - (3) Suction
 - (a) Avoid hypoxia
 - (b) Avoid upper airway stimulation
 - (c) Decrease suction negative pressure (≤ 100 mm/Hg) in infants
 - (4) Oxygenation
 - (a) Non-rebreather mask
 - (b) Blow-by oxygen if mask is not tolerated
 - (3) Utilize the parent or guardian to deliver oxygen if patient condition warrants
 - (c) Maintain proper head position
 - (5) Oropharyngeal airway
 - (a) Sizing
 - (b) Preferred method of insertion uses the tongue blade to depress the tongue and jaw
 - (6) Nasopharyngeal airway
 - (a) Sizing
 - (b) No major differences in sizing or use compared to adults
 - (7) Ventilation
 - (a) Bag size
 - (b) Proper mask fit
 - (c) Proper mask position and seal (E-C clamp)
 - (d) Ventilate at age appropriate rate (squeeze-release-release)

- (e) Obtain chest rise with each breath
 - (f) Allow adequate time for exhalation
 - (g) Assess BVM ventilation
 - (4) Apply cricoid pressure to minimize gastric inflation and passive regurgitation
 - b. Advanced airway management
 - (1) Foreign body airway obstruction - advanced clearing methods
 - (a) Direct laryngoscopy with Magill forceps
 - (b) Attempt intubation around foreign body
 - (c) Consider needle cricothyroidotomy per medical direction only as a last resort if complete upper airway obstruction is present
 - (2) Endotracheal intubation in pediatric patients
 - (a) Laryngoscope and appropriate size blade
 - i) Length based resuscitation tape to determine size
 - ii) Straight blade is preferred
 - (b) Appropriate size endotracheal tube and stylette
 - i) Sizing methods
 - 1) Length based resuscitation tape
 - c) Numerical formulas
 - d) Anatomical clues
 - ii) Stylette placement
 - (c) Technique for pediatric intubation
 - (d) Depth of insertion
 - (e) Endotracheal tube securing device
 - (3) Needle cricothyroidotomy in pediatric patients
2. Circulation
 - a. Vascular access
 - (1) Intraosseous access in children < 6 years of age in cardiac arrest or if intravenous access fails
 - b. Fluid resuscitation
 - (1) 20 ml/kg of lactated ringer's or normal saline bolus as needed
3. Pharmacological

- a. Rapid sequence intubation per medical direction
 4. Non-pharmacological
 - a. C-spine immobilization for traumatic cause
 5. Transport considerations
 - a. Appropriate mode
 - (1) Transport should not be delayed to perform procedures that can be done en route
 - (2) Proper BLS care must be performed prior to any ALS interventions
 - b. Appropriate facility
 - (1) The availability of a receiving hospital with expertise in pediatric care may improve the patient's outcome
 6. Psychological support/ communication strategies
 - a. Utilize the parent/ guardian to assist in making the infant or child more comfortable
 - b. Encourage parents to help calm the child during painful procedures
 - c. Infants, toddlers, preschool and school aged patients do not like to be separated from parent/ guardian
 - d. Infants and children have a natural fear of strangers; for stable patients, allow them to become accustomed to you before your hands-on assessment
 - e. Give some control of what is going to happen to the patient (which arm to have their IV)
 - f. When possible and practical, physically position your face at the same level as the patient's face to facilitate communication and minimize fear
 - g. Use age-appropriate vocabulary
 - h. Keep patient warm
 - i. Allow child to take their favorite toy/ blanket if possible
 - j. Permit the child to express their feelings (e.g., fear, pain, crying,)
 3. Let the child know that certain physical actions (e.g., hitting, biting, spitting) are not permitted
-
5. Specific pathophysiology, assessment and management
 - A. Respiratory compromise
 1. Introduction

- a. Epidemiology
 - (1) Incidence
 - (2) Morbidity/ mortality
 - (3) Risk factors
 - (4) Prevention strategies
 - b. Categories of respiratory compromise
 - (1) Upper airway obstruction
 - (2) Lower airway disease
2. Pathophysiology
- a. Respiratory illnesses cause respiratory compromise in airway/ lung
 - (1) Severity of respiratory compromise depends on extent of respiratory illness
 - (3) Approach to treatment depends on severity of respiratory compromise
 - b. Severity
 - (1) Respiratory distress
 - (a) Increased work of breathing
 - (b) Carbon dioxide tension in the blood initially decreases, then increases as condition deteriorates
 - (c) If uncorrected, respiratory distress leads to respiratory failure
 - (2) Respiratory failure
 - (a) Inadequate ventilation or oxygenation
 - (1) Respiratory and circulatory systems are unable to exchange enough oxygen and carbon dioxide
 - (b) Carbon dioxide tension in the blood increases, leading to respiratory acidosis
 - (c) Very ominous condition; patient is on the verge of respiratory arrest
 - (3) Respiratory arrest
 - (a) Cessation of breathing
 - (b) Failure to intervene will result in cardiopulmonary arrest
 - (c) Good outcomes can be expected with early intervention that prevents cardiopulmonary arrest
 - c. Assessment
 - (1) Chief Complaint
 - (2) History

- (3) Physical findings
 - (a) Signs and symptoms of respiratory distress
 - i) Normal mental status => irritability or anxiety
 - ii) Tachypnea
 - iii) Retractions
 - iv) Nasal flaring
 - v) Good muscle tone
 - vi) Tachycardia
 - vii) Head bobbing
 - viii) Grunting
 - ix) Cyanosis which improves with supplemental oxygen
 - (b) Signs and symptoms of respiratory failure
 - i) Irritability or anxiety ==> lethargy
 - ii) Marked tachypnea ==> bradypnea
 - iii) Marked retractions ==> agonal respirations
 - iv) Poor muscle tone
 - v) Marked tachycardia ==> bradycardia
 - vi) Central cyanosis
 - (c) Signs and symptoms of respiratory arrest
 - i) Obtunded ==> coma
 - ii) Bradypnea ==> apnea
 - iii) Absent chest wall motion
 - iv) Limp muscle tone
 - v) Bradycardia ==> asystole
 - vi) Profound cyanosis
 - (4) On-going assessment - improvement indicated by
 - (a) Improvement in color
 - (b) Improvement in oxygen saturation
 - (c) Increased pulse rate
 - (d) Increased level of consciousness
- d. Management
 - (1) Graded approach to treatment
 - (2) Consider separating parent and child
 - (3) Airway
 - (a) Manage upper airway obstructions as

- needed
- (b) Insert airway adjunct if needed
- (4) Ventilation and oxygenation
 - (a) Respiratory distress/ early respiratory failure
 - i) Administer high flow oxygen
 - (b) Late respiratory failure/ respiratory arrest
 - i) BVM - ventilate patient with 100% oxygen via age- appropriate sized bag
 - ii) ETT - intubate patient if positive pressure ventilation does not rapidly improve patient condition
 - iii) Consider gastric decompression if abdominal distention is impeding ventilation
 - iv) Consider needle decompression per medical direction if tension pneumothorax is present
 - v) Consider cricothyroidotomy per medical direction only as a last resort if complete upper airway obstruction is present
- (5) Circulation
- (6) Supportive care
- (7) Transport considerations
 - (a) Appropriate mode
 - (b) Appropriate facility
- (8) Psychological support/ communication strategies
- 3. Upper airway obstruction
 - a. Croup
 - (1) Epidemiology
 - (a) Incidence
 - 1) Very common in infants and children (6 months to 4 years of age)
 - (b) Risk factors
 - (c) Prevention strategies
 - (2) Pathophysiology
 - (2) An inflammatory process of the upper respiratory tract involving the

- subglottic region
- (d) Main cause is viral infection of the upper airway
- (e) Another form is spasmodic croup
 - v) Occurs mostly in the middle of the night
 - vi) Usually without prior upper respiratory infection
- (3) Assessment
 - (a) Signs and symptoms of respiratory distress or failure, depending on severity, plus
 - i) Appears sick
 - ii) Stridor
 - iii) Barking (seal or dog-like) or brassy cough
 - iv) Hoarseness
 - v) Fever (+/-)
 - (b) History
 - i) Usually with history of upper respiratory infection in classic croup (1-2 days)
 - ii) Rarely progresses to respiratory failure
- (4) Management
 - (a) Airway and ventilation
 - i) Humidified or nebulized oxygen
 - ii) Cool mist oxygen at 4-6 L/min
 - (b) Circulation
 - (c) Pharmacological
 - (d) Non-pharmacological
 - i) Keep child in position of comfort
 - (e) Transport considerations
 - (f) Psychological support/ communication strategies
 - i) Do not agitate the patient (no IVs, blood pressure, etc.)
 - 1) Keep the parent/ guardian/ caregiver with the infant or child if appropriate
- b. Foreign body aspiration
 - (1) Epidemiology
 - (a) Incidence

- i) Usually occurs in toddlers and pre-schoolers (1 to 4 years of age, but can occur at any age)
 - ii) Common
 - (b) Risk factors
 - (c) Prevention strategies
 - (2) Pathophysiology
 - (a) Partial or complete blockage of the upper airway by a foreign body
 - (b) Objects are usually food (hard candy, nuts, seeds, hot dog) or small objects (coins, balloons)
 - (c) If no interventions or if interventions are unsuccessful, respiratory arrest followed by cardiopulmonary arrest will ensue
 - (3) Assessment
 - (a) Partial obstruction
 - i) Signs and symptoms of respiratory distress or failure, depending on severity, plus
 - a) Appears irritable or anxious, but not toxic
 - b) Inspiratory stridor
 - c) Muffled or hoarse voice
 - d) Drooling
 - e) Pain in throat
 - ii) History
 - 1) Usually a history of choking if observed by adult
 - (b) Complete obstruction
 - i) Signs and symptoms of respiratory failure or arrest, depending on severity, plus
 - e) Appears agitated or lethargic
 - f) No or minimal air movement
 - ii) History
 - a) History often lacking
 - b) Inability to ventilate despite proper airway positioning
 - (4) Management
 - (a) Airway and ventilation

- i) Partial obstruction
 - a) Place patient in sitting position
 - b) Deliver oxygen by non-rebreather mask or blow-by
 - c) DO NOT ATTEMPT TO LOOK IN MOUTH
 - d) Interventions other than oxygen and transport may precipitate complete obstruction
- ii) Complete obstruction
 - a) Open airway and attempt to visualize the obstruction
 - b) Sweep visible obstructions with your finger (do NOT perform blind finger sweeps)
 - c) Perform BLS FBAO maneuvers
 - d) Attempt BVM ventilations
 - e) Perform laryngoscopy if BVM is unsuccessful
 - f) Remove object if possible with pediatric Magill forceps
 - g) Intubate if possible
 - h) Continue BLS FBAO maneuvers if ALS is unsuccessful
 - i) Consider needle cricothyroidotomy per medical direction only as a last resort
- (b) Circulation
- (c) Pharmacological
- (d) Transport considerations
 - i) Notify hospital of patient status
 - ii) Transport expeditiously
- (e) Psychological support/ communication strategies
 - i) Do not agitate patient
 - a) No IVs or medications
 - b) Do not look in patient's mouth
 - ii) Keep caregiver with child, if appropriate

- c. Bacterial tracheitis
 - (1) Epidemiology
 - (a) Incidence
 - 2) Usually occurs in infants and toddlers (1-5 years old), but can occur in older children
 - 3) Very uncommon
 - (b) Risk factors
 - (c) Prevention strategies
 - (2) Pathophysiology
 - (3) Bacterial infection of the upper airway, subglottic trachea, usually following viral croup
 - (3) Assessment
 - (c) Signs and symptoms - respiratory distress or failure depending on severity, plus
 - i) Appears agitated, sick
 - ii) High-grade fever
 - iii) Inspiratory and expiratory stridor
 - iv) Coughing up pus/ mucous
 - v) Hoarse voice
 - vi) Pain in throat
 - (d) History
 - i) Usually a history of croup in the preceding few days
 - (e) May progress to respiratory failure or arrest
 - (4) Management
 - (a) Assure airway and ventilation
 - (b) Administer oxygen by non-rebreather or blow-by
 - (c) Complete obstruction or respiratory failure/ arrest
 - i) BVM ventilation
 - ii) May require high pressure to adequately ventilate
 - iii) Intubate patient
 - iv) Suction endotracheal tube to reduce pus or mucous
 - (d) Circulation
 - (e) Pharmacological
 - (f) Transport considerations

- i) Place patient in sitting position
 - ii) Notify hospital of patient status as early as possible
 - iii) Transport quickly
 - (g) Psychological support/ communication strategies
 - 1) DO NOT AGITATE THE PATIENT - no IVs, no BP, do not look in patient's mouth
 - iv) Keep caregiver with child if appropriate
- d. Epiglottitis
 - (1) Epidemiology
 - (a) Incidence
 - i) Usually occurs in pre-school and school-age children (3-7 years of age) but can occur at any age
 - ii) Extremely uncommon due to the H. flu vaccine
 - (b) Risk factors
 - (c) Prevention strategies
 - (2) Pathophysiology
 - (4) Rapidly forming cellulitis of the epiglottis and its surrounding structures
 - (d) Bacterial infection, usually Hemophilus influenza type B
 - (e) Can be a true life-threatening emergency
 - (3) Assessment
 - (a) Signs and symptoms of respiratory distress or failure depending on severity, plus
 - i) Appears agitated, sick
 - ii) Stridor
 - iii) Muffled voice
 - iv) Drooling
 - v) Sore throat
 - vi) Pain on swallowing
 - vii) High fever
 - (b) History
 - i) Usually no previous history but a rapid onset of symptoms (6-8

- hours)
- (c) Can quickly progress to respiratory arrest
- (4) Management
 - (a) Airway and ventilation
 - i) NEVER ATTEMPT TO VISUALIZE THE AIRWAY IF THE PATIENT IS AWAKE
 - ii) Allow the parent to administer oxygen
 - iii) If airway becomes obstructed, two rescuer ventilation with BVM is almost always effective
 - iv) If BVM is not effective, attempt intubation with stylet in place
 - v) Intubation should not be attempted in settings with short transport times
 - vi) Performing chest compression upon glottic visualization during intubation may produce a bubble at the tracheal opening
 - vii) Consider needle cricothyroidotomy per medical direction as a last resort if complete upper airway obstruction is present
 - (b) Circulation
 - (c) Pharmacological
 - (d) Transport considerations
 - i) Allow patient to assume position of comfort
 - ii) Notify hospital of patient status early
 - 1) Transport to the hospital without delay, keeping child warm
 - (e) Psychological support/ communication strategies
 - i) DO NOT AGITATE THE PATIENT - no IVs, BP, do not look in patient's mouth
 - ii) Keep the caregiver with the child if appropriate
- 4. Lower airway disease
 - a. Asthma

- (1) Epidemiology
 - (a) Incidence
 - i) Usually occurs in children older than 2 years of age
 - ii) Very common
 - (b) Risk factors
 - i) Typically in child with known history of asthma
 - 2) Triggered by upper respiratory infections, allergies, changes in temperature, physical exercise and emotional response
 - 3) Children that experience prolonged asthma attacks tire easily; watch for signs of respiratory failure
 - (c) Prevention strategies
- (2) Pathophysiology
 - (a) Bronchospasm
 - (b) Excessive mucous production
 - (c) Inflammation of the small airways
- (3) Assessment
 - (5) Signs and symptoms - respiratory distress or failure depending on severity, plus
 - i) Appears anxious
 - ii) Wheezes
 - iii) Prolonged expiratory phase
 - iv) A silent chest means danger
 - (d) History
 - i) Usually follows exposure to known trigger
 - (e) Bronchiolitis and asthma may present very similarly
- (4) Management
 - (a) Airway and ventilation
 - i) Administer oxygen by tolerated method
 - ii) BVM ventilations for respiratory failure/ arrest (progressive lethargy, poor muscle tone, shallow respiratory effort)
 - iii) Endotracheal intubation for respiratory failure/ arrest with

- prolonged BVM ventilations, or
inadequate response to BVM
ventilations
- (b) Circulation
- (c) Pharmacological
 - i) Albuterol nebulizer
 - ii) Subcutaneous epinephrine 1:1000 -
only with severe respiratory
distress or failure
 - iii) Medications can be repeated if no
effect
- (d) Transport considerations
 - i) Allow patient to assume position
of comfort
- (e) Psychological support/ communication
strategies
 - i) Keep caregiver with child if
appropriate
- b. Bronchiolitis
 - (1) Epidemiology
 - (a) Incidence
 - i) Usually occurs in children less
than 2 years of age
 - ii) Very common
 - (b) Risk factors
 - i) Usually occurs in winter months
 - (c) Prevention strategies
 - (2) Pathophysiology
 - (6) An inflammatory process of the lower
respiratory tract including the
terminal airways
 - (7) Main cause is respiratory syncytial
virus infection of the lower airway
 - (3) Assessment
 - (a) Signs and symptoms - respiratory
distress or failure depending on
severity, plus
 - i) Appears anxious
 - ii) Wheezing
 - iii) Rales (diffuse)
 - (b) History
 - i) Usually a history of upper
respiratory infection symptoms

- (c) Bronchiolitis and asthma may present very similarly
- (4) Management
 - (a) Airway and ventilation
 - i) Administer oxygen by tolerated method
 - ii) BVM ventilations for respiratory failure/ arrest (progressive lethargy, poor muscle tone, shallow respiratory effort)
 - iii) Endotracheal intubation for respiratory failure/ arrest with prolonged BVM ventilations, or inadequate response to BVM ventilations
 - (b) Circulation
 - (c) Pharmacological
 - i) Albuterol nebulizer
 - (d) Transport considerations
 - i) Allow patient to assume position of comfort
 - (e) Psychological support/ communication strategies
 - i) Keep caregiver with child if appropriate
- c. Pneumonia
 - (1) Epidemiology
 - (a) Incidence
 - 1) Usually occurs in infants, toddlers and pre-schoolers (1-5 years of age), but can occur at any age
 - ii) Common
 - (b) Risk factors
 - (c) Prevention strategies
 - (2) Pathophysiology
 - (a) Infection of the lower airway and lung
 - (b) May be caused by bacteria or virus
 - (3) Assessment
 - (a) Signs and symptoms - respiratory distress or failure depending on the severity, plus
 - i) Appears anxious

- ii) Decreased breath sounds
- iii) Rales
- iv) Rhonchi (localized or diffuse)
- v) Pain in the chest
- vi) Fever
- (b) History
 - i) Usually a history of lower respiratory infectious symptoms
- (4) Management
 - (a) Airway and ventilation
 - i) Administer oxygen by tolerated method
 - ii) BVM ventilations for respiratory failure/ arrest (progressive lethargy, poor muscle tone, shallow respiratory effort)
 - iii) Endotracheal intubation for respiratory failure, prolonged BVM ventilations, or inadequate response to BVM ventilations
 - (b) Circulation
 - (c) Pharmacological
 - (d) Transport considerations
 - i) Allow patient to assume position of comfort
 - (e) Psychological support/ communication strategies
 - i) Keep caregiver with child if appropriate
- d. Foreign body lower airway obstruction
 - (1) Epidemiology
 - (a) Incidence
 - i) Usually occurs in toddlers and preschool age children (1-4 years of age), but can occur at any age
 - ii) Uncommon
 - (b) Risk factors
 - (c) Prevention strategies
 - (2) Pathophysiology
 - (a) Foreign body in the lower airway or lung
 - (b) Objects are usually food (nuts, seeds, etc.) or small objects

- (3) Assessment
 - (a) Signs and symptoms - respiratory distress or failure depending on the severity, plus
 - i) Appears anxious
 - ii) Decreased breath sounds
 - iii) Rales
 - iv) Rhonchi (localized or diffuse)
 - v) Pain in the chest
 - (b) History
 - i) May be a history of choking if witnessed by an adult
 - (4) Management
 - (a) Airway and ventilation
 - i) Administer oxygen by tolerated method
 - 2) BVM ventilations for respiratory failure/ arrest (progressive lethargy, poor muscle tone, shallow respiratory effort)
 - 3) Endotracheal intubation for respiratory failure/ arrest with prolonged BVM ventilations, or inadequate response to BVM ventilations
 - 4) Do not attempt to retrieve foreign body as it is beyond the reach of Magill forceps
 - (b) Circulation
 - (c) Transport considerations
 - i) Allow patient to assume position of comfort
 - (d) Psychological support/ communication strategies
 - i) Keep caregiver with child if appropriate
- B. Shock
- 1. Introduction
 - a. Epidemiology
 - (1) Incidence
 - (2) Morbidity/ mortality
 - (3) Risk factors
 - (4) Prevention strategies

- b. Categories of shock
 - (1) Non-cardiogenic
 - (2) Cardiogenic
- 2. Pathophysiology
 - a. An abnormal condition characterized by inadequate delivery of oxygen and metabolic substrates to meet the metabolic demands of tissues
 - b. Severity
 - (1) Compensated (early)
 - (8) Patient's blood pressure is normal although signs of inadequate tissue perfusion are present
 - (e) Reversible
 - (2) Decompensated (late)
 - (a) Hypotension and signs of inadequate organ perfusion are present
 - (b) Often irreversible
 - c. Assessment
 - (1) Chief complaint
 - (2) History
 - (3) Physical findings
 - (a) Signs and symptoms of compensated shock
 - i) Irritability or anxiety
 - ii) Tachycardia
 - iii) Tachypnea
 - iv) Weak peripheral pulses, full central pulses
 - v) Delayed capillary refill
 - vi) Cool, pale extremities
 - vii) Systolic blood pressure within normal limits
 - viii) Decreased urinary output
 - (b) Signs and symptoms of decompensated shock
 - i) Lethargy or coma
 - ii) Marked tachycardia or bradycardia
 - iii) Marked tachypnea or bradypnea
 - iv) Absent peripheral pulses, weak central pulses
 - v) Markedly delayed capillary refill
 - vi) Cool, pale, dusky, mottled extremities

- vii) Hypotension
- viii) Markedly decreased urinary output
- d. Management
 - (1) Graded approach to treatment
 - (2) Consider separating parent and child
 - (3) Airway
 - (a) Trauma - immobilize c-spine
 - (4) Ventilation and oxygenation
 - (a) Compensated shock
 - i) Oxygen
 - (b) Decompensated shock
 - i) BVM - consider ventilating patient with 100% oxygen via appropriate-sized bag
 - ii) ETT - consider intubating patient if positive pressure ventilation does not rapidly improve patient's condition
 - (5) Circulation
 - (a) Compensated shock
 - i) Oxygen
 - (b) Decompensated shock
 - i) Non-cardiogenic
 - a) Fluid
 - ii) Cardiogenic
 - a) No fluid
 - b) Dysrhythmia management as indicated
 - (6) Supportive care
 - (7) Transport considerations
 - (a) Appropriate mode
 - (b) Appropriate facility
 - (8) Psychological support/ communication strategies
- 3. Noncardiogenic
 - a. Hypovolemia
 - (1) Epidemiology
 - (a) Common
 - (2) Pathophysiology
 - (a) Intravascular volume depletion
 - i) Severe dehydration
 - a) Vomiting

- b) Diarrhea
 - ii) Blood loss
 - a) Trauma
 - b) Other, e.g., GI bleed
 - (3) Assessment
 - (a) Signs and symptoms of compensated or decompensated shock depending on severity, plus
 - i) Blood loss
 - a) External hemorrhage
 - b) Major trauma
 - ii) Dehydration
 - a) Poor skin turgor
 - b) Decreased saliva and or tears
 - c) Sunken fontanelle (infants)
 - (b) History
 - (4) Management
 - (a) Airway and ventilation
 - i) Oxygen
 - ii) Trauma - immobilize c-spine
 - (b) Circulation
 - i) Compensated shock
 - a) Oxygen
 - ii) Decompensated shock
 - a) Oxygen
 - b) Vascular access
 - 1) 20 ml/kg of lactated ringers or NS bolus as needed
 - (c) Supportive care
 - (d) Transport considerations
 - (e) Psychological support/ communication strategies
- b. Distributive
 - (1) Epidemiology
 - (a) Uncommon
 - (2) Etiology
 - (a) Septic
 - (b) Neurogenic
 - (c) Anaphylactic
 - (3) Pathophysiology
 - (a) Peripheral pooling due to loss of vasomotor tone
 - (4) Assessment

- (9) Signs and symptoms of compensated or decompensated shock depending on severity, plus
 - i) Septic
 - a) Early - warm skin
 - b) Late - cool skin
 - ii) Neurogenic
 - a) Warm skin
 - b) Bradycardia
 - iii) Anaphylactic
 - a) Allergic rash
 - b) Airway swelling
- (b) History
- (5) Management
 - (a) Airway and ventilation
 - i) Oxygen
 - ii) Trauma - immobilize c-spine
 - (b) Circulation
 - i) Compensated shock
 - a) Oxygen
 - ii) Decompensated shock
 - a) Oxygen
 - b) Vascular access
 - 1) 20 ml/kg of lactated ringers or NS bolus as needed
 - c) Anaphylactic - secure airway
 - (c) Supportive care
 - (d) Transport considerations
 - (e) Psychological support/ communication strategies
- 4. Cardiogenic
 - a. Cardiomyopathy
 - (1) Epidemiology
 - (a) Infection
 - (b) Congenital abnormalities
 - (2) Pathophysiology
 - (a) Mechanical pump failure
 - (b) Usually biventricular
 - (3) Assessment
 - (a) Signs and symptoms of compensated or decompensated shock, depending on severity, plus
 - i) Rales

- ii) Jugular venous distention
- iii) Hepatomegaly
- iv) Peripheral edema
- (b) History
- (4) Management
 - (a) Airway and ventilation
 - i) Oxygen
 - (b) Circulation
 - i) Compensated shock
 - a) Oxygen
 - ii) Decompensated shock
 - a) Oxygen
 - b) Vascular access
 - c) Restrict fluid
 - d) Consider diuretic
 - e) Consider vasopressor
 - (c) Supportive care
 - (d) Transport considerations
 - (e) Psychological support/ communication strategies
- b. Dysrhythmias
 - (1) Epidemiology
 - (a) Bradydysrhythmias - common
 - (b) Supraventricular tachydysrhythmias - uncommon
 - (c) Ventricular tachydysrhythmias - very uncommon
 - (2) Pathophysiology
 - (a) Electrical pump failure
 - (10) Results in cardiogenic shock or cardiopulmonary arrest depending on type
 - (3) Assessment
 - (11) Signs and symptoms of cardiogenic shock (compensated or decompensated) or cardiopulmonary arrest, depending on type
 - (b) History
 - (4) Management
 - (a) Specific to each type
- C. Dysrhythmias
 - 1. Tachydysrhythmias
 - a. Supraventricular tachycardia

- (1) Epidemiology
 - (a) Incidence
 - i) Usually in infants with no prior history
 - (b) Risk factors
 - (c) Prevention strategies
 - (2) Pathophysiology
 - (12) Stable (compensated shock) - patient will usually remain stable during transport with oxygen
 - (d) Unstable (decompensated shock) - PATIENT REQUIRES IMMEDIATE TREATMENT
 - (e) Children may be able to sustain increased rates for a while, but after several hours, they will decompensate
 - (3) Assessment
 - (a) Signs and symptoms - compensated or decompensated shock, depending on severity, plus
 - i) Narrow complex tachycardia with rates of greater than 220 beats per minute (too fast to count)
 - ii) Poor feeding
 - iii) Hypotension
 - (b) History
 - (4) Management
 - (a) Stable - supportive care
 - (b) Unstable
 - i) Airway and ventilation
 - a) Oxygen
 - ii) Circulation
 - iii) Pharmacological
 - a) Consider adenosine
 - iv) Non-pharmacological
 - a) Synchronized cardioversion
 - v) Transport considerations
 - vi) Psychological support/communication strategies
- b. Ventricular tachycardia with a pulse
- (1) Epidemiology
 - (a) Incidence
 - (b) Risk factors
 - (c) Prevention strategies

- (2) Pathophysiology
 - (13) Stable (compensated shock) - patient will usually not tolerate for long periods of time
 - (d) Unstable (decompensated shock) - PATIENT REQUIRES IMMEDIATE TREATMENT
 - (e) Most VT with a pulse is secondary to structural heart disease and responds poorly to lidocaine
 - (3) Assessment
 - (a) Signs and symptoms - signs of compensated or decompensated shock, depending on severity, plus
 - i) Rapid, wide complex tachycardia
 - ii) Poor feeding
 - iii) Hypotension
 - (b) History
 - (4) Management
 - (a) Stable - supportive care
 - (b) Unstable
 - i) Airway and ventilation
 - a) Administer high flow oxygen
 - ii) Circulation
 - iii) Pharmacological
 - a) Consider lidocaine
 - iv) Non-pharmacological
 - a) Synchronized cardioversion
 - v) Transport considerations
 - vi) Psychological support/communication strategies
2. Bradydysrhythmias
- a. Epidemiology
 - (1) Incidence - most common dysrhythmia in children
 - (2) Risk factors
 - (3) Prevention strategies
 - b. Pathophysiology
 - (1) Usually develops as a result of hypoxia
 - (2) May develop due to vagal stimulation (rare)
 - c. Assessment
 - (1) Signs and symptoms - compensated or decompensated shock, depending on severity, plus

- (a) Bradycardia
- (b) Slow, narrow complex heart rhythm, QRS duration may be normal or prolonged
- (2) History
- d. Management
 - (1) Stable - supportive care
 - (2) Unstable
 - (a) Airway and ventilation
 - i) Ventilate patient with 100% oxygen via BVM
 - ii) Intubate patient if poor response to BVM ventilations
 - (b) Circulation
 - i) Perform chest compressions if oxygen does not increase heart rate
 - (c) Pharmacological
 - i) Medications can be given down the endotracheal tube
 - ii) Administer epinephrine
 - iii) Administer atropine for vagally induced bradycardia
 - (d) Non-pharmacological
 - (e) Transport considerations
 - (f) Psychological support/ communication strategies
- 2. Absent rhythm
 - a. Asystole
 - (1) Epidemiology
 - (a) Incidence - may be the initial cardiac arrest rhythm
 - (b) Risk factors
 - (c) Prevention strategies
 - (2) Pathophysiology
 - (a) Bradycardias may degenerate into asystole
 - (b) High mortality rate
 - (3) Assessment
 - (a) Signs and symptoms
 - i) Pulseless
 - ii) Apneic
 - iii) Cardiac monitor indicating no electrical activity

- (b) History
- (4) Management
 - (a) Confirm in two leads
 - (b) Airway and ventilation
 - i) Ventilate the patient with 100% oxygen via BVM
 - ii) Intubate patient if poor response to BVM ventilations
 - (c) Circulation
 - i) Perform chest compressions
 - (d) Pharmacological
 - i) Medications can be given down the endotracheal tube
 - ii) Administer epinephrine
 - (e) Non-pharmacological
 - (f) Transport considerations
 - (g) Psychological support/ communication strategies
- b. Ventricular fibrillation/ pulseless ventricular tachycardia
 - (1) Epidemiology
 - (a) Incidence - rare
 - (b) Risk factors
 - (c) Prevention strategies
 - (2) Pathophysiology
 - (a) Possibly due to electrocution and drug overdoses
 - (b) High mortality rate
 - (3) Assessment
 - (a) Signs and symptoms
 - i) Pulseless
 - ii) Apneic
 - 1) Cardiac monitor indicating no organized electrical activity or rapid wide complex tachycardia
 - (b) History
 - (4) Management
 - (a) Unmonitored - perform basic life support
 - (b) Monitored - defibrillate up to three consecutive shocks
 - (c) Airway and ventilation
 - i) Ventilate the patient with 100%

- oxygen via BVM
- ii) Intubate patient if poor response to BVM ventilations
- (d) Circulation
 - i) Perform chest compressions
- (e) Pharmacological
 - i) Medications can be given down the endotracheal tube
 - ii) Administer epinephrine
 - iii) Administer lidocaine
 - iv) Administer bretylium
 - 2) After administration of a medication, allow it to circulate for one minute before repeat defibrillation
- (f) Non-pharmacological
- (g) Transport considerations
- (h) Psychological support/ communication strategies
- c. Pulseless electrical activity
 - (1) Epidemiology
 - (a) Incidence - look for a treatable cause
 - (b) Risk factors
 - (c) Prevention strategies
 - (2) Pathophysiology
 - (a) Pneumothorax
 - (b) Cardiac tamponade
 - (c) Hypovolemia
 - (d) Hypoxia
 - (e) Acidosis
 - (f) Hypothermia
 - (g) Hypoglycemia
 - (3) Assessment
 - (a) Signs and symptoms
 - i) Pulseless
 - ii) Apneic
 - iii) Cardiac monitor indicating organized electrical activity
 - (b) History
 - (4) Management
 - (a) Resuscitation should be directed toward relieving cause
 - (b) Airway and ventilation

- i) Ventilate the patient with 100% oxygen
 - ii) Intubate patient
 - (c) Circulation
 - i) Perform chest compressions
 - (d) Pharmacological
 - i) Medications can be given down the endotracheal tube
 - ii) Administer epinephrine
 - (e) Non-pharmacological
 - (f) Transport considerations
 - (g) Psychological support/ communication strategies
- D. Seizure
 - 1. Epidemiology
 - a. Incidence
 - b. Morbidity/ mortality
 - c. Risk factors
 - d. Prevention strategies
 - 2. Pathophysiology
 - a. Types
 - (1) Generalized
 - (2) Focal
 - 2. See neonatal section for a more specific listing of signs and symptoms
 - 3. Assessment
 - a. Signs and symptoms
 - (1) Generalized
 - (a) Sudden jerking of both sides of the body followed by tenseness and relaxation of the body
 - (1) Loss of consciousness
 - (2) Focal
 - (1) Sudden jerking of a part of the body (arm, leg)
 - (2) Lip smacking
 - (3) Eye blinking
 - (4) Staring
 - (5) Confusion
 - (6) Lethargy
 - b. History
 - 4. Management
 - a. Airway and ventilation

- (1) Maintain patent airway
 - (2) Administer high-flow oxygen
 - b. Circulation
 - c. Pharmacological
 - (1) Consider dextrose if hypoglycemic
 - (3) Consider benzodiazepine if active seizures are present; anticipate need for ventilatory support
 - d. Non-pharmacological
 - (1) Protect patient from further injury
 - (2) Protect head and cervical spine if injury has occurred
 - e. Transport considerations
 - f. Psychological support/ communication strategies
- E. Hypoglycemia
 - 1. Epidemiology
 - a. Incidence
 - b. Morbidity/ mortality
 - c. Incidence
 - d. Risk factors
 - e. Prevention strategies
 - 2. Pathophysiology
 - a. Children have limited glucose storage
 - b. In severe cases, if not treated promptly, can cause brain damage
 - 3. Assessment
 - a. Signs and symptoms
 - (1) Mild
 - (a) Hunger
 - (b) Weakness
 - (c) Tachypnea
 - (d) Tachycardia
 - (2) Moderate
 - (a) Sweating
 - (b) Tremors
 - (c) Irritability
 - (d) Vomiting
 - (e) Mood swings
 - (f) Blurred vision
 - (g) Stomach ache
 - (h) Headache
 - (i) Dizziness
 - (3) Severe

- (a) Decreased level of consciousness
 - (b) Seizure
 - b. Measure blood glucose
 - c. History
 - 4. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological
 - (1) Administer Dextrose per medical direction
 - (4) Administer Glucagon IM if IV access is not possible per medical direction
 - (2) Repeat blood glucose test 10-15 minutes after dextrose infusion
 - d. Non-pharmacological
 - e. Transport considerations
 - f. Psychological support communication strategies
- F. Hyperglycemia
 - 1. Epidemiology
 - a. Morbidity/ mortality
 - b. Incidence
 - c. Risk factors
 - d. Prevention strategies
 - 2. Pathophysiology
 - a. Hyperglycemia leads to dehydration and ketoacidosis
 - 3. Assessment
 - a. Signs and symptoms
 - (1) Early
 - (a) Increased thirst
 - (b) Increased urination
 - (c) Weight loss
 - (2) Late (dehydration and early ketoacidosis)
 - (a) Weakness
 - (b) Abdominal pain
 - (c) Generalized aches
 - (d) Loss of appetite
 - (e) Nausea
 - (f) Vomiting
 - (g) Signs of dehydration except decreased urinary output
 - (h) Fruity breath odor
 - (i) Tachypnea
 - (j) Hyperventilation

- (k) Tachycardia
- (3) If untreated, progresses to
 - (a) Coma
 - (b) Deep and slow respirations (Kussmaul)
 - (c) Signs of severe dehydration
- b. Measure blood glucose
- c. History
- 4. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological
 - (5) Consider lactated ringers or NS if signs of dehydration are present per medical direction
 - d. Non-pharmacological
 - e. Transport considerations
 - f. Psychological support communication strategies
- 2. Infection
 - 1. Epidemiology
 - a. Incidence
 - b. Morbidity/ mortality
 - c. Risk factors
 - d. Prevention strategies
 - 2. Pathophysiology
 - a. Depends upon the type of infectious organism and extent of infection
 - 3. Assessment
 - a. Signs and symptoms vary depending upon the infection and the time since the patient was exposed
 - (3) Fever
 - (4) Chills
 - (5) Tachycardia
 - (6) Cough
 - (7) Sore throat
 - (8) Nasal congestion
 - (9) Malaise
 - (10) Tachypnea
 - (11) Cool or clammy skin
 - (12) Petechia
 - (13) Respiratory distress
 - (14) Poor feeding
 - (15) Vomiting

- (16) Diarrhea
- (17) Dehydration
- (18) Hypoperfusion
- (19) Purpura
- (20) Seizures
- (21) Severe headache
- (22) Irritability
- (23) Stiff neck
- (24) Bulging fontanelle (infant)
- b. History
- 4. Management
 - a. Body substance isolation precautions must be strictly adhered to due to the unknown etiology of the infection
 - b. Airway and ventilation
 - (1) Administer high-flow oxygen
 - (2) Provide ventilatory support if indicated
 - c. Circulation
 - d. Pharmacological
 - (1) Administer lactated ringers or NS if signs of decompensated shock are present per medical direction
 - (2) Administer benzodiazepine per medical direction if active seizure is present
 - e. Non-pharmacological
 - f. Transport considerations
 - g. Psychological support communication strategies
- G. Poisoning and toxic exposure
 - 1. Epidemiology
 - a. Incidence
 - (1) Children account for the majority of poisoning events
 - b. Morbidity/ mortality
 - (1) Major cause of preventable death in children under five years of age
 - c. Risk factors
 - d. Prevention strategies
 - 2. Pathophysiology
 - a. Depends upon the type of poison or toxin and the extent of exposure
 - 3. Common substances of pediatric poisonings
 - a. Alcohol, barbiturates, sedatives
 - b. Amphetamines, cocaine, hallucinogens

- c. Anticholinergic
- d. Aspirin
- e. Corrosives
- f. Digitalis, beta-blockers
- g. Hydrocarbons
- h. Narcotics
- i. Organic solvents (inhaled)
- j. Organophosphate
- 4. Assessment
 - 1. Signs and symptoms - vary depending upon both the poisoning/ toxic substance and the time since the child was exposed
 - (1) Respiratory system depression
 - (2) Circulatory system depression
 - (3) Central nervous system stimulation or depression
 - (4) Mind-altering ability
 - (5) Gastrointestinal system irritation
 - k. History
- 5. Management
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological
 - (1) Contact poison control center or medical direction to obtain directions for specific treatment
 - d. Non-pharmacological
 - (1) Take pills, substances, containers to the hospital
 - e. Transport considerations
 - f. Psychological support communication strategies
- 6. Pediatric trauma
 - A. Pathophysiology
 - 1. Blunt
 - a. Thinner body wall allows forces to be readily transmitted to body contents
 - b. Predominant cause of injury in children
 - 2. Penetrating
 - a. Becoming an increasing problem in adolescents
 - b. Higher incidence in the inner city (mostly intentional), but significant incidence in other areas (mostly unintentional)

- B. Mechanism of injury
1. Fall
 - a. Single most common cause of injury in children
 - b. Serious injury or death resulting from truly accidental falls is relatively uncommon unless from a significant height
 - c. Prevention strategies
 2. Motor vehicle crash
 - a. Leading cause of permanent brain injury and new cases of epilepsy
 - b. Leading cause of death and serious injury in children
 - c. Prevention strategies
 3. Pedestrian vehicle crash
 - a. Particularly lethal form of trauma in children
 - b. Initial injury due to impact with vehicle (extremity/ trunk)
 - c. Child is thrown from force of impact causing additional injury (head/ spine) upon impact with other objects (ground, another vehicle, light standard, etc.)
 - d. Prevention strategies
 4. Near-drowning
 - a. Third leading cause of injury or death in children between birth and 4 years of age
 - b. Causes approximately 2000 deaths annually
 - c. Severe, permanent brain damage occurs in 5-20% of hospitalized children for near drowning
 - d. Prevention strategies
 5. Penetrating injuries
 - a. Risk of death from firearm injuries increase with age
 - b. Stab wounds and firearm injuries account for approximately 10-15% of all pediatric trauma admissions
 - c. Visual inspection of external injuries can not evaluate the extent of internal involvement
 - d. Prevention strategies
 6. Burns
 - a. The leading cause of accidental death in the home for children under the age of 14 years
 - b. Burn survival is a function of burn size and concomitant injuries

1. Modified "rule of nines" is utilized to determine percentage of surface area involved
- c. Prevention strategies
7. Physical abuse
 - a. Has been classified into four categories - physical abuse, sexual abuse, emotional abuse and child neglect
 - b. Social phenomena such as increased poverty, domestic disturbance, younger aged parents, substance abuse, and community violence have been attributed to increase of abuse
 - c. Document all pertinent findings, treatments and interventions
 - d. Prevention strategies
- C. Special considerations
 1. Airway control
 - a. Maintain in-line stabilization in neutral, not sniffing position
 - b. Administer 100% oxygen to all trauma patients
 - c. Patent airway must be maintained via suctioning and jaw thrust
 - d. Be prepared to assist ineffective respirations
 - e. Intubation should be performed when the airway remains inadequate
 - f. Gastric tube should be placed after intubation
 - g. Needle cricothyroidotomy is rarely indicated for traumatic upper airway obstruction
 2. Immobilization
 - a. Indications for stabilization and immobilization of cervical spine
 - b. Utilize appropriate sized pediatric immobilization equipment
 - (1) Rigid cervical collar
 - (2) Towel/ blanket roll
 - (3) Child safety seat
 - (4) Pediatric immobilization device
 - (5) Vest-type/ short wooden backboard
 - (6) Long backboard
 - (7) Straps, cravats
 - (8) Tape
 - (9) Padding
 2. Maintain supine neutral in-line position for infants, toddlers, and pre-schoolers by placing

- padding from the shoulders to the hips
- 3. Fluid management
 - a. Management of the airway and breathing take priority over management of circulation because circulatory compromise is less common in children than adults
 - b. Vascular access
 - (1) Large-bore intravenous catheter should be inserted into a large peripheral vein
 - (2) Do not delay transport to gain access
 - (3) Intraosseous access in children < 6 years of age if intravenous access fails
 - (4) Initial fluid bolus of 20 ml/kg of an lactated ringers or NS
 - (5) Reassess vital signs and rebolus with 20 ml/kg if no improvement
 - (6) If improvement does not occur after the second bolus, there is likely to be significant blood loss and the need for rapid surgical intervention
- 4. Traumatic brain injury
 - a. Early recognition and aggressive management can reduce mortality and morbidity
 - b. Severity
 - (1) Mild - GCS is 13 to 15
 - (2) Moderate - GCS is 9 to 12
 - (3) Severe - GCS is less than or equal to 8
 - c. Signs of increased intracranial pressure
 - (1) Elevated blood pressure
 - (2) Bradycardia
 - (1) Rapid deep respirations (Kussmaul) progressing to slow, deep respirations alternating with rapid deep respirations (Cheyne-Stokes)
 - (3) Bulging fontanelle (infant)
 - d. Signs of herniation
 - (1) Asymmetrical pupils
 - (2) Posturing
 - e. Specific management
 - (1) Administer high concentration of oxygen for mild to moderate head injuries (GCS 9-15)
 - (2) Intubate and ventilate at normal breathing rate with 100% oxygen for severe head

injuries (GCS 3-8)

(a) Use of lidocaine may blunt rise in ICP
(controversial)

(b) Consider RSI per medical direction

(3) Indications for hyperventilation

(a) Asymmetric pupils

(b) Active seizures

(c) Neurologic posturing

D. Specific injuries

1. Head and neck injury

a. Larger relative mass of the head and lack of neck muscle strength provides increased momentum in acceleration-deceleration injuries and a greater stress to the cervical spine region

b. Fulcrum of cervical mobility in the younger child is at the C2-C3 level

c. 60% to 70% of pediatric fractures occur in C1 or C2

d. Head injury is the most common cause of death in pediatric trauma victim

e. Diffuse injuries are common in children, focal injuries are rare

f. Soft tissues, skull and brain are more compliant in children than in adults

3. Due to open fontanelles and sutures, infants up to an average age of 16 months may be more tolerant to an increase of intracranial pressure and can have delayed signs

g. Subdural bleeds in a infant can produce hypotension (extremely rare)

h. Significant blood loss can occur through scalp lacerations and should be controlled immediately

i. The Modified Glasgow Coma scale should be utilized for infants and young children

2. Chest injury

a. Chest injuries in children under 14 years of age are usually the result of blunt trauma

b. Due to the compliance of the chest wall, severe intrathoracic injury can be present without signs of external injury

c. Tension pneumothorax is poorly tolerated and is an immediate threat to life

d. Flail segment is an uncommon injury in children;

- when noted without a significant mechanism of injury, suspect child abuse
- e. Many children with cardiac tamponade will have no physical signs of tamponade other than hypotension
3. Abdominal injury
- a. Musculature is minimal and poorly protects the viscera
 - b. Organs most commonly injured are liver, kidney and spleen
 - c. Onset of symptoms may be rapid or gradual
 - d. Due to the small size of the abdomen, be certain to palpate only one quadrant at a time
4. Any child who is hemodynamically unstable without evidence of obvious source of blood loss should be considered as having an abdominal injury until proven otherwise
4. Extremity
- a. Relatively more common in children than adults
 - b. Growth plate injuries are common
 - c. Compartment syndrome is an emergency in children
 - d. Any sites of active bleeding must be controlled
 - e. Splinting should be performed to prevent further injury and blood loss
 - f. PASG may be useful in unstable pelvic fractures with hypotension
5. Burns
- a. Thermal burns in children
 - b. Chemical burns in children
 - c. Electrical burns in children
 - d. Management priorities
 - (1) Prompt management of the airway is required as swelling can develop rapidly
 - (2) If intubation is required, an endotracheal tube up to two sizes smaller than what would normally be used may be required
 - (3) Thermally burned children are very susceptible to hypothermia; maintain normal body temperature
 - (4) Suspect musculoskeletal injuries in electrical burn patients and perform spine immobilization techniques

7. Sudden Infant Death Syndrome (SIDS)
 - A. Epidemiology
 1. Incidence
 2. Morbidity/ mortality
 3. Risk factors
 - a. Occurs most frequently in the fall and winter months
 - b. Minor illness (cold or upper respiratory infection) within two weeks prior to the death
 - c. Premature and low birth-weight infants
 - d. Infants of young mothers
 - e. Infants of mothers who did not receive prenatal care
 - f. Infants of mothers who used cocaine, methadone or heroin during pregnancy
 4. Prevention strategies
 - B. Pathophysiology
 1. Sudden and unexpected death of a seemingly healthy infant, which remains unexplained even after a thorough postmortem examination
 2. No prior symptoms of life-threatening illness
 3. Death usually occurs during sleep
 4. No definitive answer at this time
 5. A small percentage is abuse related
 6. Many victims of SIDS appear to have suffered from long-term underventilation of the lungs, possibly due to poor control of breathing during sleep; prone positioning may be a factor
 7. Abnormalities in the brainstem
 - C. Assessment
 1. Signs and symptoms
 - a. No external signs of injury
 - b. Lividity
 - c. Frothy blood-tinged drainage from nose/ mouth
 - d. Rigor mortis
 - e. Evidence that the baby was very active just prior to the death (i.e. rumpled bed clothes, unusual position or location in the bed)
 2. History
 - D. Management
 1. Airway and ventilation
 2. Circulation
 3. Pharmacological

4. Non-pharmacological
 5. Transport considerations
 6. Psychological support/ communication strategies
 - a. Initiate CPR unless the infant is obviously dead (unquestionably dead to a lay person)
 - b. Perform ALS as indicated
 - c. Be prepared for the range of possible family emotional reactions
 - d. Parents/ caregiver should be allowed to accompany their baby in the ambulance
 - e. Explain that certain information is required regarding the infant's health is necessary to determine the care to be given
 - f. Utilize the baby's name
 - g. Questions should be phrased so blame is not implied
 - h. Debriefing
 - i. Resources for SIDS families
8. Child abuse and neglect
- A. Epidemiology
 1. Second leading cause of death in infants less than 6 months of age
 2. Between 2000 and 5000 children die each year due to abuse and neglect
 - B. Age considerations
 1. Under 18 years of age
 2. Physically or mentally handicapped person under 21 years of age
 - C. Abuse or neglect perpetrators
 1. Parent, legal guardian, foster parent
 2. Person, institution, agency or program having custody of the child
 3. Person serving as a caretaker, i.e. babysitter
 - D. Abuse
 1. Types
 - a. Physical
 - b. Emotional
 - c. Sexual
 2. Abuse indicators
 - a. Historical
 - b. Psychosocial
 - c. Signs of physical abuse
-

- d. Signs of emotional abuse
 - (1) Physical indicators
 - (2) Behavioral indicators
 - e. Signs of sexual abuse
 - E. Neglect
 - 1. Types
 - a. Physical
 - b. Emotional
 - 2. Neglect indicators
 - a. Behavioral
 - b. Physical
 - F. Paramedic role in treating abuse and neglect
 - 1. Assess the injuries/ neglect and render appropriate care
 - 2. Look at the environment for condition and cleanliness
 - 3. Look for evidence of anything out of the ordinary
 - 4. Look and listen to caregiver/ family members
 - 5. Assess whether the explanation fits the injury
 - 6. Document all findings thoroughly
 - 7. Report suspicion
 - a. Mandated reporter
 - b. Immunity from liability
 - G. Resources for abuse and neglect
 - 1. State, regional and local child protection agency
 - 2. Hospital social service department
 - 9. Infants and children with special needs
 - A. This can include many different types of children
 - 1. Premature babies
 - 2. Lung disease
 - 3. Heart diseases
 - 4. Neurological diseases
 - 5. Chronic diseases
 - 6. Altered functions from birth
 - B. Often these children will be at home, technologically dependent
 - 1. Tracheostomy tube
 - a. Types
 - b. Complications
 - (1) Obstruction
 - (2) Bleeding
 - (3) Air leak
 - (4) Dislodged

- (5) Infection
- c. Treatment
 - (1) Maintain an open airway
 - (2) Suction
 - (3) Maintain position of comfort
 - (4) Intubation
 - (a) Intubate orally in the absence of upper airway obstruction
 - (b) Intubate via the stoma if there is an upper airway obstruction
 - (5) Transport
- 2. Home artificial ventilators
 - a. Types
 - (1) Parents are usually familiar with the operation
 - b. Treatment
 - (1) Assure airway
 - (2) Artificially ventilate with oxygen
 - (3) Transport
- 3. Central venous lines
 - a. Intravenous lines that are placed near the heart for long term use
 - b. Complications
 - (1) Cracked line
 - (2) Infection
 - (3) Clots
 - (4) Bleeding
 - (5) Air embolism
 - c. Treatment
 - (1) If cracked line, clamp between crack and patient
 - (1) If altered mental status following cracked line, position on left side with head down
 - (2) If bleeding, apply pressure
 - d. Transport
- 4. Gastrostomy tubes and gastric feeding
 - a. Tubes placed directly into stomach for feeding
 - b. Come in many shapes
 - c. Patients usually cannot be fed by mouth
 - d. Be alert for breathing problems
 - e. Treatment
 - (1) Assure adequate airway

- (2) Administer 100% oxygen
- (3) Suction if needed
- (4) Consider hypoglycemia in diabetic patient who cannot be fed
- f. Transport
 - (1) Sitting
 - (2) Lying on right side, head elevated
- 5. Shunts
 - a. Device running from the brain to abdomen to drain excess cerebral spinal fluid
 - (1) Will find a reservoir on the side of the skull
 - (2) Change in mental status
 - (3) Prone to respiratory arrest
 - b. Treatment
 - (1) Manage airway
 - (2) Assure adequate artificial ventilation
 - c. Transport
 - (1) Keep head elevated if possible

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UNIT TERMINAL OBJECTIVE

6-3 At the completion of this unit, the paramedic student will be able to integrate the pathophysiological principles and the assessment findings to formulate and implement a treatment plan for the geriatric patient.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 6-3.1 Discuss population demographics demonstrating the rise in elderly population in the U.S. (C-1)
- 6-3.2 Discuss society's view of aging and the social, financial, and ethical issues facing the elderly. (C-1)
- 6-3.3 Assess the various living environments of elderly patients. (C-3)
- 6-3.4 Describe the local resources available to assist the elderly and create strategies to refer at risk patients to appropriate community services. (C-3)
- 6-3.5 Discuss issues facing society concerning the elderly. (C-1)
- 6-3.6 Discuss common emotional and psychological reactions to aging to include causes and manifestations. (C-1)
- 6-3.7 Apply the pathophysiology of multi-system failure to the assessment and management of medical conditions in the elderly patient. (C-2)
- 6-3.8 Discuss the problems with mobility in the elderly and develop strategies to prevent falls. (C-1)
- 6-3.9 Discuss the implications of problems with sensation to communication and patient assessment. (C-2)
- 6-3.10 Discuss the problems with continence and elimination and develop communication strategies to provide psychological support. (C-3)
- 6-3.11 Discuss factors that may complicate the assessment of the elderly patient. (C-1)
- 6-3.12 Describe principles that should be employed when assessing and communicating with the elderly. (C-1)
- 6-3.13 Compare the assessment of a young patient with that of an elderly patient. (C-3)
- 6-3.14 Discuss common complaints of elderly patients. (C-1)
- 6-3.15 Compare the pharmacokinetics of an elderly patient to that of a young adult. (C-2)6-3.
- 6-3.16 Discuss the impact of polypharmacy and medication non-compliance on patient assessment and management. (C-1)
- 6-3.17 Discuss drug distribution, metabolism, and excretion in the elderly patient. (C-1)
- 6-3.18 Discuss medication issues of the elderly including polypharmacy, dosing errors and increased drug sensitivity. (C-1)
- 6-3.19 Discuss the use and effects of commonly prescribed drugs for the elderly patient. (C-1)
- 6-3.20 Discuss the normal and abnormal changes with age of the pulmonary system. (C-1)
- 6-3.21 Describe the epidemiology of pulmonary diseases in the elderly, including incidence, morbidity/ mortality, risk factors, and prevention strategies for patients with pneumonia, chronic obstructive pulmonary diseases and pulmonary embolism. (C-1)
- 6-3.22 Compare and contrast the pathophysiology of pulmonary diseases in the elderly with that of a younger adult, including pneumonia, chronic obstructive pulmonary diseases, and pulmonary embolism. (C-3)
- 6-3.23 Discuss the assessment of the elderly patient with pulmonary complaints, including pneumonia, chronic obstructive pulmonary diseases, and pulmonary embolism. (C-1)
- 6-3.24 Identify the need for intervention and transport of the elderly patient with pulmonary complaints. (C-1)
- 6-3.25 Develop a treatment and management plan of the elderly patient with pulmonary complaints, including pneumonia, chronic obstructive pulmonary diseases, and pulmonary embolism. (C-3)
- 6-3.26 Discuss the normal and abnormal cardiovascular system changes with age. (C-1)
- 6-3.27 Describe the epidemiology for cardiovascular diseases in the elderly, including incidence, morbidity/ mortality, risk factors, and prevention strategies for patients with myocardial infarction, heart failure, dysrhythmias, aneurism, and hypertension. (C-1)
- 6-3.28 Compare and contrast the pathophysiology of cardiovascular diseases in the elderly with that of a younger

- adult, including myocardial infarction, heart failure, dysrhythmias, aneurism, and hypertension. (C-3)
- 6-3.29 Discuss the assessment of the elderly patient with complaints related to the cardiovascular system, including myocardial infarction, heart failure, dysrhythmias, aneurism, and hypertension. (C-1)
- 6-3.30 Identify the need for intervention and transportation of the elderly patient with cardiovascular complaints. (C-1)
- 6-3.31 Develop a treatment and management plan of the elderly patient with cardiovascular complaints, including myocardial infarction, heart failure, dysrhythmias, aneurism and hypertension. (C-3)
- 6-3.32 Discuss the normal and abnormal changes with age of the nervous system. (C-1)
- 6-3.33 Describe the epidemiology for nervous system diseases in the elderly, including incidence, morbidity/ mortality, risk factors, and prevention strategies for patients with cerebral vascular disease, delirium, dementia, Alzheimer's disease and Parkinson's disease. (C-1)
- 6-3.34 Compare and contrast the pathophysiology of nervous system diseases in the elderly with that of a younger adult, including cerebral vascular disease, delirium, dementia, Alzheimer's disease and Parkinson's disease. (C-3)
- 6-3.35 Discuss the assessment of the elderly patient with complaints related to the nervous system, including cerebral vascular disease, delirium, dementia, Alzheimer's disease and Parkinson's disease. (C-1)
- 6-3.36 Identify the need for intervention and transportation of the patient with complaints related to the nervous system. (C-1)
- 6-3.37 Develop a treatment and management plan of the elderly patient with complaints related to the nervous system, including cerebral vascular disease, delirium, dementia, Alzheimer's disease and Parkinson's disease. (C-3)
- 6-3.38 Discuss the normal and abnormal changes of the endocrine system with age. (C-1)
- 6-3.39 Describe the epidemiology for endocrine diseases in the elderly, including incidence, morbidity/ mortality, risk factors, and prevention strategies for patients with diabetes and thyroid diseases. (C-1)
- 6-3.40 Compare and contrast the pathophysiology of diabetes and thyroid diseases in the elderly with that of a younger adult. (C-3)
- 6-3.41 Discuss the assessment of the elderly patient with complaints related to the endocrine system, including diabetes and thyroid diseases. (C-1)
- 6-3.42 Identify the need for intervention and transportation of the patient with endocrine problems. (C-1)
- 6-3.43 Develop a treatment and management plan of the elderly patient with endocrine problems, including diabetes and thyroid diseases. (C-3)
- 6-3.44 Discuss the normal and abnormal changes of the gastrointestinal system with age. (C-1)
- 6-3.45 Discuss the assessment of the elderly patient with complaints related to the gastrointestinal system. (C-1)
- 6-3.46 Identify the need for intervention and transportation of the patient with gastrointestinal complaints. (C-1)
- 6-3.47 Develop and execute a treatment and management plan of the elderly patient with gastrointestinal problems. (C-3)
- 6-3.48 Discuss the assessment and management of an elderly patient with GI hemorrhage and bowel obstruction. (C-1)
- 6-3.49 Compare and contrast the pathophysiology of GI hemorrhage and bowel obstruction in the elderly with that of a young adult. (C-3)
- 6-3.50 Discuss the normal and abnormal changes with age related to toxicology. (C-1)
- 6-3.51 Discuss the assessment of the elderly patient with complaints related to toxicology. (C-1)
- 6-3.52 Identify the need for intervention and transportation of the patient with toxicological problems. (C-1)
- 6-3.53 Develop and execute a treatment and management plan of the elderly patient with toxicological problems. (C-3)
- 6-3.54 Describe the epidemiology in the elderly, including the incidence, morbidity/ mortality, risk factors, and prevention strategies, for patients with drug toxicity. (C-1)
- 6-3.55 Compare and contrast the pathophysiology of drug toxicity in the elderly with that of a younger adult. (C-3)

- 6-3.56 Discuss the assessment findings common in elderly patients with drug toxicity. (C-1)
- 6-3.57 Discuss the management/ considerations when treating an elderly patient with drug toxicity. (C-1)
- 6-3.58 Describe the epidemiology for drug and alcohol abuse in the elderly, including incidence, morbidity/ mortality, risk factors, and prevention strategies. (C-1)
- 6-3.59 Compare and contrast the pathophysiology of drug and alcohol abuse in the elderly with that of a younger adult. (C-3)
- 6-3.60 Discuss the assessment findings common in elderly patients with drug and alcohol abuse. (C-1)
- 6-3.61 Discuss the management/ considerations when treating an elderly patient with drug and alcohol abuse. (C-1)
- 6-3.62 Discuss the normal and abnormal changes of thermoregulation with age. (C-1)
- 6-3.63 Discuss the assessment of the elderly patient with complaints related to thermoregulation. (C-1)
- 6-3.64 Identify the need for intervention and transportation of the patient with environmental considerations. (C-1)
- 6-3.65 Develop and execute a treatment and management plan of the elderly patient with environmental considerations. (C-3)
- 6-3.66 Compare and contrast the pathophysiology of hypothermia and hyperthermia in the elderly with that of a younger adult. (C-3)
- 6-3.67 Discuss the assessment findings and management plan for elderly patients with hypothermia and hyperthermia. (C-1)
- 6-3.68 Discuss the normal and abnormal psychiatric changes of age. (C-1)
- 6-3.69 Describe the epidemiology of depression and suicide in the elderly, including incidence, morbidity/ mortality, risk factors, and prevention strategies. (C-1)
- 6-3.70 Compare and contrast the psychiatry of depression and suicide in the elderly with that of a younger adult. (C-3)
- 6-3.71 Discuss the assessment of the elderly patient with psychiatric complaints, including depression and suicide. (C-1)
- 6-3.72 Identify the need for intervention and transport of the elderly psychiatric patient. (C-1)
- 6-3.73 Develop a treatment and management plan of the elderly psychiatric patient, including depression and suicide. (C-3)
- 6-3.74 Discuss the normal and abnormal changes of the integumentary system with age. (C-1)
- 6-3.75 Describe the epidemiology for pressure ulcers in the elderly, including incidence, morbidity/ mortality, risk factors, and prevention strategies. (C-1)
- 6-3.76 Compare and contrast the pathophysiology of pressure ulcers in the elderly with that of a younger adult. (C-3)
- 6-3.77 Discuss the assessment of the elderly patient with complaints related to the integumentary system, including pressure ulcers. (C-1)
- 6-3.78 Identify the need for intervention and transportation of the patient with complaints related to the integumentary system. (C-1)
- 6-3.79 Develop a treatment and management plan of the elderly patient with complaints related to the integumentary system, including pressure ulcers. (C-3)
- 6-3.80 Discuss the normal and abnormal changes of the musculoskeletal system with age. (C-1)
- 6-3.81 Describe the epidemiology for osteoarthritis and osteoporosis, including incidence, morbidity/ mortality, risk factors, and prevention strategies. (C-1)
- 6-3.82 Compare and contrast the pathophysiology of osteoarthritis and osteoporosis with that of a younger adult. (C-3)
- 6-3.83 Discuss the assessment of the elderly patient with complaints related to the musculoskeletal system, including osteoarthritis and osteoporosis. (C-1)
- 6-3.84 Identify the need for intervention and transportation of the patient with musculoskeletal complaints. (C-1)
- 6-3.85 Develop a treatment and management plan of the elderly patient with musculoskeletal complaints,

- including osteoarthritis and osteoporosis. (C-3)
- 6-3.86 Describe the epidemiology for trauma in the elderly, including incidence, morbidity/ mortality, risk factors, and prevention strategies for patients with orthopedic injuries, burns and head injuries. (C-1)
- 6-3.87 Compare and contrast the pathophysiology of trauma in the elderly with that of a younger adult, including orthopedic injuries, burns and head injuries. (C-3)
- 6-3.88 Discuss the assessment findings common in elderly patients with traumatic injuries, including orthopedic injuries, burns and head injuries. (C-1)
- 6-3.89 Discuss the management/ considerations when treating an elderly patient with traumatic injuries, including orthopedic injuries, burns and head injuries. (C-1)
- 6-3.90 Identify the need for intervention and transport of the elderly patient with trauma. (C-1)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 6-3.91 Demonstrate and advocate appropriate interactions with the elderly that conveys respect for their position in life. (A-3)
- 6-3.92 Recognize the emotional need for independence in the elderly while simultaneously attending to their apparent acute dependence. (A-1)
- 6-3.93 Recognize and appreciate the many impediments to physical and emotional well being in the elderly. (A-2)
- 6-3.94 Recognize and appreciate the physical and emotional difficulties associated with being a caretaker of an impaired elderly person, particularly the patient with Alzheimer's disease. (A-3)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 6-3.95 Demonstrate the ability to assess a geriatric patient. (P-2)
- 6-3.96 Demonstrate the ability to adjust their assessment to a geriatric patient. (P-3)

DECLARATIVE

- I. Introduction
 - A. Special population with special and varying needs
 - B. Epidemiology/ demographics
 - 1. Prevalence/ "graying of America"
 - C. Societal issues
 - 1. Society's view of aging
 - 2. Social issues
 - a. Isolation
 - b. Marital status
 - 3. Living environments
 - a. Independent living
 - (1) Spousal/ family support
 - (2) Visiting nursing
 - b. Dependent living
 - (1) Live in nursing care
 - (2) Assisted living environments
 - (3) Nursing homes
 - 4. Financial aspects
 - 5. Ethics
 - a. Advanced directives
 - D. Referral resources
 - 1. Private
 - a. National
 - b. State
 - c. Local
 - 2. Governmental
 - a. National
 - b. State
 - c. Local
- II. Pathophysiology, assessment and management
 - A. Pathophysiology
 - 1. Multi-system failure
 - a. Concomitant disease process
 - b. Non specific complaints
 - c. Decreased ability to detect changes
 - 2. Pharmacology in the elderly
 - a. Age related pharmacokinetics
 - (1) Older adults are more sensitive to drugs
 - (2) Experience prolonged drug effects
 - (3) Have more adverse reactions
 - b. Polypharmacy
 - (1) Many chronic illnesses
 - (2) Interactions with over the counter medication
 - c. Compliance
 - (1) Multiple dosage regimens

- (2) Difficult reading/ hearing/ understanding directions
3. Problems with mobility and falls
 - a. Physical effects of decreased mobility
 - (1) Poor nutrition
 - (2) Difficulty with elimination
 - (3) Circulation
 - (4) Skin integrity
 - (5) Predisposes patients to falls and injury
 - b. Psychological effect of decreased mobility
 - (1) Loss of independence
 - (2) Loss of confidence
 - (3) Feeling "old"
 - c. Risk factors for falls
 - (1) History of falls
 - (2) Dizziness, weakness, impaired vision
 - (3) Altered gait
 - (4) CNS problems/ decreased mental status
 - (5) Medications
 - d. Prevention strategies
 - (1) Use of assistive devices
 - (2) Environmental modifications
 - (a) Remove scatter rugs and secure loose carpeting
 - (b) Remove items that may cause tripping
 - (c) Provide/ use railings
 - (d) Adequate lighting
 - (e) Unclutter the environment
 - (f) Arrange furniture for walking ease
 - (g) Use non slip decals in the tub
 - (h) Provide handrails on tubs, showers, and commodes
4. Problems with sensations
 - a. Problems with seeing
 - (1) Pathophysiology
 - (a) Visual changes begin at age 40 and increase gradually
 - (b) Effects
 - i) Reading
 - ii) Depth perception
 - iii) Loss of independence
 - iv) Limitations
 - v) Poor accommodation
 - vi) Altered color perception
 - vii) Sensitivity to light and glare
 - viii) Decreased visual acuity
 - (2) Cataracts
 - (a) Lens becomes hardened and opaque
 - (b) Patient may have
 - i) Blurred vision
 - ii) Double vision
 - iii) Spots

-
-
- iv) Ghost images
 - (c) May require surgery if it affects lifestyles
 - (3) Glaucoma
 - (a) Increased intraocular pressure
 - (b) Damage to optic nerve
 - (c) May progress to permanent loss of peripheral and central vision
 - (d) Oral medications and eye drops may relieve the pressure
 - b. Problems with hearing
 - (1) Not all elderly patient have hearing loss
 - (2) Overall hearing decreases
 - (3) Ability to perceive speech
 - (4) Tinnitus
 - (5) Meniere's disease
 - (6) Hearing loss
 - (a) Impairs the ability to communicate
 - (b) Hearing aids may not restore hearing to normal
 - c. Problems with speech
 - (1) Word retrieval
 - (2) Decreased fluency of speech
 - (3) Slowed rate of speech
 - (4) Change in voice quality
 - d. Pain perception
 - e. Assessment findings specific to the elderly patient
 - f. Management implications for the elderly patient
 - (1) Alterations for sensory deficits
5. Problems with continence and elimination
 - a. Incontinence
 - (1) Definition
 - (2) Incontinence is never normal
 - (3) Urinary or bowel
 - (4) Mild to total incontinence
 - (5) Extremely embarrassing
 - (6) Can lead to
 - (a) Skin irritation
 - (b) Skin breakdown
 - (c) Urinary tract infection
 - (7) Pathophysiology
 - (a) Continence requires
 - i) Anatomically correct GI/ GU tract
 - ii) Competent sphincter mechanism
 - iii) Cognitive and physical function
 - iv) Motivation
 - (b) Effects of age
 - i) Decrease in bladder capacity
 - ii) Involuntary bladder contractions
 - iii) Decreased ability to postpone voiding
 - iv) Medications may effect bladder/ bowel control
 - (8) Management implications

- (a) Some cases of incontinence are managed surgically
 - (b) Absorbent devices are commonly used for fecal and urinary incontinence
 - (c) Indwelling catheters are less common and often cause infection
 - (d) Self esteem and social issues appreciation
- b. Elimination
- (1) Causes of difficulty in urination
 - (a) Enlargement of the prostate in men
 - (b) Urinary tract infections
 - (c) Acute or chronic renal failure
 - (2) Causes of difficulty in bowel elimination
 - (a) Diverticular disease
 - (b) Constipation
 - (c) Colorectal cancer
- B. Assessment of the elderly patient
- 1. Patience is of utmost importance
 - 2. General health assessment
 - a. Social history
 - b. Living situation
 - c. Social support system
 - d. Activity level
 - e. Medication history
 - (1) Prescription medications
 - (2) Non-prescription medications
 - f. Nutrition
 - (1) Overall health is greatly affected by nutrition
 - (2) Malnutrition causes dehydration and hypoglycemia
 - (3) Lowered sensory stimulation of eating
 - (4) Decreased internal cues of hunger and thirst
 - (5) Caloric requirements decrease with age
 - (6) Eating may be complicated by
 - (a) Breathing
 - (b) Abdominal pain
 - (c) Nausea/ vomiting
 - (d) Poor dental care
 - (e) Health problems
 - (f) Medications
 - (g) Alcohol/ drugs
 - g. Sleep and rest
 - h. Environmental assessment
 - (1) Ability for self care
 - 3. Geriatric assessment
 - a. Factors complicating assessment
 - (1) Multiple diseases/ complaints
 - (2) Absent classical symptoms
 - (3) Failure to relate symptoms
 - (4) Sensory alterations
 - (5) Polypharmacy

- (6) Other
 - b. Assessment communication methods
 - (1) Always introduce yourself
 - (2) Speak slowly, distinctly, and respectfully
 - (3) Speak to the patient first rather than family or bystanders
 - (4) Speak face to face, at eye level with eye contact
 - (5) Locate hearing aid or eyeglasses if needed
 - (6) Turn on lights
 - (7) Verbal and nonverbal communication of concern and empathy
 - (8) Use polite, respectful terms
 - (9) Preserve dignity
 - (10) Always explain before you do
 - c. History
 - (1) Common medical complaints
 - (2) Environment assessment
 - d. Physical exam
 - (1) Mental status assessment
 - C. Management considerations for the elderly
 - 1. Airway and ventilation
 - 2. Circulation
 - 3. Pharmacological
 - 4. Non-pharmacological
 - 5. Transport considerations
 - a. Gentle handling
 - b. Extra padding
 - 6. Psychological support/ communication strategies
 - a. Communication strategies
 - (1) Encourage the patient to express their feelings
 - (2) Acknowledge nonverbal messages
 - (3) Avoid questions which are judgmental
 - (4) Confirm what the patient says
 - (5) Take responsibility for communication breakdowns
 - b. Incontinence
 - (1) Do not make a big deal about incontinence
 - (2) Maintain patient dignity
 - (3) Reassurance that it is a treatable problem
 - (4) Usually does NOT require surgical intervention
- III. System pathophysiology, assessment and management
- A. Pulmonary changes in the elderly
 - 1. Normal and abnormal changes with age
 - a. Kyphosis may affect pulmonary function
 - b. Decreased lung function due to
 - (1) Chronic exposure to pollutants
 - (2) Decreased respiratory muscle tone
 - (3) Changes in alveolar/ capillary exchange
 - (4) Respiratory center changes
 - 2. Assessment findings specific to the elderly

- a. Most common pulmonary diseases in the elderly
 - (1) Pneumonia
 - (2) Pulmonary embolism
 - (3) Obstructive airway diseases
- 3. Management implications for the elderly
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological/ non-pharmacological
 - d. Transport considerations
 - e. Psychological support/ communications strategies
- 4. Specific illnesses
 - a. Pneumonia in the elderly
 - (1) Epidemiology in the elderly
 - (a) Incidence in the elderly
 - i) Usually bacterial
 - ii) Aspiration pneumonia due to difficult swallowing
 - iii) Viral
 - iv) High incidence due to
 - a) Decreased immune response
 - b) Reduced pulmonary function
 - c) Increased gram-negative pharyngeal colonization
 - (b) Morbidity/ mortality in the elderly
 - i) Leading cause of death in the elderly
 - ii) Often fatal in frail adults
 - iii) Concomitant chronic diseases
 - (c) Risk factors
 - i) Institutional environments
 - ii) Chronic diseases
 - iii) Immune compromise
 - (d) Prevention strategies
 - i) Prophylaxis treatment with antibiotics
 - (2) Assessment findings specific for the elderly patient
 - (a) Fever
 - (b) Cough
 - (c) Shortness of breath
 - (d) Often presents with mental status alterations
 - (e) May be afebrile
 - (f) Tachypnea
 - (3) Management considerations for the elderly patient
 - (a) Manage life-threats
 - (b) Maintain oxygenation
 - (c) Must be transported for diagnosis
 - (d) High rate of hospital admission
 - b. Chronic obstructive pulmonary disease in the elderly
 - (1) Epidemiology in the elderly
 - (a) Incidence in the elderly
 - i) Combined bronchitis and emphysema in patients with a

- long history of smoking
 - (b) Morbidity/ mortality in the elderly
 - i) Diminished efficiency of breathing reduced tolerance
 - (c) Risk factors
 - i) Cigarette smoking
 - (d) Prevention strategies
 - (2) Assessment findings specific for the elderly patient
 - (a) Obtain history of prior intubation or steroid therapy
 - (b) Wheezing and prolonged expiratory phase
 - (c) Breath sounds are unreliable
 - (3) Management considerations for the elderly patient
 - c. Pulmonary embolism in the elderly
 - (1) Epidemiology in the elderly
 - (a) Incidence in the elderly
 - (b) Morbidity/ mortality in the elderly
 - i) Therapy is effective
 - ii) Mortality is high due to difficulty in diagnosis
 - (c) Risk factors
 - i) Deep vein thrombosis
 - ii) Venous stasis from immobility
 - iii) Tumor
 - iv) Surgery
 - (d) Prevention strategies
 - (2) Assessment findings specific for the elderly patient
 - (a) Dyspnea
 - (b) Pleuritic chest pain
 - (c) Cough
 - (d) Tachypnea
 - (3) Management considerations for the elderly patient
 - (a) Airway and ventilation
 - i) Lysing the thrombus
 - ii) Anticoagulation after confirming no GI bleeding
 - (b) Circulation
 - (c) Pharmacological/ non-pharmacological
 - (d) Transport consideration
 - (e) Psychological support/ communication strategies
- B. Cardiology in the elderly
 - 1. Normal and abnormal changes with age
 - a. Arteries become increasingly rigid
 - b. Decreased peripheral resistance
 - c. Reduced blood flow to all organs
 - d. Increased blood pressure
 - e. Widened pulse pressure
 - f. Heart muscle stiffens
 - g. Increased incidence of postural hypotension
 - h. Increased atherosclerosis throughout the body
 - 2. Assessment findings specific to the elderly
 - a. History

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- (1) Cardiovascular fitness
 - (2) Changes in exercise tolerance
 - (3) Recent diet history
 - (4) Medications
 - (5) Smoking
 - (6) Breathing difficulty, especially at night
 - (7) Palpitations, flutter, skipped beats
 - b. Physical exam
 - (1) The heart increases in size
 - (2) Hypertension and orthostatic hypotension
 - (3) Dependent edema
 - (4) Consider checking the blood pressure in both arms
 - (5) Check pulses in all extremities routinely
 - (6) Check for carotid bruits
 - (7) Check for dehydration
 - 3. Management implications for the elderly
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological/ non-pharmacological
 - (1) Use caution to avoid medication interaction
 - (2) Proper dosing is very important due to
 - (a) Less lean body mass
 - (b) Low fluid reserve
 - (c) Slow metabolism
 - (d) Decreased renal and hepatic function
 - d. Transport consideration
 - e. Psychological support/ communication strategies
 - 4. Specific illnesses
 - a. Myocardial infarction in the elderly
 - (1) Epidemiology in the elderly
 - (a) Incidence in the elderly
 - (b) Morbidity/ mortality in the elderly
 - i) Mortality doubles after 70 years old
 - ii) Much greater complication rate
 - (c) Risk factors
 - i) Physical exertion
 - (d) Prevention strategies
 - (2) Assessment findings specific for the elderly patient
 - (a) Chest pain is less common in the elderly
 - (b) Much greater incidence of silent MI
 - (c) Dyspnea is the most common sign in patients over 85
 - (d) Any nonspecific complaints of upper trunk discomfort
 - (3) Management considerations for the elderly patient
 - b. Heart failure in the elderly
 - (1) Epidemiology in the elderly
 - (a) Incidence in the elderly
 - i) More frequent in older adults
 - ii) Large incidence of non cardiac causes

- (b) Morbidity/ mortality in the elderly
 - (c) Risk factors
 - (d) Prevention strategies
 - (2) Assessment findings specific for the elderly patient
 - (a) First symptom of left failure is often fatigue
 - (b) Two pillow orthopnea
 - (c) Dyspnea on exertion
 - (d) Dry, hacking cough progressing to productive cough
 - (e) Dependent edema due to right failure
 - (f) Nocturia
 - (g) Anorexia, hepatomegaly, ascites
 - (3) Management considerations for the elderly patient
- c. Dysrhythmias in the elderly
 - (1) Epidemiology in the elderly
 - (a) Incidence in the elderly
 - i) The most common cause is hypertensive heart disease
 - ii) PVCs are present in most adults over 80
 - iii) Can be caused by anything that decreases myocardial blood flow
 - iv) May be caused by electrolyte aberrancies
 - v) Atrial fibrillation is the most common dysrhythmia
 - (b) Morbidity/ mortality in the elderly
 - i) Serious due to the decreased tolerance due to less CO
 - ii) Can lead to falls from cerebral hypoperfusion
 - iii) Can lead to TIAs and CHF
 - (c) Risk factors
 - (d) Prevention strategies
 - (2) Assessment findings specific for the elderly patient
 - (3) Management considerations for the elderly patient
- d. Aneurysm in the elderly
 - (1) Epidemiology in the elderly
 - (a) Incidence in the elderly
 - (b) Morbidity/ mortality in the elderly
 - (c) Risk factors
 - (d) Prevention strategies
 - (2) Assessment findings specific for the elderly patient
 - (3) Management considerations for the elderly patient
- e. Hypertension in the elderly
 - (1) Epidemiology in the elderly
 - (a) Incidence in the elderly
 - i) Increases with atherosclerosis
 - (b) Morbidity/ mortality in the elderly
 - i) BP greater than 160/95 doubles mortality in men
 - ii) Can lead to kidney loss
 - iii) Can lead to blindness
 - (c) Risk factors
 - i) Age
 - ii) Diabetes

- iii) Obesity
 - (d) Prevention strategies
 - i) Medication compliance
 - ii) Dietary sodium reduction
 - iii) Exercise
 - iv) Smoking cessation
 - (2) Assessment findings specific for the elderly patient
 - (a) Often presents as memory loss
 - i) Epistaxis
 - ii) Slow tremors
 - iii) Nausea and vomiting
 - (3) Management considerations for the elderly patient
- C. Neurology in the elderly
 - 1. Normal and abnormal changes with age
 - a. Cognition requires perceptual organs and the brain
 - b. Cognitive function is not affected by the normal aging process
 - c. Slight changes in the following are normal
 - (1) Difficulty with recent memory
 - (2) Psychomotor slowing
 - (3) Forgetfulness
 - (4) Decrease in reaction time
 - 2. Assessment findings specific to the elderly
 - a. Best if conducted over time
 - b. Ask family or caretakers for information to determine the progression
 - c. Focus on the patient's
 - (1) Perceptions
 - (2) Thinking processes
 - (3) Communication
 - d. Provide an environment with minimal distractions
 - e. Mental status/ cognitive functioning exam
 - (1) Be calm, unhurried
 - (2) Ask clear, direct questions
 - (3) Give the patient time to respond
 - (4) Establish normal patterns of behavior and changes in behavior
 - (5) Include ability to perform activities of daily living
 - (6) Look for patters of behavior over time
 - (7) Assess the patient's mood and affective or emotional state
 - f. Assess for
 - (1) Weakness
 - (2) Chronic fatigue
 - (3) Changes in sleep patterns
 - (4) Syncope, or near syncope
 - 3. Management implications for the elderly
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological/ non-pharmacological
 - d. Transport consideration
 - e. Psychological support/ communication strategies

4. Specific illnesses
 - a. Cerebral vascular disease
 - (1) Epidemiology in the elderly
 - (a) Incidence
 - (b) Morbidity/ mortality
 - i) Expected course of disease
 - ii) Complications
 - (c) Risk factors
 - (d) Prevention strategies
 - (2) Pathophysiology
 - (a) Cerebral vascular accident
 - (b) Transient ischemic attack
 - (3) Assessment
 - (4) Management
 - b. Delirium
 - (1) Epidemiology in the elderly
 - (a) Incidence
 - (b) Morbidity/ mortality
 - i) Expected course of disease
 - a) Potentially reversible, if caught early
 - b) Can progress into chronic mental disfunction
 - ii) Complications
 - (c) Risk factors
 - (d) Prevention strategies
 - (2) Pathophysiology
 - (a) Organic brain dysfunction
 - (b) Possible causes
 - i) Tumor
 - ii) Metabolic disorders
 - iii) Fever
 - iv) Drug reaction
 - v) Alcohol intoxication/ withdrawal
 - (3) Assessment findings specific for the elderly patient
 - (a) Acute onset of anxiety
 - (b) Unable to focus
 - (c) Unable to think logically or maintain attention
 - (d) Memory is intact
 - (4) Management considerations for the elderly patient
 - c. Dementia
 - (1) Epidemiology
 - (a) Incidence
 - i) Increases with age
 - ii) Half of nursing home patients have some form of dementia
 - (b) Morbidity/ mortality
 - i) Generally considered irreversible
 - ii) Expected course of disease

- iii) Complications
 - a) Patient becomes dependent on others
 - (c) Risk factors
 - (d) Prevention strategies
 - (2) Pathophysiology in the elderly
 - (a) Many causes
 - i) Strokes
 - ii) Genetic or viral factors
 - iii) Alzheimer's
 - (b) Progressive loss of cognitive function
 - (3) Assessment
 - (a) Progressive disorientation
 - (b) Shortened attention span
 - (c) Aphasia, nonsense talking
 - (d) Hallucinations
 - (e) Caretaker exhaustion
 - (4) Management implications
 - (a) Severely limits ability to communicate
 - d. Alzheimer's disease
 - (1) Epidemiology
 - (a) Incidence
 - (b) Morbidity/ mortality
 - i) Expected course of disease
 - ii) Complications
 - (c) Risk factors
 - (d) Prevention strategies
 - (2) Pathophysiology
 - (3) Assessment
 - (4) Management implications
 - e. Parkinson's disease
 - (1) Epidemiology
 - (a) Incidence
 - (b) Morbidity/ mortality
 - i) Expected course of disease
 - ii) Complications
 - (c) Risk factors
 - (d) Prevention strategies
 - (2) Pathophysiology
 - (3) Assessment
 - (4) Management implications
- D. Endocrinology in the elderly
 - 1. Normal and abnormal changes with age
 - 2. Assessment findings specific to the elderly
 - 3. Management implications for the elderly
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological/ non-pharmacological
 - d. Transport considerations

- e. Psychological support/ communications strategies
 - 4. Specific illnesses
 - a. Diabetes in the elderly
 - (1) Epidemiology in the elderly
 - (a) Incidence in the elderly
 - i) Approximately 20% of older adults have diabetes
 - ii) Almost 40% have some impaired glucose tolerance
 - iii) Most commonly type II
 - (b) Morbidity/ mortality in the elderly
 - (c) Risk factors
 - (d) Prevention strategies
 - (2) Assessment findings specific for the elderly patient
 - (a) Test for neuropathy
 - (b) Test visual acuity
 - (3) Management considerations for the elderly patient
 - b. Thyroid diseases in the elderly
 - (1) Epidemiology in the elderly
 - (a) Incidence in the elderly
 - (b) Morbidity/ mortality in the elderly
 - (c) Risk factors
 - (d) Prevention strategies
 - (2) Assessment findings specific for the elderly patient
 - (3) Management considerations for the elderly patient
- E. Gastroenterology in the elderly
 - 1. Epidemiology
 - 2. Assessment findings
 - a. Look for indication of malnutrition
 - b. Hiatal hernia
 - 3. Management implications
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological/ non-pharmacological
 - d. Transport consideration
 - e. Psychological support/ communication strategies
 - 4. Specific illnesses
 - a. GI hemorrhage in the elderly
 - (1) Increased risk in the elderly
 - b. Bowel obstruction in the elderly
- F. Toxicology in the elderly
 - 1. Pathophysiology/ pharmacokinetics
 - a. Decreased kidney function alters elimination
 - b. Increased likelihood of CNS side effects
 - c. Altered GI absorption
 - d. Decreased liver blood flow alters metabolism and excretion
 - 2. Specific
 - a. Lidocaine toxicity in the elderly
 - (1) Epidemiology in the elderly
 - (2) Assessment findings in the elderly

- (3) Management implications for the elderly
- b. Beta-blockers in the elderly
 - (1) Epidemiology in the elderly
 - (2) Assessment findings in the elderly
 - (3) Management implications for the elderly
- c. Antihypertensives in the elderly
 - (1) Epidemiology in the elderly
 - (2) Assessment findings in the elderly
 - (3) Management implications for the elderly
- d. Diuretics in the elderly
 - (1) Epidemiology in the elderly
 - (2) Assessment findings in the elderly
 - (3) Management implications for the elderly
- e. Digitalis in the elderly
 - (1) Epidemiology in the elderly
 - (2) Assessment findings in the elderly
 - (3) Management implications for the elderly
- f. Psychotropics in the elderly
 - (1) Epidemiology in the elderly
 - (2) Assessment findings in the elderly
 - (3) Management implications for the elderly
- g. Antidepressants in the elderly
 - (1) Epidemiology in the elderly
 - (2) Assessment findings in the elderly
 - (3) Management implications for the elderly
- h. Substance abuse in the elderly
 - (1) Epidemiology in the elderly
 - (2) Assessment findings in the elderly
 - (3) Management implications for the elderly
- i. Alcohol abuse in the elderly
 - (1) Epidemiology
 - (a) Common problem
 - (b) History of alcoholism
 - (c) Severe stress is a risk factor
 - (2) Assessment findings
 - (a) Often very subtle signs
 - (b) Small amounts of alcohol can cause intoxications
 - (c) Mood swings, denial, and hostility
 - (d) Question family and friends
 - (e) Confusion
 - (f) History of falls
 - (g) Anorexia
 - (h) Insomnia
 - (3) Management implications
 - (a) Requires identification and referral
- j. Drug abuse in the elderly
 - (1) Epidemiology
 - (a) Very common problem in the elderly

- (b) Risk factors
 - i) Vision and memory changes
 - ii) Polypharmacy
 - iii) Nutritional deficits
 - (2) Assessment findings
 - (a) Memory changes
 - (b) Drowsy
 - (c) Decreased vision/ hearing
 - (d) Orthostatic hypotension
 - (e) Poor dexterity
 - (3) Management implications
 - (a) Requires identification and referral
- G. Environmental considerations in the elderly
 - 1. Normal and abnormal changes with age
 - 2. Assessment findings specific to the elderly
 - 3. Management implications for the elderly
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological/ non-pharmacological
 - d. Transport considerations
 - e. Psychological support/ communications strategies
 - 4. Specific illnesses
 - a. Hypothermia in the elderly
 - b. Hyperthermia in the elderly
- H. Behavioral/ psychiatric disorders in the elderly
 - 1. Normal and abnormal changes with age
 - 2. Assessment findings specific to the elderly
 - 3. Management implications for the elderly
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological/ non-pharmacological
 - d. Transport considerations
 - e. Psychological support/ communications strategies
 - 4. Specific situations
 - a. Depression in the elderly
 - (1) Epidemiology in the elderly
 - (a) Incidence in the elderly
 - (b) Morbidity/ mortality in the elderly
 - (c) Risk factors
 - (d) Prevention strategies
 - (2) Assessment findings specific for the elderly patient
 - (3) Management considerations for the elderly patient
 - b. Suicide in the elderly
 - (1) Epidemiology in the elderly
 - (a) Incidence in the elderly
 - (b) Morbidity/ mortality in the elderly
 - (c) Risk factors
 - (d) Prevention strategies

- (2) Assessment findings specific for the elderly patient
- (3) Management considerations for the elderly patient
- I. Integumentary changes with age
 - 1. Normal and abnormal changes with age
 - a. Epidermal cellular turnover decreases
 - b. Slower healing
 - c. Increased risk of secondary infection
 - d. Increased risk of skin tumors, fungal or viral infections
 - e. Skin decreases in thickness, increasing susceptibility to tears
 - f. Hair becomes finer and thinner
 - 2. Assessment findings specific to the elderly
 - 3. Management implications for the elderly
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological/ non-pharmacological
 - d. Transport considerations
 - e. Psychological support/ communications strategies
 - 4. Specific illnesses
 - a. Pressure ulcers in the elderly
 - (1) Result from tissue hypoxia
 - (2) Usually over bony areas
 - (3) Common in immobile patients
 - (4) Possibility increases with
 - (a) Altered sensory perception
 - (b) Skin exposure to moisture
 - (c) Decreased activity
 - (d) Decreased mobility
 - (e) Poor nutrition
 - (f) Friction or shear
- J. Musculoskeletal changes with age
 - 1. Normal and abnormal changes with age
 - 2. Assessment findings specific to the elderly
 - a. Bone fractures with mild trauma
 - 3. Management implications for the elderly
 - a. Airway and ventilation
 - b. Circulation
 - c. Pharmacological/ non-pharmacological
 - d. Transport considerations
 - e. Psychological support/ communications strategies
 - 4. Specific illnesses
 - a. Osteoarthritis in the elderly
 - (1) Epidemiology in the elderly
 - (a) Incidence in the elderly
 - (b) Morbidity/ mortality in the elderly
 - (c) Risk factors
 - (d) Prevention strategies
 - (2) Assessment findings specific for the elderly patient
 - (3) Management considerations for the elderly patient

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- b. Osteoporosis in the elderly
 - (1) Epidemiology in the elderly
 - (a) Incidence in the elderly
 - (b) Morbidity/ mortality in the elderly
 - (c) Risk factors
 - (d) Prevention strategies
 - (2) Assessment findings specific for the elderly patient
 - (3) Management considerations for the elderly patient
- K. Trauma in the elderly
- 1. Pathophysiology
 - a. Osteoporosis and muscle weakness increases likelihood of fractures
 - b. Reduced cardiac reserve decreases the ability to compensate for blood loss
 - c. Decreased respiratory function increases likelihood of adult respiratory distress syndrome (ARDS)
 - d. Impaired renal function decreases the ability to adapt to fluid shifts
 - 2. Epidemiology
 - a. Fifth leading cause of death
 - b. Mortality rates markedly increased
 - c. Post injury disability more common
 - 3. Assessment findings
 - a. Mechanism of injury
 - (1) Falls
 - (2) Motor vehicle crashes
 - (3) Burns
 - (4) Assault/ abuse
 - (5) Other - syncope, MI, etc. may be underlying cause of trauma
 - b. Initial level of consciousness very important
 - c. Blood pressure that is normal, may be hypovolemic
 - d. Fractures can be occult due to diminished pain perception
 - e. Observe scene for clues of abuse
 - (1) Physical abuse
 - (2) Active and passive neglect
 - (3) Psychological abuse
 - (4) Financial abuse
 - (5) Self abuse
 - (6) Reporting
 - 4. Management
 - a. Airway and ventilation
 - (1) Dentures may need to be removed
 - (2) Oxygen is very important due to vascular disease
 - b. Circulation
 - (1) Fluid administration should be closely monitored for signs/ symptoms of pulmonary edema
 - c. Other
 - (1) Prevent hypothermia by keeping patient warm
 - (2) ECG monitoring is indicated due to increased cardiac disease
 - d. Transportation consideration
 - (1) Appropriate mode

- (2) Appropriate facilities
- e. Psychological support/ communications strategies
- 5. Specific injuries
 - a. Orthopedic injuries
 - (1) Hip fracture is the most common acute orthopedic condition
 - (2) Elderly are susceptible to stress fractures of femur, pelvis, tibia
 - (3) Packaging should include bulk, and padding to fill in areas
 - (4) Kyphosis may require extra padding under the shoulders to maintain alignment
 - b. Burns
 - (1) Increased risk of significant mortality and morbidity due to pre-existing disease
 - (2) Skin changes result in increased burn depth
 - (3) Altered nutrition decreases defense against infection
 - (4) Fluid important to prevent renal tubular damage
 - (5) Assess hydration in initial hours after burn injury by BP, pulse, and urine output (at least 50-60 cc/ hr)
 - c. Head injury
 - (1) More serious in the elderly
 - (2) Brain shrinkage allows brain to move
 - (3) Subdural hematoma may develop more slowly, sometimes over days or weeks

UNIT TERMINAL OBJECTIVE

- 6-4 At the completion of this unit, the paramedic student will be able to integrate the assessment findings to formulate a field impression and implement a treatment plan for the patient who has sustained abuse or assault.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 6-4.1 Discuss the incidence of abuse and assault. (C-1)
- 6-4.2 Describe the categories of abuse. (C-1)
- 6-4.3 Discuss examples of spouse abuse. (C-1)
- 6-4.4 Discuss examples of elder abuse. (C-1)
- 6-4.5 Discuss examples of child abuse. (C-1)
- 6-4.6 Discuss examples of sexual assault. (C-1)
- 6-4.7 Describe the characteristics associated with the profile of the typical abuser of a spouse. (C-1)
- 6-4.8 Describe the characteristics associated with the profile of the typical abuser of the elder. (C-1)
- 6-4.9 Describe the characteristics associated with the profile of the typical abuser of children. (C-1)
- 6-4.10 Describe the characteristics associated with the profile of the typical assailant of sexual assault. (C-1)
- 6-4.11 Identify the profile of the "at-risk" spouse. (C-1)
- 6-4.12 Identify the profile of the "at-risk" elder. (C-1)
- 6-4.13 Identify the profile of the "at-risk" child. (C-1)
- 6-4.14 Discuss the assessment and management of the abused patient. (C-1)
- 6-4.15 Discuss the legal aspects associated with abuse situations. (C-1)
- 6-4.16 Identify community resources that are able to assist victims of abuse and assault. (C-1)
- 6-4.17 Discuss the documentation associated with abused and assaulted patient. (C-1)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 6-4.18 Demonstrate sensitivity to the abused patient. (A-1)
- 6-4.19 Value the behavior of the abused patient. (A-2)
- 6-4.20 Attend to the emotional state of the abused patient. (A-1)
- 6-4.21 Recognize the value of non-verbal communication with the abused patient. (A-1)
- 6-4.22 Attend to the needs for reassurance, empathy and compassion with the abused patient. (A-1)
- 6-4.23 Listen to the concerns expressed by the abused patient. (A-1)
- 6-4.24 Listen and value the concerns expressed by the sexually assaulted patient. (A-2)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 6-4.25 Demonstrate the ability to assess a spouse, elder or child abused patient. (P-1)
- 6-4.26 Demonstrate the ability to assess a sexually assaulted patient. (P-1)

DECLARATIVE

- I. Introduction
 - A. Epidemiology
 1. Incidence
 - a. Abuse of spouse, elderly relatives, and children is greater than most estimate
 - b. Only 10% of women report battering incidents
 - c. Over 1 million children suffer from abuse or neglect
 2. Mortality/ morbidity
 - a. Victims may die as a result of the abuse or assault
 - b. Victims may suffer mental or physical injuries
 3. Risk factors
 - a. Men and women who beat one another also most likely beat their children
 - b. Children of abusive and unloving homes are more likely to become spouse or child batterers and later, abusers of their elderly parents
 4. Prevention strategies
 - a. Early detection
 - b. Social services support
 - c. Altering life styles
 - II. The battered spouse
 - A. Epidemiology
 1. Incidence
 - a. Not a new phenomenon
 - b. The act itself can be traced to early history
 - B. Battered women
 1. Overview
 - a. Women generally report incident only as a last resort
 - b. Reasons for not reporting
 - (1) Fear
 - (a) For her self
 - (b) For her children
 - (2) Believes behavior will change
 - (3) Lack of financial support
 - (a) No money
 - (b) No one to turn to
 - (c) No knowledge of where to go
 - (4) Believes she is the cause of the violent behavior
 - (5) Believes that it is part of the marriage and must endure in order to keep the family together
 - c. Characteristics of wife-battering
 - (1) The beatings do not stop
 - (2) Beatings become more severe and more frequent
 - (3) Beatings occur without provocation whatsoever
 - (4) At some point will turn violence toward the children
 - d. Characteristics of spouse abusers
 - (1) They have low self esteem and are not happy about themselves
 - (2) For the most part their violence was learned from their parents

- (3) Some believe they are demonstrating discipline
 - (4) They do not like being out of "control"
 - (5) Fail to see any alternatives and do not know what else to do
 - (6) Both parties do not know how to back down from conflict
 - (7) He/ she may feel powerless to change
 - (8) The use of alcohol seems to be a factor
 - (9) Mental illness occurs in less than 10% of abusers
 - (10) Abuse does occur in all socio-economic groups, however most abusers are in the lower socio-economic groups
 - (11) The abuser goes into sudden rages
 - (12) Abusers feel insecure and jealous
 - (13) The abuser can appear charming and loving after the incident of battering
 - (14) The abuser may have money difficulties, problems holding a job and possible legal issues
 - e. Ten "risk factors" for domestic violence (as taken from "Domestic Violence: Cracking the Code of Silence")
 - (1) Male is unemployed
 - (2) Male uses illegal drugs at least once a year
 - (3) Partners have different religious backgrounds
 - (4) Family income is below poverty line
 - (5) Partners are unmarried
 - (6) Either partner is violent toward children at home
 - (7) Male did not graduate from high school
 - (8) Male has a blue-collar job, if employed
 - (9) Male is between 18-30
 - (10) Male saw father hit mother
- C. Battered men
- 1. Overview
 - a. Battering is not limited to women
 - b. Men also rarely report incident
 - c. Humiliation suffered by a woman is multiplied for a man
 - d. Men feel as trapped as women do
 - e. Same psychological and emotional effects
 - (1) Guilt
 - (2) Loss of self-control
 - (3) Loss of control
 - f. Society is less empathetic toward men
 - g. Even fewer resources exist for men
- D. Homosexual relationships
- 1. Overview
 - a. Spouse battering occurs in homosexual relationship as well
 - b. Homosexuals are conditioned the same as heterosexuals
- E. Identifying the battered patient
- 1. Difficult to do because the description of the injuries may be incorrect, inaccurate and protective of the attacker
 - 2. May not seek care for bruises or lacerations
 - 3. May avoid eye contact and be hesitant or evasive about the details of the injuries
 - 4. Clues about the situation

- a. "Things haven't been going well lately"
 - b. "There have been problems at home"
 - F. Approaching the battered patient
 - 1. Direct questioning is best
 - 2. Ask if the difficulties led to the physical harm
 - 3. Convey your awareness that the injuries may be due to their spouse
 - a. May feel a sense of relief that someone else is aware
 - 4. Once the subject has been introduced, show a willingness to discuss it
 - a. Remember the following key points for the discussion
 - (1) Non-judgmental attitude
 - (a) Avoid judgmental statements
 - i) "Oh, how awful"
 - ii) Avoid "why" questions
 - a) "Why don't you leave"
 - (2) Supportive attitude
 - (a) Listen attentively
 - (b) Support and encourage
 - (3) Return of control
 - (a) Help them to gain control over their life
 - (b) Have them identify what they want for themselves and their children
 - (4) Community resources
 - (a) Community resources vary widely
 - (b) Become knowledgeable of the community resources
 - b. Safety precautions
 - (1) Encourage the patient to take precautions as needed
 - (2) What is the quick way out
 - (a) Where they can go
 - (b) Whom they can call
 - G. Legal considerations
 - 1. It is a crime to beat another person
 - 2. Assault is a misdemeanor or a felony
 - a. Depends on amount of injury inflicted and devices used
 - 3. Attacker may be arrested
 - a. May be released within hours on their own recognizance
 - b. The patient must be aware of this
 - H. Victim-witness assistance programs
 - 1. State and federal funded programs are available
 - 2. Need to become aware of services available in your area
- III. The abused elder
 - A. Overview
 - 1. Prevalent medical and social problem
 - 2. Factors contributing to the problem
 - a. Increased life expectancy
 - b. Physical and mental impairment
 - c. Decreased productivity
 - d. Increased dependence with greater longevity

- e. Limited resources for care of the elderly
- f. Economic factors
- g. Stress of the middle-aged caretaker responsible for two generations
- 3. Two types of elder abuse
 - a. Domestic
 - (1) The National Aging Resource Center on Elder Abuse gives the following percentages as to who are the perpetrators of elder abuse in domestic settings
 - (a) Adult children 32.5%
 - (b) Grandchildren 4.2%
 - (c) Spouse 14.4%
 - (d) Sibling 2.5%
 - (e) Other relatives 12.5%
 - (f) Friend/ neighbor 7.5%
 - (g) All others 18.2%
 - (h) Unknown 2.0%
 - (2) Four major theories of causes of domestic elder abuse
 - (a) The care giver is stressed-care; giver is ill-equipped to give care (this may be due to personal problems and/ or lack of knowledge of how to do the job)
 - (b) Impairment of dependent elders - elders in poor health are more likely to be abused than those in good health
 - (c) Cycle of violence = tension/ crisis/ calm/ repeat cycle
 - (d) Personal problems of abusers - abusers of the elderly tend to have more personal problems than do non-abusers
 - b. Institutional abuse-perpetrators of institutional abuse usually are persons who have legal or contractual obligation to provide care to elders (e.g., paid caretakers, staff, professionals)
- 4. Characteristics of elder abuse
 - a. More likely to suffer from physical or mental impairment
 - b. Abusers are most often the children of the abused person
 - c. Elders are most often repeatedly abused by family members
 - d. Abused elders do not seek help
- 5. Forms of abuse
 - a. Physical abuse or neglect
 - b. Psychological abuse
 - c. Violation of individual rights
 - (1) Victim of theft
 - (2) Loss of freedom of choice

IV. The abused child

A. Overview

- 1. Various forms of abuse or neglect
- 2. Results in physical or emotional impairment
- 3. Involves the mistreatment of children
 - a. Occur from infancy to 18 years of age
 - b. Involves caretakers
 - (1) Parents

- (2) Foster parents
 - (3) Stepparents
 - (4) Babysitters
 - 4. Neglect
 - a. Failure to provide physical care
 - (1) Nutrition
 - (2) Shelter
 - (3) Clothing
 - b. Failure to provide emotional care
 - (1) Indifference
 - (2) Disregard
 - c. Importance of identifying the abused child
 - (1) Tends to be repetitive
 - (2) Repeated calls to the patient's home
- B. Characteristics of abusers
 - 1. Overview
 - a. Not related to social class, income or level of education
 - b. Rigorous discipline accounts for the cyclical nature of abuse
 - c. History of severe physical punishment
 - d. The abuser was beaten as a child
 - e. Abuser would prefer to use other forms of discipline, the stress makes them regress to the earliest patterns
 - 2. Signs of a pre-abuse state
 - a. Sometimes the abusive adult will actively seek help
 - b. The following pattern may be observed
 - (1) Several calls in a 24 hour period
 - (2) Frequent calls for inconsequential symptoms
 - (3) Parent begins to demonstrate behavior of being unable to handle the impending crisis
 - 3. Characteristics of the child abuser
 - a. Immature behavior and is preoccupied with him/ herself
 - b. Has little perception of how a child could feel, physically or emotionally
 - c. Is critical of the child
 - d. Seldom touches or looks at the child
 - e. Is unconcerned about the child's injury, treatment, or prognosis
 - f. Gives no indication of feeling guilt or remorse
 - (1) May blame the child for the injury
 - g. Is more concerned about themselves
- C. Characteristics of the abused child
 - 1. Overview
 - a. The child's behavior offers important clues
 - (1) This behavior is age related
 - (a) Child under 6 years is excessively passive
 - (b) The child over 6 years is aggressive
 - b. Child doesn't mind, at any age, if their parent leaves the room
 - 2. Behavior of the abused child
 - a. Cries hopelessly during treatment or cries very little in general
 - b. Does not look at parents for assurance

- c. May avoid parents
 - d. Is wary of physical contact
 - e. Is apprehensive
 - f. Appears constantly on the alert for danger
 - g. May constantly seek favors, food, or things
3. Accidental versus intentional injury
- a. Children very commonly get injured
 - b. Not all children with injuries are abused
 - c. If the story by the child is volunteered without hesitation and matched that of the parent, child abuse is very unlikely
 - d. Distinguishing between an intentional injury and an authentic accident is a challenge
- D. Physical examination
1. Overview
- a. The examination is best done with another colleague
 - b. The recording of information must be objective
 - c. Assumptions and personal perceptions must not be included
 - d. The report must be terse and legible
 - e. The exam should be performed with kindness and gentleness
2. Common types of soft tissue injuries
- a. Overview
 - (1) Soft tissue injuries are the injuries found most frequently in early abuse and may present in a variety of forms
 - b. Multiple bruises and ecchymoses
 - (1) Look for presence of defense wounds
 - (2) Look for injuries on multiple planes of the body
 - c. Patterned injuries
 - (1) Bites
 - (2) Burns
 - d. Scalds
 - (1) A common form of abuse
 - (2) Young and old are particularly susceptible
3. Fractures
- a. Overview
 - (1) Second most common injury
 - b. Types of fractures
 - (1) Twisting injuries
 - (2) Jerking injuries
 - (3) Rib fractures
 - (4) Multiple fractures
4. Head injuries
- a. Overview
 - (1) Produce the highest mortality
 - (2) Result in greater amount of permanent disability
 - (3) Progression of injuries appears to be from the trunk and extremities towards the head
 - b. Types of injuries
 - (1) Scalp wounds

- (2) Skull fractures
 - (3) Subdural or subgaleal hematomas
 - (4) Repeated concussions
 - 5. Abdominal injuries
 - a. Overview
 - (1) A small number of injuries, but serious
 - b. Types of injuries
 - (1) Causes rupture of liver, injuries to intestine and mesentery
- V. Sexual assault
- A. Overview
 - 1. Incidence
 - a. Increases annually
 - b. Sexual assault is the more frequently committed offense than abuse
 - c. Victims of abuse and assault may die from their injuries
 - d. Victims may sustain mental or physical injury
 - e. Victims range from 9 months to 90 years of age
 - f. Women alone in isolated areas
 - B. Legal aspect of sexual assault
 - 1. What constitutes rape
 - a. Each state has different interpretation of sexual assault
 - b. Generally, sexual assault refers to sexual contact, whether genital, oral or manual
 - c. Rape is defined as penile penetration of the genitalia (however slight) without consent of the victim
 - d. Rape is a felony crime, based on proof that a crime has occurred
 - 2. Considerations for providing care for a patient who has been sexually assaulted
 - a. Take steps to preserve any evidence
 - b. The patient should not urinate, defecate, douche, bathe
 - c. The patient should not in any way remove evidence from the part of the body that was subjected to sexual contact
 - d. Notify law enforcement as soon as possible
 - e. Remember there will be a "chain of evidence"
 - f. Be aware of local and state requirements for caring for these patients
 - C. Characteristics of sexual assault
 - 1. Overview
 - a. Anyone can be a victim
 - b. Victims are from 9 months to 90 years of age
 - c. Frequently victims know their assailant
 - D. Psychosocial aspect of care
 - 1. Initial contact with the patient
 - a. Non-judgmental attitude
 - b. Supportive attitude
 - c. Empathetic, sensitive comments
 - d. Considerate gestures
 - (1) Covering them
 - (2) Moving from public view
 - 2. Acceptance of behavior
 - a. Each patient responds differently
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- b. Anger is especially difficult for most to accept
 - 3. Privacy
 - a. Avoid further exposure and embarrassment
 - b. If possible have same sex partner provide care to the patient
 - 4. Returning control
 - a. Patient must regain as much control of their life as possible
 - b. Ask open ended questions
 - (1) Would you like to sit on a seat or ride on the stretcher
 - (2) Would you like us to contact someone
- E. The child victim
 - 1. Overview
 - a. Children who are assaulted usually have frequent contact with their assailant
 - b. In a trusted person's home
 - c. Usually involves a male assailant and a female victim
 - d. Male victims involved in heterosexual relationships are unlikely to report incident
 - e. Many children are fondled or physically explored without intercourse
 - f. Often the child conceals the sexual activity out of fear
 - 2. Assessment considerations
 - a. Symptoms may include behavior or physical manifestations
 - (1) Nightmares
 - (2) Restlessness
 - (3) Withdrawal tendencies
 - (4) Hostility
 - (5) Phobias related to the offender
 - (6) Regression (i.e. bed wetting)
 - (7) Truancy
 - b. Emotional impact
 - (1) Adult will create the impression on the child
 - (2) Children will perceive the importance and ramifications of sexual assault through the behavior of the adults around them
 - 3. Legal considerations
 - a. If sexual assault is confirmed or suspected, any law that applies must be followed
 - b. In some states minors may seek and be treated for sexual assault without parental consent

UNIT TERMINAL OBJECTIVE

- 6-5 At the completion of this unit the paramedic student will be able to integrate pathophysiological and psychosocial principles to adapt the assessment and treatment plan for diverse patients and those who face physical, mental, social and financial challenges.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 6-5.1 Describe the various etiologies and types of hearing impairments. (C-1)
- 6-5.2 Recognize the patient with a hearing impairment. (C-1)
- 6-5.3 Anticipate accommodations that may be needed in order to properly manage the patient with a hearing impairment. (C-3)
- 6-5.4 Describe the various etiologies of visual impairments. (C-1)
- 6-5.5 Recognize the patient with a visual impairment. (C-1)
- 6-5.6 Anticipate accommodations that may be needed in order to properly manage the patient with a visual impairment. (C-3)
- 6-5.7 Describe the various etiologies and types of speech impairments. (C-1)
- 6-5.8 Recognize the patient with a speech impairment. (C-1)
- 6-5.9 Anticipate accommodations that may be needed in order to properly manage the patient with a speech impairment. (C-3)
- 6-5.10 Describe the various etiologies of obesity. (C-1)
- 6-5.11 Anticipate accommodations that may be needed in order to properly manage the patient with obesity. (C-3)
- 6-5.12 Describe paraplegia/ quadriplegia. (C-1)
- 6-5.13 Anticipate accommodations that may be needed in order to properly manage the patient with paraplegia/ quadriplegia. (C-3)
- 6-5.14 Define mental illness. (C-1)
- 6-5.15 Describe the various etiologies of mental illness. (C-1)
- 6-5.16 Recognize the presenting signs of the various mental illnesses. (C-1)
- 6-5.17 Anticipate accommodations that may be needed in order to properly manage the patient with a mental illness. (C-3)
- 6-5.18 Define the term developmentally disabled. (C-1)
- 6-5.19 Recognize the patient with a developmental disability. (C-1)
- 6-5.20 Anticipate accommodations that may be needed in order to properly manage the patient with a developmental disability. (C-3)
- 6-5.21 Describe Down's syndrome. (C-1)
- 6-5.22 Recognize the patient with Down's syndrome. (C-1)
- 6-5.23 Anticipate accommodations that may be needed in order to properly manage the patient with Down's syndrome. (C-3)
- 6-5.24 Describe the various etiologies of emotional impairment. (C-1)
- 6-5.25 Recognize the patient with an emotional impairment. (C-1)
- 6-5.26 Anticipate accommodations that may be needed in order to properly manage the patient with an emotional impairment. (C-3)
- 6-5.27 Define emotional/ mental impairment (EMI). (C-1)
- 6-5.28 Recognize the patient with an emotional or mental impairment. (C-1)
- 6-5.29 Anticipate accommodations that may be needed in order to properly manage patients with an emotional or mental impairment. (C-3)
- 6-5.30 Describe the following diseases/ illnesses: (C-1)
 - a. Arthritis

- b. Cancer
 - c. Cerebral palsy
 - d. Cystic fibrosis
 - e. Multiple sclerosis
 - f. Muscular dystrophy
 - g. Myasthenia gravis
 - h. Poliomyelitis
 - i. Spina bifida
 - j. Patients with a previous head injury
- 6-5.31 Identify the possible presenting sign(s) for the following diseases/ illnesses: (C-1)
- a. Arthritis
 - 2. Cancer
 - 3. Cerebral palsy
 - 4. Cystic fibrosis
 - 5. Multiple sclerosis
 - 6. Muscular dystrophy
 - 7. Myasthenia gravis
 - 8. Poliomyelitis
 - 9. Spina bifida
 - 10. Patients with a previous head injury
- 6-5.32 Anticipate accommodations that may be needed in order to properly manage the following patients: (C-3)
- 1. Arthritis
 - 2. Cancer
 - 3. Cerebral palsy
 - 4. Cystic fibrosis
 - 5. Multiple sclerosis
 - 6. Muscular dystrophy
 - 7. Myasthenia gravis
 - 8. Poliomyelitis
 - 9. Spina bifida
 - 10. Patients with a previous head injury
- 6-5.33 Define cultural diversity. (C-1)
- 6-5.34 Recognize a patient who is culturally diverse. (C-1)
- 6-5.35 Anticipate accommodations that may be needed in order to properly manage a patient who is culturally diverse. (C-3)
- 6-5.36 Identify a patient that is terminally ill. (C-1)
- 6-5.37 Anticipate accommodations that may be needed in order to properly manage a patient who is terminally ill. (C-3)
- 6-5.38 Identify a patient with a communicable disease. (C-1)
- 6-5.39 Recognize the presenting signs of a patient with a communicable disease. (C-1)
- 6-5.40 Anticipate accommodations that may be needed in order to properly manage a patient with a communicable disease. (C-3)

- 6-5.41 Recognize sign(s) of financial impairments. (C-1)
6-5.42 Anticipate accommodations that may be needed in order to properly manage the patient with a financial impairment. (C-3)

AFFECTIVE OBJECTIVES

None identified for this unit.

PSYCHOMOTOR OBJECTIVES

None identified for this unit.

DECLARATIVE

- I. Introduction
 - A. Different types of "challenged" patients

- II. Physical challenges
 - A. Hearing impairments
 - 1. Types
 - a. Conductive deafness
 - b. Sensorineural deafness
 - 2. Etiologies
 - a. Conductive deafness (curable)
 - (1) Infection
 - (2) Injury
 - (3) Earwax
 - b. Sensorineural deafness (many incurable)
 - (1) Congenital
 - (2) Birth injury
 - (3) Disease
 - (4) Medication-induced
 - (5) Viral infection
 - (6) Tumor
 - (7) Prolonged exposure to loud noise
 - (8) Aging
 - 3. Recognition
 - a. Hearing aids
 - b. Poor diction
 - c. Inability to respond to verbal communication in the absence of direct eye contact
 - 4. Accommodations that may be necessary
 - a. Retrieve hearing aid
 - b. Paper/ pen
 - (1) Many patients with a hearing impairment use American Sign Language (ASL)
 - (2) Different syntax than English
 - c. Do not shout
 - (1) 80% of hearing loss is related to the loss of high-pitched sounds
 - (2) Use low-pitched sounds directly into ear canal
 - d. Do not exaggerate lip movement
 - e. Interpreter
 - (1) Notify receiving facility as early as

- possible
- f. Use of an "amplified" listener (e.g., ear microphone)
- g. Use of picture that illustrate basic needs/procedures
- B. Visual impairments
 - 1. Etiologies
 - a. Injury
 - b. Disease
 - c. Degeneration of eyeball, optic nerve or nerve pathways
 - d. Congenital
 - e. Infection (C.M.V.)
 - 2. Recognition
 - a. May be difficult
 - 3. Accommodations that may be necessary
 - a. Retrieve visual aids
 - b. Describe everything that you're going to do
 - c. Provide sensory information
 - d. If ambulatory, guide by leading, not by pushing
 - e. Allow leader dogs to accompany patient
- C. Speech impairments
 - 1. Types
 - a. Language disorders
 - b. Articulation disorders
 - c. Voice production disorders
 - d. Fluency disorders
 - 2. Etiologies
 - a. Language disorders
 - (1) Stroke
 - (2) Head injury
 - (3) Brian tumor
 - (4) Delayed development
 - (5) Hearing loss
 - (6) Lack of stimulation
 - (7) Emotional disturbance
 - b. Articulation disorders
 - (1) From damage to nerve pathways passing from brain to muscles in larynx, mouth or lips
 - (2) Delayed development from hearing problems, slow maturation of nervous system
 - c. Voice production disorders

- (1) Disorder affecting closure of vocal cords
 - (2) Hormonal or psychiatric disturbance
 - (3) Severe hearing loss
 - d. Fluency disorders
 - (1) Not fully understood
 - 3. Recognition
 - a. Language disorders (aphasia)
 - (1) Slowness to understand speech
 - (2) Slow growth in vocabulary and sentence structure
 - b. Articulation disorders (dysarthria)
 - (1) Speech can be slurred, indistinct, slow, or nasal
 - c. Voice production disorders
 - (1) Hoarseness
 - (2) Harshness
 - (3) Inappropriate pitch
 - (4) Abnormal nasal resonance
 - d. Fluency disorders
 - (1) Stuttering
 - 4. Accommodations that may be necessary
 - a. Allow patient time to respond to questions
 - b. Provide aids when available
- D. Obesity
 - 1. Etiologies
 - a. Caloric intake exceeds calories burned
 - b. Low basal metabolic rate
 - c. Genetic predisposition
 - 2. Accommodations that may be necessary
 - a. Obtaining medical history
 - (1) Often extensive medical history
 - b. Assessment
 - (1) Use appropriately sized diagnostic devices
 - c. Management
 - (1) Maintain professionalism
 - d. Transport
 - (1) May require additional assistance
- E. Patients with paraplegia/ quadriplegia
 - 1. Description
 - a. Paraplegia
 - (1) Weakness or paralysis of both legs
 - b. Quadriplegia
 - (1) Paralysis of all four extremities and the

- trunk
- 2.2 Accommodations that may be necessary
 - a. Assessment
 - (1) May require airway management
 - (a) Patients with halo traction device
 - (2) Observe for ostomies
 - (a) Trachea
 - (b) Bladder
 - (c) Colon
 - (3) Priapism may be present
 - b. Transport
 - (1) May require additional assistance/ equipment
- F. Other physically challenged patients

III. Mental challenges

- A. Mental illness
 - 1. Description
 - a. Any form of psychiatric disorder
 - 2. Etiologies
 - a. Psychoses
 - (1) Caused by complex biochemical brain disease
 - b. Neuroses
 - (1) Disease related to personality
 - 3. Recognition
 - a. Behavior may be unaffected
 - b. May present with signs and symptoms consistent with illness
 - 4. Accommodations that may be necessary
 - a. Obtaining history
 - (1) Don't be afraid to ask about
 - (a) History of mental illness
 - (b) Prescribed medications
 - (c) Whether patient is taking medications as prescribed
 - (d) Concomitant ingestion of alcohol, other drugs
 - b. Assessment
 - (1) Be sure to solicit permission before beginning
 - c. Management
 - (1) Treat as you would any patient that does not have a mental illness, unless call is related specifically to the mental illness; patients

- with mental illness also experience myocardial infarctions, hypoglycemic episodes, and dislocated shoulders
- B. Developmental disabilities
 - 1. Description/ etiologies
 - a. Impaired/ insufficient development of the brain, causing an inability to learn at the usual rate
 - 2. Recognition
 - a. History
 - 3. Accommodations that may be necessary
 - a. Obtaining history
 - b. Assessment
 - c. Management
 - d. Transport
 - 4. Down's syndrome
 - a. Description/ etiologies
 - (1) A chromosomal abnormality resulting in mild to severe mental retardation, and a characteristic physical appearance
 - b. Recognition (typical)
 - (1) Eyes slope up at outer corners; folds of skin on either side of nose cover the inner corners of eye
 - (2) Small face and features
 - (3) Large and protruding tongue
 - (4) Flattening on back of the head
 - (5) Hands short and broad
 - c. Accommodations that may be necessary
 - (1) Obtaining history, consider
 - (a) Approximately 25% have a heart defect at birth
 - (b) IQ varies from 30-80
 - (2) Assessment
 - (3) Management
 - (4) Transport
 - C. Emotional impairments
 - 1. Description/ etiologies
 - a. Neurasthenia
 - b. Anxiety neurosis
 - c. Compulsion neurosis
 - d. Hysteria
 - 2. Recognition
 - a. History

3. Accommodations that may be necessary
 - a. Obtaining history
 - b. Assessment
 - c. Management
 - d. Transport
 - D. Emotional/ mental impairments (EMI)
 1. Description/ etiologies
 2. Recognition
 - a. History
 3. Accommodations that may be necessary
 - a. Obtaining history
 - b. Assessment
 - c. Management
 - d. Transport
- IV. Pathological challenges
- A. Arthritis
 1. Description
 - a. Inflammation of a joint; characterized by pain, stiffness, swelling, redness
 2. Types/ etiologies
 3. Accommodations that may be necessary
 - a. Assessment
 - (1) Decreased range of motion/ mobility may limit physical exam
 - (2) Be sure to solicit current medications before considering the administration of medications
 - b. Management/ transport
 - (1) Limited ability to be mobile
 - (2) Make equipment fit patient, not vice-versa; pad all voids
 - B. Cancer (malignant tumor)
 1. Description/ etiologies
 - a. Various; dependent on primary site
 2. Recognition
 - a. Various; dependent on primary site
 3. Accommodations that may be necessary
 - a. Obtaining history
 - b. Assessment
 - (1) Look for transdermal pain medication on skin
 - c. Management
 - (1) Mediport access
 - d. Transport

- C. Cerebral palsy
 - 1. Description
 - a. Nonprogressive disorders of movement and posture
 - 2. Types
 - a. Spastic paralysis
 - (1) Abnormal stiffness and contraction of groups of muscles
 - b. Athetosis
 - (1) Involuntary, writhing movements
 - c. Ataxia
 - (1) Loss of coordination and balance
 - 3. Etiologies
 - a. Most occur before birth
 - b. Prepartum
 - (1) Cerebral hypoxia
 - (2) Maternal infection
 - (3) Kernicterus
 - c. Postpartum
 - (1) Encephalitis
 - (2) Meningitis
 - (3) Head injury
 - 4. Recognition
 - a. Spastic
 - (1) Muscles of one or more extremities are permanently contracted
 - b. Athetoid
 - (1) Involuntary writhing movement
 - c. Quadriplegia
 - d. Mental retardation in about 75% of all people with CP
 - e. Many people with athetoid and diplegic cerebral palsy are highly intelligent
 - 5. Accommodations that may be necessary
 - a. Transport
 - (1) May require additional resources to facilitate transport
 - (2) May need suctioning, due to increased oral secretions
 - (3) If contractures are present, pad appropriately; do not force extremities to move
- D. Cystic fibrosis (Mucoviscidosis)
 - 1. Description

- a. An inherited metabolic disease of the lungs and digestive system, manifesting itself in childhood
- 2. Etiology
 - a. A defective, recessive gene
- 3. Recognition
 - a. History
 - b. Patient may be oxygen-dependent
 - c. Salty taste on skin
 - d. Productive cough
- 4. Accommodations that may be necessary
 - a. Management
 - (1) May require respiratory support, suctioning, oxygen
- E. Multiple sclerosis
 - 1. Description
 - a. A progressive autoimmune disease of the CNS, whereby scattered patches of myelin in the brain and spinal cord are destroyed
 - 2. Etiologies
 - a. Unknown
 - 3. Recognition
 - a. If brain is affected
 - (1) Fatigue
 - (2) Vertigo
 - (3) Clumsiness
 - (4) Muscle weakness
 - (5) Slurred speech
 - (6) Ataxia
 - (7) Blurred or double vision
 - (8) Numbness, weakness or pain in the face
 - b. If spinal cord is affected
 - (1) Tingling, numbness, or feeling of constriction in any part of the body
 - (2) Extremities may feel heavy and become weak
 - (3) Spasticity may be present
 - 4. Accommodations that may be necessary
 - a. Assessment
 - (1) Recognize characteristic presentations
 - (2) May be accompanied by
 - (a) Painful muscle spasms
 - (b) UTI
 - (c) Constipation
 - (d) Skin ulcerations

- (e) Changes of mood, from euphoria to depression
 - b. Management
 - (1) Possible respiratory support
 - c. Transport
 - (1) Patient should not be expected to ambulate
- F. Muscular dystrophy
 - 1. Description
 - a. An inherited muscle disorder of unknown cause in which there is slow but progressive degeneration of muscle fibers
 - 2. Recognition
 - a. History
 - b. Little or no movement of muscle groups
 - 3. Accommodations that may be necessary
 - a. Management
 - (1) Possible respiratory support
 - b. Transport
 - (1) Patient should not be expected to ambulate
- G. Poliomyelitis
 - 1. Description/ etiologies
 - a. Caused by a virus, which usually results in a mild illness
 - b. In more serious cases, it attacks the CNS; may result in paralysis or death
 - 2. Recognition
 - a. History
 - b. Patients with severe polio may present with paralysis (including respiratory)
 - 3. Accommodations that may be necessary
 - a. Management
 - (1) If lower extremities are paralyzed, patient may require catheterization
 - (2) If respiratory paralysis, patient may require tracheostomy
 - b. Transport
 - (1) Patient should not be expected to ambulate
- H. Patients with previous head injuries
 - 1. Recognition
 - a. Physical appearance may be uncharacteristic
 - b. Speech and mobility may be affected
 - c. Short term memory loss
 - 2. Accommodations that may be necessary

- a. Obtaining history
 - b. Assessment
 - c. Management
 - d. Transport
- I. Spina bifida
- 1. Description
 - a. A congenital defect in which part of one or more vertebrae fails to develop, leaving a portion of the spinal cord exposed
 - 2. Etiology
 - a. Unknown
 - 3. Recognition
 - a. History
 - 4. Accommodations that may be necessary
 - a. Management/ transport
 - (1) Patient should not be expected to ambulate, altho
ugh
most
can
- J. Myasthenia gravis
- 1. Description
 - a. A disorder in which muscles become weak and tire easily
 - b. Eyes, face, throat, and extremity muscles most commonly affected
 - 2. Etiology
 - a. Autoimmune disorder of unknown etiology
 - 3. Recognition
 - a. Drooping eyelids, double vision
 - b. Difficulty speaking
 - c. Chewing, swallowing may be difficult
 - d. Movement of extremities may be difficult
 - e. Respiratory muscles may be weakened
 - 4. Accommodations that may be necessary
 - a. Assessment/ management
 - (1) History
 - (2) Accommodations vary, based upon presentation
- V. Culturally diverse patients
- A. Variables
 - 1. Ethnicity, religion, gender, homelessness, etc. may dictate various accepted medical practices

- a. May conflict with learned medical practice of the paramedic
 - 2. Patients who speak a language other than English have unique challenges
 - B. Recognition
 - C. Accommodations that may be necessary
 - 1. Assessment/ management/ transport
 - a. Be sure to obtain permission to treat when possible
 - b. Attempt to recruit an interpreter, or consider translator device (e.g. AT&T language line) for non-English speaking patients; notify receiving facility as soon as possible if an interpreter will be needed
-
- VI. Terminally ill patients
 - A. Variables
 - B. Accommodations
 - 1. Obtaining history
 - a. Advance directives, DNR
 - 2. Assessment
 - a. Pain assessment (transdermal delivery of pain medications) - quantify and qualify
 - b. Management
 - c. Transport
-
- VII. Patients with communicable diseases
 - A. Review of etiologies
 - B. Accommodations
 - 1. Obtaining history
 - 2. Assessment
 - 3. Management
 - a. Precautions will depend upon modes of transmission
 - 4. Transport
-
- VIII. Financial challenges
 - A. Description
 - 1. May be apprehensive about seeking medical care
 - B. Accommodations
 - 1. Management
 - 2. Transport

UNIT TERMINAL OBJECTIVE

- 6-6 At the completion of this unit, the paramedic student will be able to integrate the pathophysiological principles and the assessment findings to formulate a field impression and implement a treatment plan for the acute deterioration of a chronic care patient.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 6-6.1 Compare and contrast the primary objectives of the ALS professional and the home care professional. (C-3)
- 6-6.2 Identify the importance of home health care medicine as related to the ALS level of care. (C-1)
- 6-6.3 Differentiate between the role of EMS provider and the role of the home care provider. (C-3)
- 6-6.4 Compare and contrast the primary objectives of acute care, home care and hospice care. (C-3)
- 6-6.5 Summarize the types of home health care available in your area and the services provided. (C-3)
- 6-6.6 Discuss the aspects of home care that result in enhanced quality of care for a given patient. (C-1)
- 6-6.7 Discuss the aspects of home care that have a potential to become a detriment to the quality of care for a given patient. (C-1)
- 6-6.8 List complications commonly seen in the home care patients which result in their hospitalization. (C-1)
- 6-6.9 Compare the cost, mortality and quality of care for a given patient in the hospital versus the home care setting. (C-3)
- 6-6.10 Discuss the significance of palliative care programs as related to a patient in a home health care setting. (C-1)
- 6-6.11 Define hospice care, comfort care and DNR/ DNAR as they relate to local practice, law and policy. (C-1)
- 6-6.12 List the stages of the grief process and relate them to an individual in hospice care. (C-1)
- 6-6.13 List pathologies and complications typical to home care patients. (C-1)
- 6-6.14 Given a home care scenario, predict complications requiring ALS intervention. (C-3)
- 6-6.15 Given a series of home care scenarios, determine which patients should receive follow-up home care and which should be transported to an emergency care facility. (C-3)
- 6-6.16 Describe airway maintenance devices typically found in the home care environment. (C-1)
- 6-6.17 Describe devices that provide or enhance alveolar ventilation in the home care setting. (C-1)
- 6-6.18 List modes of artificial ventilation and an out-of-hospital situation where each might be employed. (C-1)
- 6-6.19 List vascular access devices found in the home care setting. (C-1)
- 6-6.20 Recognize standard central venous access devices utilized in home health care. (C-1)
- 6-6.21 Describe the basic universal characteristics of central venous catheters. (C-1)
- 6-6.22 Describe the basic universal characteristics of implantable injection devices. (C-1)
- 6-6.23 List devices found in the home care setting that are used to empty, irrigate or deliver nutrition or medication to the GI/ GU tract. (C-1)
- 6-6.24 Describe complications of assessing each of the airway, vascular access, and GI/ GU devices described above. (C-1)
- 6-6.25 Given a series of scenarios, demonstrate the appropriate ALS interventions. (C-3)
- 6-6.26 Given a series of scenarios, demonstrate interaction and support with the family members/ support persons for a patient who has died. (C-3)
- 6-6.27 Describe common complications with central venous access and implantable drug administration ports in the out-of-hospital setting. (C-1)
- 6-6.28 Describe the indications and contraindications for urinary catheter insertion in an out-of-hospital setting. (C-1)
- 6-6.29 Identify the proper anatomy for placement of urinary catheters in males or females. (C-2)
- 6-6.30 Identify failure of GI/ GU devices found in the home care setting. (C-2)
- 6-6.31 Identify failure of ventilatory devices found in the home care setting. (C-2)

- 6-6.32 Identify failure of vascular access devices found in the home care setting. (C-2)
- 6-6.33 Identify failure of drains. (C-2)
- 6-6.34 Differentiate between home care and acute care as preferable situations for a given patient scenario. (C-3)
- 6-6.35 Discuss the relationship between local home care treatment protocols/ SOPs and local EMS Protocols/ SOPs. (C-3)
- 6-6.36 Discuss differences in individuals ability to accept and cope with their own impending death. (C-3)
- 6-6.37 Discuss the rights of the terminally ill. (C-1)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 6-6.38 Value the role of the home-care professional and understand their role in patient care along the life-span continuum. (A-2)
- 6-6.39 Value the patient's desire to remain in the home setting. (A-2)
- 6-6.40 Value the patient's desire to accept or deny hospice care. (A-2)
- 6-6.41 Value the uses of long term venous access in the home health setting, including but not limited to: (A-2)
 - a. Chemotherapy
 - b. Home pain management
 - c. Nutrition therapy
 - d. Congestive heart therapy
 - e. Antibiotic therapy

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 6-6.42 Observe for an infected or otherwise complicated venous access point. (P-1)
- 6-6.43 Demonstrate proper tracheotomy care. (P-1)
- 6-6.44 Demonstrate the insertion of a new inner cannula and/ or the use of an endotracheal tube to temporarily maintain an airway in a tracheostomy patient. (P-1)
- 6-6.45 Demonstrate proper technique for drawing blood from a central venous line. (P-1)
- 6-6.46 Demonstrate the method of accessing vascular access devices found in the home health care setting. (P-1)

DECLARATIVE

- I. Introduction
 - A. Epidemiology of home care
 - 1. Patients receiving home care
 - a. Supportive statistics
 - 2. ALS responses to home care patients
 - a. Role of the ALS provider
 - b. Role of the home care provider
 - c. Supportive statistics
 - d. Typical responses
 - (1) Respiratory failure
 - (2) Cardiac decompensation
 - (3) Septic complications
 - (4) Equipment malfunction
 - (5) Other medical pathologies exacerbated in the home care setting
 - 3. Medical devices commonly found in the home care setting
 - a. Supportive statistics
 - (1) National (number of trach patients, home ventilator patients, etc.)
 - (2) Local
 - b. Examples of home care problems requiring intervention by a home health practitioner or physician
 - (1) Chemotherapy
 - (2) Pain management
 - (3) Hospice care
 - (4) Others
 - c. Examples of home care problems requiring acute intervention
 - (1) Inadequate respiratory support
 - (2) Acute respiratory events
 - (3) Acute cardiac events
 - (4) Acute sepsis
 - (5) GI/ GU crisis
 - 4. Injury control and prevention in the home care setting
 - a. Haddon's matrix
 - b. Performance versus task demand
 - c. Infection control in the home care setting
 - B. Types of home care patients
 - 1. Airway pathologies
 - a. Inadequate pulmonary toilet
 - b. Inadequate alveolar ventilation
 - c. Inadequate alveolar oxygenation
 - 2. Circulatory pathologies
 - a. Alterations in peripheral circulation
 - 3. GI/ GU pathologies
 - a. Ostomies
 - b. Catheters

- 4. Infections
 - c. Home dialysis
 - a. Cellulitis
 - b. Sepsis
 - 5. Wound care
 - a. Surgical wound closure
 - b. Decubitus wounds
 - c. Drains
 - 6. Hospice care
 - 7. Maternal/ child care
 - a. Apnea monitors
 - b. The new parent
 - 8. Progressive dementia in the patient at home
 - 9. Psychosocial support of the home care family
 - 10. Chronic pain management
 - 11. Home chemotherapy
 - 12. The transplant candidate
- II. General system pathophysiology, assessment and management
- A. Assessment
- 1. Scene size-up
 - a. Body substance isolation
 - (1) Infectious waste issues in the home care environment
 - b. Scene safety
 - (1) Pets
 - (2) Firearms and other home protection devices
 - (3) Home hazards
 - c. Milieu
 - (1) Ability to maintain a healthy environment
 - (2) Adequate nutritional support available
 - (3) Adequate basic needs (heat, electricity, etc.)
 - 2. Initial assessment
 - 3. Focused history and physical examination
 - a. Critical findings
 - (1) Rapid assessment and transport
 - (2) Detailed assessment
 - (3) On-going assessment
 - b. Non-critical findings
 - (1) Focused history and physical examination
 - (a) Medication interactions in home care
 - (b) Using the available home health history
 - (c) Accessing the home health history
 - (d) Compliance issues
 - (e) Assessing dementia
 - (2) Other intervention and transport considerations
 - (a) Notification of family or caretakers

- (b) Securing the home
 - 4. On-going assessment
 - 5. Comprehensive assessment
 - a. Inspection
 - b. Palpation
 - c. Auscultation
 - 6. Differential diagnosis and continued management
 - B. Management/ treatment plan
 - 1. Replacing home health treatment modalities with ALS modalities
 - a. Airway and ventilatory support
 - b. Circulatory support
 - c. Pharmacological intervention
 - d. Non-pharmacologic interventions
 - e. Transport considerations
 - (1) Home care follow-up
 - (2) Referral to other public service agencies
 - (3) Notification of family medical doctor or home health agencies
- III. Specific acute home health situations
 - A. Inadequate respiratory support
 - 1. Supportive statistics
 - a. Home oxygen
 - b. COPD patients
 - c. Home ventilation patients
 - 2. Review of specific anatomy and physiology
 - a. Respiratory anatomy and physiology as it relates to
 - (1) CPAP
 - (2) Positive pressure ventilation
 - 3. Review pathophysiology
 - a. Increased risk of airway infections in the respiratory compromised patient
 - b. Progression of chronic respiratory diseases
 - c. Chronic pathologies requiring home respiratory support
 - (1) COPD
 - (2) Bronchopulmonary dysplasia
 - (3) Patients awaiting lung transplant
 - (4) Cystic fibrosis
 - (5) Sleep apnea
 - d. Increased respiratory demand making current support inadequate
 - (1) Respiratory infections
 - (2) Other factors affecting respiratory demand
 - e. Increased secretions
 - f. Obstructed or malfunctioning airway devices
 - g. Improper application of medical device
 - 4. Medical therapy found in the home setting
 - a. Home oxygen therapy
 - (1) Oxygen concentrators

- (2) Oxygen in cylinders
 - (3) Liquid oxygen systems
 - b. CPAP
 - (1) Mask CPAP
 - (2) Nasal CPAP
 - (3) BiPAP
 - c. Artificial airways
 - (1) Tracheotomies
 - d. Home ventilation
 - (1) Volume ventilators
 - (2) Pressure ventilators
 - (3) Negative pressure ventilation devices (poncho ventilators)
 - 5. Assessment findings
 - a. Work of breathing
 - b. Tidal volume
 - c. Peak flow
 - d. Oxygen saturation
 - e. Breath sounds
 - 6. Management
 - a. Improving airway patency
 - (1) Repositioning airway devices
 - (2) Removing secretions from airway devices
 - (3) Replacing a home airway device with an ALS device
 - (a) ET tube replacing trach tube
 - b. Improving ventilation
 - (1) Removing from a home care device and using positive pressure ventilation
 - (2) Adjusting home care devices fit or settings to improve ventilations
 - c. Improving oxygenation
 - (1) Replacing oxygen delivery devices
 - (2) Changing the flow rate of oxygen delivery devices
 - d. Transport considerations
 - e. Psychological support/ communication strategies
 - (1) Communication with the intubated patient
 - (2) Communication using a "talking trach"
- B. Acute cardiovascular and vascular access
 - 1. Epidemiology
 - a. Supportive statistics
 - (1) Types and numbers of central venous access devices found in the home
 - (2) Types and numbers of dialysis patients found in the home
 - 2. Review of specific anatomy and physiology
 - a. Cardiovascular anatomy and physiology as it relates to
 - (1) Central venous access
 - (2) Dialysis shunts
 - (3) Peripheral circulation
 - (4) Cardiovascular decompensation

3. Review pathophysiology
 - a. Cardiomyopathy
 - b. Post MI cardiac insufficiency
 - c. Anticoagulation associated with percutaneous or implanted devices
 - d. Embolus formation associated with indwelling devices, stasis and inactivity
 - e. Air embolus associated with central venous access devices
 - f. Obstructed or malfunctioning vascular access devices
 - g. Infected access site
 - h. Obstructed dialysis shunts
 4. Medical therapy found in the home setting
 - a. Vascular access devices
 - (1) Surgically implanted medication delivery devices (Mediports, etc.)
 - (2) Peripheral vascular access devices (PICC, Intracath, etc.)
 - (3) Central vascular access devices (Hickman, Groshon, etc.)
 - b. Dialysis shunts
 - c. Hemodynamic support
 - d. Anticoagulant therapy
 5. Assessment findings
 - a. Infection
 - b. Hemodynamic compromise
 - c. Hemorrhage
 - d. Embolus
 - (1) Air
 - (2) Thrombus
 - (3) Plastic or catheter tip
 - e. Stable versus unstable angina
- C. GI/ GU crisis
1. Epidemiology
 - a. Supportive statistics referencing numbers of devices in the out-of-hospital setting
 - (1) Urinary catheters or urostomies
 - (2) Benign prostetic hypertrophy
 - (3) Indwelling nutritional support device (peg tube, G-tube)
 - (4) Colostomies
 - (5) NG tubes
 2. Review of specific anatomy and physiology
 - a. GI/ GU anatomy and physiology as it relates to
 - (1) Urinary tract infections and urosepsis
 - (2) Bowel obstruction
 - (3) Aspiration of gastric contents
 3. Review pathophysiology
 - a. Urosepsis
 - b. Urinary retention
 - c. Aspiration of gastric contents secondary to
 - (1) Non-patent gastric tube
 - (2) Improper nutritional support via feeding tube
 - (3) Patient positioning with the above devices

- d. Bowel obstruction in the patient with gastric devices
- e. Obstructed or malfunctioning gastric devices
- 4. Medical therapy found in the home setting
 - a. Urinary tract
 - (1) External urinary catheters
 - (2) Indwelling urinary catheters
 - (3) Suprapubic catheters
 - (4) Urostomy
 - b. Gastric emptying or feeding
 - (1) NG tubes
 - (2) Feeding tubes
 - (3) Peg tubes, J tubes, etc.
 - (4) Colostomy
- 5. Assessment findings
 - a. Abdominal pain
 - b. Distention
 - c. Bowel sounds
 - d. Palpation of bladder
 - e. Color/ character/ amount of urine
- 6. Management
 - a. Aspiration
 - b. Urinary retention
 - (1) Hypotension
 - (2) Catheterization
 - c. Bowel obstruction
 - d. Dysfunctional device
 - e. Transport considerations
 - (1) Positioning
 - (2) Positioning of devices for proper drainage and prevention of reflux
- D. Acute infections
 - 1. Epidemiology
 - a. Supportive statistics
 - (1) Mortality rates from sepsis and severe peripheral infections
 - (2) Increased rate of infections in the elderly, chronically ill and homebound
 - (3) Decreased ability to perceive pain or perform self-care in many homebound populations
 - 2. Review of specific anatomy and physiology
 - a. Immune system
 - b. Normal wound healing
 - 3. Review pathophysiology
 - a. Increased risk of airway infections in the immunocompromised patient
 - b. Poor peripheral perfusion results in decreased healing and increased peripheral infections
 - c. Sedentary existence leads to skin breakdown and peripheral infections
 - d. Percutaneous and implanted medical devices increase risk for infections and sepsis

- e. Patients discharged to home with open wounds and incisions
- f. Chronic diseases may further impair healing
- g. Poor nutrition, hygiene or ability to care for self impact infection rates
- h. Abscesses
- i. Cellulitis
- 4. Medical therapy found in the home setting
 - a. Open wounds
 - (1) Dressings
 - (2) Wound packing
 - (3) Drainage
 - b. Drains found in wounds
 - (1) Penrose drains
 - (2) Jackson-Pratt drains
 - (3) Others
 - c. Wound closure techniques
 - (1) Sutures
 - (2) Wires
 - (3) Staples
 - (4) Others
- 5. Assessment findings
 - a. Signs of healthy wound healing
 - b. Signs of superficial infections
 - c. Signs of major infections
 - d. Signs of sepsis
- 6. Management
 - a. Sterile dressing (redressing) after wound evaluation
 - b. Transport considerations
 - c. Psychological support/ communication strategies
- E. Maternal/ child
 - 1. Epidemiology
 - a. Supportive statistics
 - (1) Birth rates and average length of hospitalization
 - (2) Rates for post partum bleeding
 - (3) Rates for infant septicemia
 - 2. Review of specific anatomy and physiology
 - a. Childbirth and post partum changes
 - b. Newborn pathophysiology as it relates to
 - (1) Thermoregulation
 - (2) Respiratory drive
 - (3) Immune response
 - 3. Review pathophysiology
 - a. Infantile apnea
 - (1) Review apnea monitoring
 - b. Septicemia in the newborn
 - c. Other newborn pathophysiologies
 - d. Post partum hemorrhage

- e. Post partum depression
- f. Other post partum pathophysiologies
 - (1) Sepsis
 - (2) Pulmonary embolus
- 4. Assessment findings
 - a. Signs of sepsis
 - b. Failure to thrive
 - c. The well-baby exam
 - d. Post partum assessment
- 5. Management
 - a. Transport considerations
 - b. Psychological support/ communication strategies
- F. Hospice/ comfort care
 - 1. Epidemiology
 - a. Supportive statistics
 - (1) Hospice care statistics
 - 2. Review of specific terms
 - a. Palliative care
 - b. Comfort care
 - c. Hospice care
 - d. DNR/ DNAR
 - e. Durable power of attorney
 - 3. Review material
 - a. The grief response
 - b. Local DNR or related legislation
 - c. Medical direction considerations
 - 4. Medical therapy found in the home setting
 - a. Pain control in the terminal patient
 - (1) Therapy for overmedication
 - 5. Management
 - a. Transport considerations
 - b. Psychological support/ communication strategies

UNIT TERMINAL OBJECTIVE

7-1 At the completion of this unit, the paramedic student will be able to integrate the principles of assessment based management to perform an appropriate assessment and implement the management plan for patients with common complaints.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 7-1.1 Explain how effective assessment is critical to clinical decision making. (C-1)
- 7-1.2 Explain how the paramedic's attitude affects assessment and decision making. (C-1)
- 7-1.3 Explain how uncooperative patients affect assessment and decision making. (C-1)
- 7-1.4 Explain strategies to prevent labeling and tunnel vision. (C-1)
- 7-1.5 Develop strategies to decrease environmental distractions. (C-1)
- 7-1.6 Describe how manpower considerations and staffing configurations affect assessment and decision making. (C-1)
- 7-1.7 Synthesize concepts of scene management and choreography to simulated emergency calls. (C-3)
- 7-1.8 Explain the roles of the team leader and the patient care person. (C-1)
- 7-1.9 List and explain the rationale for carrying the essential patient care items. (C-3)
- 7-1.10 When given a simulated call, list the appropriate equipment to be taken to the patient. (C-2)
- 7-1.11 Explain the general approach to the emergency patient. (C-1)
- 7-1.12 Explain the general approach, patient assessment, differentials, and management priorities for patients with the following problems: (C-3)
 - a. Chest pain
 - b. Medical and traumatic cardiac arrest
 - c. Acute abdominal pain
 - d. GI bleed
 - e. Altered mental status
 - f. Dyspnea
 - g. Syncope
 - h. Seizures
 - i. Environmental or thermal problem
 - j. Hazardous material or toxic exposure
 - k. Trauma or multi trauma patients
 - l. Allergic reactions
 - m. Behavioral problems
 - n. Obstetric or gynecological problems
 - o. Pediatric patients
- 7-1.13 Describe how to effectively communicate patient information face to face, over the telephone, by radio, and in writing. (C-1)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 7-1.14 Appreciate the use of scenarios to develop high level clinical decision making skills. (A-2)
- 7-1.15 Defend the importance of considering differentials in patient care. (A-3)
- 7-1.16 Advocate and practice the process of complete patient assessment on all patients. (A-3)

7-1.17 Value the importance of presenting the patient accurately and clearly. (A-2)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 7-1.18 While serving as team leader, choreograph the EMS response team, perform a patient assessment, provide local/ regionally appropriate treatment, present cases verbally and in writing given a moulaged and programed simulated patient. (P-3)
- 7-1.19 While serving as team leader, assess a programmed patient or mannequin, consider differentials, make decisions relative to interventions and transportation, provide the interventions, patient packaging and transportation, work as a team and practice various roles for the following common emergencies: (P-3)
- a. Chest pain
 - b. Cardiac Arrest
 - 1. Traumatic arrest
 - 2. Medical arrest
 - c. Acute abdominal pain
 - d. GI bleed
 - e. Altered mental status
 - f. Dyspnea
 - g. Syncope
 - h. Seizure
 - i. Thermal/ environmental problem
 - j. Hazardous materials/ toxicology
 - k. Trauma
 - 1. Isolated extremity fracture (tibia/ fibula or radius/ ulna)
 - 2. Femur fracture
 - 3. Shoulder dislocation
 - 4. Clavicular fracture or A-C separation
 - 5. Minor wound (no sutures required, sutures required, high risk wounds, with tendon and/ or nerve injury)
 - 6. Spine injury (no neurologic deficit, with neurologic deficit)
 - 7. Multiple trauma-blunt
 - 8. Penetrating trauma
 - 9. Impaled object
 - 10. Elderly fall
 - 11. Athletic injury
 - 12. Head injury (concussion, subdural/ epidural)
 - l. Allergic reactions/ bites/ envenomation
 - 1. Local allergic reaction
 - 2. Systemic allergic reaction
 - 3. Envenomation
 - m. Behavioral
 - 1. Mood disorders
 - 2. Schizophrenic and delusional disorders
 - 3. Suicidal
 - n. Obstetrics/ gynecology

- 1. Vaginal bleeding
- 2. Childbirth (normal and abnormal)
- o. Pediatric
 - 1. Respiratory distress
 - 2. Fever
 - 3. Seizures

DECLARATIVE

- I. Effective Assessment
 - A. Assessment is the foundation of care
 - 1. Can't treat or report anything that isn't found
 - 2. Must gather, evaluate and synthesize the information
 - 3. Make the right decisions
 - 4. Take appropriate action
 - B. Accurate information is critical to decision making
 - 1. The history
 - a. Often 80% of a medical diagnosis is based on history
 - b. Knowledge of disease and suspicion affect quality of the history acquired
 - c. Is focused toward the complaint and associated problems
 - 2. The physical examination
 - a. Often overlooked or done in a cursory manner
 - b. Effectiveness compromised by some field situations
 - c. Focused toward systems associated with complaint
 - 3. Pattern recognition
 - a. Gathered information compared to knowledge base
 - b. Pattern is or isn't recognized
 - c. Greater the knowledge base and assessment information, better the chances of accurate assessment and decisions
 - 4. Assessment/ field impression
 - a. Field impression
 - (1) Pattern recognition
 - (2) Gut instinct based on experience
 - b. Formulation of plan of action
 - (1) Patients condition
 - (2) The environment
 - 5. BLS/ ALS treatment driven by
 - a. Protocols
 - (1) Must have right impression to know which one to use
 - b. Judgment
 - (1) Know when and how to apply protocols
 - (2) Know when to deviate from protocols
 - C. Factors affecting assessment and decision making
 - 1. Paramedic attitude - need to be non-judgmental
 - a. May "short circuit" information gathering
 - b. Lead to insufficient information to recognize patterns
 - c. GIGO = garbage in - garbage out
 - d. Patients depend on us for medical assessment/ management not determination of social standing or "likability"
 - 2. Uncooperative patients
 - a. Perception of intoxication
 - b. In all uncooperative, restless, belligerent patients consider the following as possible causes

- (1) Hypoxia
 - (2) Hypovolemia
 - (3) Hypoglycemia
 - (4) Head injury/ concussion
 3. Obvious but distracting injuries
 - a. Can divert attention from more serious problems
 4. Tunnel vision/ labeling
 - a. "Labels" applied by responders sometimes set an inappropriate tone, distract and cause biased assessment
 - (1) "Just another drunk"
 - (2) "Frequent flyer"
 - (3) Etc.
 - b. Tunnel vision causes distraction
 - (1) Locking on, making a field impression too early
 - (2) "Gut instinct" sometimes causes a rush to judgment too early
 5. The environment
 - a. Scene chaos
 - b. Violent/ dangerous situations
 - c. Crowds of bystanders
 - d. Crowds of responders
 - e. Noise levels
 6. Patient compliance
 - a. Patient confidence in rescuers
 - b. Cultural and ethnic barriers
 7. Manpower considerations
 - a. Single paramedic
 - (1) Sequential information gathering
 - (2) Sequential treatment
 - b. Two paramedics
 - (1) Simultaneous information gathering
 - (2) Simultaneous treatment
 - c. Multiple responders
 - (1) History by "committee"
 - (a) Disorganized acquisition of history
- D. Assessment/ management choreography
 1. Number of responders often makes coherent assessment challenging
 - a. Multiple tier responders
 - b. Too many people attempting to acquire history
 - c. Worse if responders at same level without clear direction
 2. Members of the team need to have a preplan for determining roles
 - a. Predesignated roles assigned to team members
 - b. Roles should be rotated among team members
 - c. Paramedics working alone must assume all ALS roles
 - d. Multiple paramedics need to have a plan
 3. One example is a 2 paramedic preplan with "team leader" and "patient care" paramedic designated

- a. Plan is not cast in concrete as field situations are dynamic
 - b. Regular partners may develop their "own plan" and flow
 - (1) Having a universally understood plan allows for others to participate
 - c. Having a some basic "game plan" is important to prevent chaos
 - 4. Team leader
 - a. Usually who ever will accompany patient thru to definitive care
 - b. Establishes contact and a dialogue with the patient
 - c. Obtains the history
 - d. Performs the physical examination
 - e. Presents the patient, gives verbal report over the radio or at definitive care
 - f. Does the documentation
 - g. Tries to maintain the overall patient perspective and
 - (1) Designating tasks
 - (2) Coordinating transportation
 - h. During resuscitative phase of initial assessment designates and actively participates in critical interventions
 - i. Multiple casualty situations acts as initial EMS command
 - j. During ACLS
 - (1) Reads ECG
 - (2) Talks on radio and gives drug orders
 - (3) Controls the drug box
 - (4) Keeps notes on drug administrations/ effects
 - 5. Patient care person(s)
 - a. Provides scene cover (watches the team leader's back)
 - b. Gathers scene information, talks to relatives, bystanders etc.
 - c. Obtains vital signs
 - d. Performs skills, interventions as requested by team leader
 - (1) Attach monitoring leads
 - (2) Oxygen administration
 - (3) Venous access
 - (4) Medication administration
 - (a) Obtains transportation equipment
 - e. Multiple casualty situations acts as triage group leader
 - f. During ACLS
 - (1) Administers drugs
 - (2) Monitors tube placement
 - (3) Monitors BCLS
- II. The right "stuff"
- A. The right stuff means carrying the right equipment to the patient's side
 - 1. Paramedics need to be prepared for the worst
 - 2. For some patients, assessment and management is simultaneous
 - 3. Not having the right equipment compromises care and causes pandemonium
 - B. Having the right stuff is like backpacking
 - 1. Have the essential items
 - 2. Downsized to facilitate rapid movement

- 3. Minimum weight and bulk
- C. Essential equipment carried to every patient
 - 1. Paramedic management of the ABCDE
 - 2. Cardiac monitoring and defibrillation
- D. Essential items
 - 1. Airway control
 - a. Oral airways
 - b. Nasal airways
 - c. Suction (electric or manual)
 - d. Rigid Yankauer and flexible suction catheters
 - e. Laryngoscope and blades
 - f. Endotracheal tubes, stylettes, syringes, tape
 - 2. Breathing
 - a. Mouth powered ventilation devices (pocket mask)
 - b. Manual ventilation bag-valve-mask
 - c. Spare masks
 - d. Oxygen tank and regulator
 - e. Oxygen masks, cannulas and extension tubing
 - f. Occlusive dressings
 - g. Large bore IV catheter for thoracic decompression
 - 3. Circulation
 - a. Dressings
 - b. Bandages and tape
 - c. Infection control supplies-gloves, eye shields
 - d. Sphygmomanometer, stethoscope
 - e. Note pad and pen or pencil
 - 4. Disability and Dysrhythmia
 - a. Rigid collars
 - b. Flashlight
 - c. Cardiac monitor/ defibrillator
 - 5. Exposure
 - a. Scissors
 - b. Space blanket or something to cover the patient
 - 6. Note pad and pen or pencil
 - 7. The essential items need to be brought to every patient
- E. Optional "take in" equipment
 - 1. Drug therapy and venous access supplies need to be portable too
 - a. May not need to go in for every patient contact
 - b. How supplies are carried often depends on how the system is designed
 - (1) Paramedic ambulances
 - (2) Paramedics in non-transporting vehicles
 - 2. What is carried to the patient depends on local protocols
 - a. Standing order flexibility
 - b. Number of paramedic responders
 - c. Difficulty in accessing patients
 - 3. Venous access is required to administer most emergency drugs

- a. Venous access supplies should be carried with drug box
 - b. Drug box should contain drugs allowed in the formulary
- III. General approach to the patient
- A. Calm orderly demeanor is essential
 - 1. Look the part
 - 2. Act the part
 - 3. "Bedside" manner is important
 - 4. Patients may not be able to rate medical performance
 - a. They can rate people skills and service
 - B. Have a "preplan" to prevent confusion and improve accuracy of the assessment
 - 1. One team member does the talking to the patient
 - a. Active concerned dialogue
 - b. Listen
 - 2. Take notes when acquiring the history
 - a. Helps prevent asking the same question repeatedly
 - C. Carry in all of the essential equipment
 - 1. Ready to provide resuscitative care
 - 2. Minimizes pandemonium
 - D. Use the initial scene size-up to gather clues and help formulate an impression
 - 1. Especially useful in trauma situations
 - a. Hazards
 - b. MOI
 - c. Number of patients
 - 2. Avoid tunnel vision
 - E. The initial assessment sets the tone for the patient encounter
 - 1. Resuscitative approach
 - a. Immediate intervention is necessary
 - b. Patient has a life threatening problem such as
 - (1) Cardiac/ respiratory arrest
 - (2) Respiratory distress/ failure
 - (3) Unstable dysrhythmias
 - (4) Seizures
 - (5) Coma/ altered mental status
 - (6) Shock/ hypotension
 - (7) Major trauma
 - (8) Possible "C" spine injury
 - c. Begin to take resuscitative action
 - (1) Acquire more history and details post immediate resuscitation
 - 2. Contemplative approach
 - a. Immediate intervention not necessary
 - b. Generally history and physical; then interventions if required
 - 3. Immediate evacuation to the ambulance may be required if
 - a. Patient needs lifesaving interventions that can't be provided by the paramedic
 - b. Scene is too unstable/ or unsafe
 - c. Scene is too chaotic to allow for rational assessment

- F. To find something, one must suspect it
 - 1. During initial assessment one must actively look for life-threatening problems
 - 2. Must be systematic
 - 3. Rapidly determine the chief complaint
 - 4. Assess the degree of distress
 - 5. Obtain baseline vital signs early
 - 6. Focused on the relevant history and physical findings
 - G. The greater the knowledge about what is being looked for the more productive the line of questioning will be
 - H. Experience assists in developing the ability of "multi-tasking" or being able to ask questions and do something while listening to the answer
 - 1. Until experienced, ask questions and just listen
 - 2. Have partner perform necessary tasks
 - 3. Important clues are lost by not listening
 - I. The patient's ability to describe symptoms and paramedic's ability to listen has a great effect on the assessment
 - 1. Pain severity does not correlate well with life-threat potential
 - 2. Location of pain and it's source also do not always correlate well; especially if it is visceral
 - J. Paramedics role is to rapidly assess and treat for the worst case scenario
- IV. Presenting the patient
- A. Effective communication and transfer of patient information is vital to both out-of-hospital and hospital care
 - 1. Patient presentation is often a weak link in care in spite of the frequency of use
 - 2. Paramedics may actually use BLS/ ALS interventions on few patients, but patient presentation and information exchange occurs with every patient encounter
 - 3. Presentation will routinely be done
 - a. Face to face
 - b. Over the telephone
 - c. Over the radio
 - d. In writing
 - B. Effective presentation and communications skills are essential to establish trust and credibility
 - 1. Good assessment and presentation go hand in hand
 - a. Can't report anything that isn't found
 - b. Can't treat things that are not found
 - 2. Good presentations suggest effective patient assessment and care
 - a. Poor presentation, suggests poor assessment and care to the listener
 - 3. Other health care providers are disinterested in listening to rambling, disjointed presentations covering inconsequential information while omitting vital information
 - a. Most health care providers are used to listening to either the SOAP format or some close variation of it
 - C. Poor presentation can also compromise patient care
 - 1. As physician extenders, paramedics must contact supervising physicians for orders at some level
 - 2. Patient's needs and status must be communicated effectively
 - D. Effective presentations

1. Are very concise, usually lasting less than one minute
 2. Are usually free of extensive medical jargon
 3. Follow the same basic information pattern
 4. Generally follow the SOAP format or some close variation of it
 5. Includes pertinent findings and pertinent negatives
 - a. Expected findings that are absent (ie. a patient with dyspnea who's chest is clear to auscultation)
- E. Start with the end in mind; know what discrete areas of information will be asked for and be sure to acquire the right information
1. Until experienced and the format is committed to memory, use a pre-printed card or sheet to organize information and take notes during the work-up
 2. Use the form to organize thoughts and assessment findings before making the presentation
 3. With time the flow will become second nature
- F. Discrete areas of an ideal presentation
1. Patient identification, age, sex and degree of distress
 2. Chief complaint
 - a. Why they called
 3. Present illness/ injury
 - a. Pertinent details about the present problem
 - b. Pertinent negatives
 4. Past medical history
 - a. Allergies, medications and pertinent medical history
 5. Physical findings
 - a. Vital signs
 - b. Pertinent positive findings
 - c. Pertinent negative findings
 6. Assessment
 - a. Paramedic impression
 7. Plan
 - a. What has been done
 - b. Orders requested
- G. The key to developing proficiency is repetition and understanding the format
1. Use a small pre-printed form; eventually you will depend on the form less and less
 2. Practice presenting on simulated and real patients
 3. Listen to other's radio reports
- V. Review of common complaints
- A. In order to develop as an entry level practitioner at the paramedic level, scenario based practice and review needs to be conducted for complaints commonly encountered in the field
- B. The goal of practice sessions should be to
1. Choreograph the EMS response team
 2. Practice assessment and decision making on cases they are likely to be encountered out-of-hospital
 3. Provide interventions based on their assessment and modalities in local/ regional treatment protocols

4. Practice presenting cases verbally and in writing
- C. Laboratory based simulations should require the paramedic student to
 1. Assess a programmed patient or mannequin
 2. Make decisions relative to interventions and transportation
 3. Provide the interventions, patient packaging and transportation
 4. Work as a team and practice various roles
- D. Simulations should include the following patient presentations
 1. Chest pain
 - a. Scenarios
 - (1) Stable with no dysrhythmias
 - (2) Stable bradycardia
 - (3) Unstable bradycardia (hypotension/ chest pain)
 - (4) Stable supraventricular tachycardia
 - (5) Unstable supraventricular tachycardia
 - (6) Stable ventricular tachycardia
 - (7) Unstable ventricular tachycardia
 - (8) Ventricular ectopy
 - (9) Cardiogenic shock/ hypotension
 - b. Must demonstrate the ability to identify/ differentiate between
 - (1) AMI
 - (2) Unstable angina
 - (3) Aortic aneurism
 - (4) Pulmonary embolism
 - (5) Pneumothorax
 - (6) Esophageal rupture
 2. Cardiac arrest
 - a. Scenarios
 - (1) Trauma arrest
 - (2) Medical arrest
 - (3) Ventricular fibrillation
 - (4) Ventricular tachycardia
 - (5) Asystole
 - (6) Pulseless electrical activity
 - (7) Termination of resuscitation
 - (8) No resuscitation indicated
 - b. Must demonstrate the ability to identify/ differentiate between
 - (1) Blunt trauma with tension pneumothorax
 - (2) Electrocution
 - (3) Drowning
 - (4) Hypothermia
 3. Abdominal pain
 - a. Scenarios
 - (1) Acute abdominal pain
 - (2) Chronic abdominal pain
 - b. Must demonstrate the ability to identify/ differentiate between
 - (1) Acute myocardial infarction

- (2) Aortic aneurism
 - (3) Renal colic
 - (4) Ruptured ectopic pregnancy
 - (5) Cholecystitis
 - (6) Appendicitis
 - (7) Hernia/ intestinal obstruction
4. GI Bleeding
- a. Must demonstrate the ability to identify/ differentiate between
 - (1) Upper GI bleeding
 - (2) Lower GI bleeding
5. Altered mental status
- a. Must demonstrate the ability to identify/ differentiate between
 - (1) Alcohol overdose
 - (2) Drug ingestion/ overdose
 - (3) Idiopathic seizure disorder
 - (4) Hypoglycemia
 - (5) Hyperglycemia
 - (6) Stroke
 - (7) Transient ischemic attack
 - (8) Head injury
6. Dyspnea
- a. Must demonstrate the ability to identify/ differentiate between
 - (1) Emphysema/ chronic bronchitis
 - (2) Asthma/ acute bronchospasm
 - (3) Acute pulmonary edema/ left heart failure
 - (4) Acute myocardial infarction
 - (5) Foreign body obstruction
 - (6) Pneumonia
 - (7) Pulmonary embolism
 - (8) Spontaneous pneumothorax
 - (9) Hyperventilation syndrome/ carpo-pedal spasm
 - (10) Smoke/ toxic inhalation
7. Syncope
- a. Must demonstrate the ability to identify/ differentiate between
 - (1) Cardiac related
 - (a) Bradycardia/ heart block
 - (b) Paroxysmal supraventricular tachycardia
 - (c) Ventricular tachycardia
 - (2) Vascular/ volume causes
 - (a) Medication induced
 - (b) Hypovolemia
 - (c) Carotid sinus stimulation
 - (d) Orthostatic
 - (e) Vaso-vagal
 - (3) Metabolic
 - (a) Hypoglycemic

- (4) (b) Hyperventilation
- (4) Neurologic
 - (a) TIA
 - (b) Seizure
- 8. Seizure
 - a. Must demonstrate the ability to differentiate between
 - (1) Idiopathic
 - (2) Fever
 - (3) Neoplasms
 - (4) Infection
 - (5) Metabolic
 - (a) Hypoxia
 - (b) Hypoglycemia
 - (c) Thyrotoxicosis
 - (d) Hypocalcemia
 - (6) Drug intoxication
 - (7) Drug withdrawal
 - (8) Head trauma
 - (9) Eclampsia
 - (10) Cerebral degenerative diseases
- 9. Thermal/ environmental
 - a. Scenarios
 - (1) Hypothermia
 - (2) Hyperthermia
 - (3) Superficial/ deep frostbite
 - (4) Thermal burns
 - (5) Smoke inhalation
 - (6) Near drowning
- 10. Hazardous materials/ toxicology
 - a. Scenarios
 - (1) Accidental toxic ingestion
 - (2) Toxic inhalation
 - (3) Chemical burn/ contact dermatitis
 - (4) Chemicals in the eyes
 - (5) Overdose/ street drugs
- 11. Trauma
 - a. Scenarios
 - (1) Isolated extremity fracture (tibia/ fibula or radius/ ulna)
 - (2) Femur fracture (hip, mid-shaft, supra-condylar)
 - (3) Shoulder dislocation
 - (4) Clavicular fracture or A-C separation
 - (5) Minor wounds
 - (6) Spinal injuries
 - (7) Multiple trauma - blunt
 - (8) Penetrating trauma
 - (9) Impaled object

- (10) Elderly fall
- (11) Athletic injury
- (12) Head injury
- b. Must demonstrate the ability to identify/ differentiate between
 - (1) Minor wound - no sutures required
 - (2) Minor wound - sutures required
 - (3) High risk wounds
 - (4) Wound with tendon and/ or nerve injury
 - (5) Spine injury - no neurologic deficit
 - (6) Spine injury - neurologic deficit
 - (7) Concussion
 - (8) Subdural/ epidural hematoma
- 12. Allergic reactions/ bites/ envenomation
 - a. Scenarios
 - (1) Bee sting
 - (2) Pit viper envenomation
 - (3) Spider/ scorpion
 - (4) Human bite
 - b. Must demonstrate the ability to identify/ differentiate between
 - (1) Local allergic reaction
 - (2) Systemic allergic reaction
- 13. Behavioral
 - a. Scenarios
 - (1) Mood disorders - depression, bi-polar (manic-depression)
 - (2) Schizophrenic and delusional disorders
 - (3) Suicidal
- 14. Obstetrics/ gynecology
 - a. Scenarios
 - (1) Vaginal bleeding
 - (2) Childbirth (normal and abnormal)
 - b. Must demonstrate the ability to identify
 - (1) Ectopic pregnancy
- 15. Pediatric
 - a. Scenarios
 - (1) Respiratory distress/ failure/ arrest
 - (2) Shock
 - (3) Cardiopulmonary failure/ arrest
 - (4) Major trauma
 - (5) Fever
 - (6) Seizures
 - b. Must demonstrate the ability to identify/ differentiate between
 - (1) Respiratory distress/ failure/ arrest
 - (2) Upper airway obstruction/ lower airway disease
 - (3) Cardiogenic/ non-cardiogenic shock
 - (4) Major/ minor trauma

UNIT TERMINAL OBJECTIVE

8-1 At the completion of this unit, the paramedic will understand standards and guidelines that help ensure safe and effective ground and air medical transport.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 8-1.1 Identify current local and state standards which influence ambulance design, equipment requirements and staffing of ambulances. (C-1)
- 8-1.2 Discuss the importance of completing an ambulance equipment/ supply checklist. (C-1)
- 8-1.3 Discuss the factors to be considered when determining ambulance stationing within a community. (C-1)
- 8-1.4 Describe the advantages and disadvantages of air medical transport. (C-1)
- 8-1.5 Identify the conditions/ situations in which air medical transport should be considered. (C-1)

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 8-1.6 Assess personal practices relative to ambulance operations which may affect the safety of the crew, the patient and bystanders. (A-3)
- 8-1.7 Serve as a role model for others relative to the operation of ambulances. (A-3)
- 8-1.8 Value the need to serve as the patient advocate to ensure appropriate patient transportation via ground or air. (A-2)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 8-1.9 Demonstrate how to place a patient in, and remove a patient from, an ambulance. (P-1)

DECLARATIVE

- I. Ambulance operations
 - A. Ambulance standards
 - 1. Influence ambulance design, equipment, and staffing
 - a. State statutes/ administrative rules
 - (1) KKK specifications
 - (2) Air ambulance standards
 - (3) Operational staffing standards
 - (4) Operational driver standards
 - (5) Operational driving standards
 - (6) Operational equipment standards
 - (7) City/ county/ district ordinance standards
 - B. Checking ambulances
 - 1. Completing an ambulance equipment/ supply checklist is important
 - a. Safety
 - b. Patient care
 - c. Risk management issues
 - d. Scheduled medications
 - C. Ambulance stationing
 - 1. Peak load staffing (cyclic patterns)
 - a. Geographical demands
 - b. Standards of reliability
 - c. Patient demand
 - d. Traffic congestion
 - e. Deployment strategies
 - D. Safe ambulance operation
 - 1. Factors in safe driving
 - 2. Using escorts
 - 3. Adverse environmental conditions
 - 4. Use of lights and sirens
 - 5. Proceeding through intersections
 - 6. Parking at an emergency scene
 - 7. Operate with "due regard for the safety of all others"
 - 8. Safely placing a patient in and removing a patient from an ambulance
- II. Utilizing air medical transport
 - A. Types
 - 1. Rotorcraft
 - 2. Fixed wing
 - B. Advantages
 - 1. Specialized care
 - a. Skills, supplies, equipment
 - 2. Rapid transport
 - 3. Access to remote areas
 - 4. Helicopter hospital helipads

- C. Disadvantages
 - 1. Weather/ environmental
 - 2. Altitude limitations
 - 3. Airspeed limitations
 - 4. Aircraft cabin size
 - 5. Terrain
 - 6. Cost
- D. Activation
 - 1. Local and state guidelines exist for air medical activation
 - a. State statutes
 - b. Administrative rules
 - c. City/ county/ district ordinance standards
- E. Indications for patient transport
 - 1. Medical
 - 2. Trauma
 - 3. Search and rescue
- F. Patient transfer
 - 1. Interacting with flight personnel
 - 2. Patient preparation
 - 3. Scene safety
 - a. Securing loose objects
 - b. Approaching the aircraft

UNIT TERMINAL OBJECTIVE

8-2 At the completion of this unit, the paramedic student will be able to integrate the principles of general incident management and multiple casualty incident (MCI) management techniques in order to function effectively at major incidents.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 8-2.1 Explain the need for the incident management system (IMS)/ incident command system (ICS) in managing emergency medical services incidents. (C-1)
- 8-2.2 Define the term multiple casualty incident (MCI). (C-1)
- 8-2.3 Define the term disaster management. (C-1)
- 8-2.4 Describe essential elements of scene size-up when arriving at a potential MCI. (C-1)
- 8-2.5 Describe the role of the paramedics and EMS systems in planning for MCIs and disasters. (C-1)
- 8-2.6 Define the following types of incidents and how they affect medical management: (C-1)
 - a. Open or uncontained incident
 - b. Closed or contained incident
- 8-2.7 Describe the functional components of the incident management system in terms of the following: (C-1)
 - 1. Command
 - 2. Finance
 - 3. Logistics
 - 4. Operations
 - 5. Planning
- 8-2.8 Differentiate between singular and unified command and when each is most applicable. (C-3)
- 8-2.9 Describe the role of command. (C-1)
- 8-2.10 Describe the need for transfer of command and procedures for transferring it. (C-1)
- 8-2.11 Differentiate between command procedures used at small, medium and large scale medical incidents. (C-1)
- 8-2.12 Explain the local/ regional threshold for establishing command and implementation of the incident management system including threshold MCI declaration. (C-1)
- 8-2.13 List and describe the functions of the following groups and leaders in ICS as it pertains to EMS incidents: (C-1)
 - a. Safety
 - b. Logistics
 - c. Rehabilitation (rehab)
 - d. Staging
 - e. Treatment
 - f. Triage
 - g. Transportation
 - h. Extrication/ rescue
 - I Disposition of deceased (morgue)
 - j. Communications
- 8-2.14 Describe the methods and rationale for identifying specific functions and leaders for these

- functions in ICS. (C-1)
- 8-2.15 Describe the role of both command posts and emergency operations centers in MCI and disaster management. (C-1)
- 8-2.16 Describe the role of the physician at multiple casualty incidents. (C-1)
- 8-2.17 Define triage and describe the principles of triage. (C-1)
- 8-2.18 Describe the START (simple triage and rapid treatment) method of initial triage. (C-1)
- 8-2.19 Given a list of 20 patients with various multiple injuries, determine the appropriate triage priority with 90% accuracy. (C-3)
- 8-2.20 Given color coded tags and numerical priorities, assign the following terms to each: (C-1)
- a. Immediate
 - b. Delayed
 - c. Hold
 - d. Deceased
- 8-2.21 Define primary and secondary triage. (C-1)
- 8-2.22 Describe when primary and secondary triage techniques should be implemented. (C-1)
- 8-2.23 Describe the need for and techniques used in tracking patients during multiple casualty incidents. (C-1)
- 8-2.24 Describe techniques used to allocate patients to hospitals and track them. (C-1)
- 8-2.25 Describe modifications of telecommunications procedures during multiple casualty incidents. (C-1)
- 8-2.26 List and describe the essential equipment to provide logistical support to MCI operations to include: (C-1)
- a. Airway, respiratory and hemorrhage control
 - b. Burn management
 - c. Patient packaging/ immobilization
- 8-2.27 List the physical and psychological signs of critical incident stress. (C-1)
- 8-2.28 Describe the role of critical incident stress management sessions in MCIs. (C-1)
- 8-2.29 Describe the role of the following exercises in preparation for MCIs: (C-1)
- a. Table top exercises
 - b. Small and large MCI drills

AFFECTIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 8-2.30 Understand the rationale for initiating incident command even at a small MCI event. (A-1)
- 8-2.31 Explain the rationale for having efficient and effective communications as part of an incident command/ management system. (A-1)
- 8-2.32 Explain why common problems of an MCI can have an adverse effect on an entire incident. (A-1)
- 8-2.33 Explain the organizational benefits for having standard operating procedures (SOPs) for using

the incident management system or incident command system. (A-1)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 8-2.34 Demonstrate the use of local/ regional triage tagging system used for primary and secondary triage. (P-1)
- 8-2.35 Given a simulated tabletop multiple casualty incident, with 5-10 patients: (P-1)
 - a. Establish unified or singular command
 - b. Conduct a scene assessment
 - c. Determine scene objectives
 - d. Formulate an incident plan
 - e. Request appropriate resources
 - f. Determine need for ICS expansion and groups
 - g. Coordinate communications and groups leaders
 - h. Coordinate outside agencies
- 8-2.36 Demonstrate effective initial scene assessment and update (progress) reports. (P-1)
- 8-2.37 Given a classroom simulation of a MCI with 5-10 patients, fulfill the role of triage group leader. (P-3)
- 8-2.38 Given a classroom simulation of a MCI with 5-10 patients, fulfill the role of treatment group leader. (P-3)
- 8-2.39 Given a classroom simulation of a MCI with 5-10 patients, fulfill the role of transportation group leader. (P-3)

DECLARATIVE

- I. Introduction
 - A. Need for incident command system
 - 1. Used at small "everyday" incidents
 - 2. Expands/ contracts as incident evolves
 - 3. Provides a clear system of command/ control
 - 4. Overcomes jurisdictions and geographic boundaries
 - B. The FEMA incident management or command system
 - 1. National standard for incident management
 - 2. Used by public and by private sectors
 - 3. Flexible system
 - 4. Used for routine and large scale emergencies
 - C. Incident command system elements
 - 1. Define span of control
 - 2. Define multiple casualty incident
 - 3. Define incident management system (IMS)/ incident command system (ICS)

4. Define disaster management
 5. Uniform terminology
 6. Geographic and functional components
 7. Define an open or uncontained incident
 8. Define a closed or contained incident
 9. Major functional areas are C-FLOP
 - a. C command
 - b. F finance
 - c. L logistics
 - d. O operations
 - e. P planning
 10. Discuss importance of communications
 11. Define triage
 12. Define transfer of command
 13. Define sectorization
 14. Discuss benefits of using standard operating procedures (SOPs) for ICS
 15. Identify laws or regulations that relate to the incident command system
- D. Need for preplanning
1. Periodic review of plan and updating as needed
 2. Participation in local/ regional planning
- E. Drills and critiques
1. Need to practice the plan
 - a. Drills
 - b. Table top exercises
 2. Critiques
 - a. Drills and exercises
 - b. Actual MCIs and incidents where IMS or ICS model is used

II. Basic elements of the incident command system (C-FLOP)

- A. Command
1. Responsible for all functions unless delegated
 - a. Oversees incident needs
 - b. Establishes objectives/ priorities
 - c. Develops action plan
 - d. Coordinates with other agencies/ officials
 - e. Identifies appropriate command structure for operation size
 - f. Approves, orders and releases resources
 2. Established at all incidents
 - a. Identify appropriate command structure for size of incident
 3. Singular command

- a. Single commander responsible for entire operation
 - b. Works well for incidents with limited jurisdictions or responsibilities
 - c. Ideal for short duration limited incidents
 - d. Unrealistic in many localities
 - (1) Overlapping responsibilities
 - (2) Overlapping jurisdictions
 - (3) Incident evolution
4. Unified command
- a. EMS-police-fire command personnel unify
 - b. As incident evolves, right agency leads at the right time
 - c. Identification and accessing appropriate agency(ies) or specialized organization, as needed, to complement command (e.g. health department, public works, building department, American Red Cross, Salvation Army, etc.)
 - d. Stimulates cooperation
 - e. Provides for balanced decision making
 - f. Selection of sector leaders and functions
 - g. "Span of control" (supervisor/ worker ratio)
 - (1) 1 to 6 ratio
 - (2) Maintaining unity/ command structure
 - h. Determines need for public information officer and liaison with media
- B. Finance
- 1. Accounting and administration of the incident
 - 2. Staff support function
 - a. Monitors costs, provides for careful accounting
 - b. Seldom used on small scale incidents
 - c. Essential as incident grows in magnitude and costs
 - d. Not a component used in routine daily incidents
 - e. Finance section responsible for
 - (1) Time accounting
 - (2) Procurement
 - (3) Paying claims
 - (4) Estimating costs
- C. Logistics
- 1. Procurement and stockpiling of equipment and supplies
 - 2. Staff support function
 - a. Support the logistical needs of the incident
 - b. Logistics appropriate to incident size/ duration
 - c. Seldom used at routine daily incidents
 - d. Logistics section responsible for

- (1) Supplies/ equipment
 - (2) Facilities
 - (3) Food
 - (4) Communications support
 - (5) Medical support for workers
 - D. Operations
 - 1. Carries out the action functions and commands direction
 - 2. Line or actual operational responsibility
 - 3. Major functional area in all operations
 - a. Carries out tactical objectives
 - b. Directs the front end activities
 - c. Participates in planning
 - d. Modifies action plan
 - e. Maintains discipline
 - f. Accounts for personnel
 - 4. EMS operation areas fall under this section
 - E. Planning
 - 1. Staff function to provide past, present and future information about the incident
 - 2. Resource and situation status on a real time basis
- III. Role and functions of command in managing major medical incidents
 - A. Establishing command
 - 1. Local threshold as to when command is established
 - 2. Low threshold encourages frequent practice (> 2 patients)
 - 3. Identify which group/ sector functions or major functional areas need to be implemented for the size and scope of incident
 - 4. Unification of EMS command with fire and police
 - 5. Tactical worksheet used to focus command on SOP
 - 6. Bib or other ID to easily identify command
 - 7. Assumption of a command position and arrival report
 - B. Scene assessment
 - 1. First unit on the scene should make a quick and rapid assessment of the situation
 - a. Windshield assessment
 - b. What is observed as you enter the area (incident scene)
 - 2. Precise and complete assessment should be done as soon as safety and time permit
 - a. Type of incident and potential duration
 - b. Entrapment or special rescue resources needed
 - c. Number of patients in each triage category
 - d. Additional resources needed

3. Continually updated scene assessment
- C. Communications
 1. Command established over radio with communication center/ emergency operations center (EOC)
 2. Radio traffic can be very distracting
 3. In larger incidents communications aide is used
- D. Obtaining resources
 1. Additional units requested according to the situation
 2. Communications center should have written SOP on mutual aid
 3. Assignment of units consistent with the situation
 4. Additional support services requested as needed for victims, for food, shelter and clothing
- E. Strategic deployment of resources
 1. Command issues instructions as to deployment
 2. Personnel stay with vehicle until given instructions
 3. Staging slows resource deployment and premature commitment
 4. Staging techniques
 - a. Lining vehicles up at scene to facilitate egress
 - b. Staging off of the limited access highway
 - c. Formal staging area with staging officer assigned
 5. Resources deployed more effectively
- F. Strategic development of resources
 1. "Tool box" theory
 - a. Identification of resources ("tools") specific to an incident, utilizing only needed resources
 - b. Issue instruction for deployment of resources
- G. Transferring command
 1. Procedures established for transferring command
 2. Command remains in that position until relieved according to SOP
 3. Limitation of transferring command
- H. Terminating command
 1. Procedures established for de-escalation and relief of units
 2. Procedures for terminating command and the ICS structure
- I. Command procedures at various size events
 1. Small
 2. Medium
 3. Large
- J. Common problems at a multiple casualty incident
 1. Failure to adequately provide widespread notification of the event
 2. Lack of rapid "initial" stabilization of all patients

3. Failure to move, collect and to organize patients rapidly at a treatment area
4. Failure to provide proper triage
5. Overly time consuming care employed
6. Premature transportation of patients
7. Improper use of personnel in field
8. Lack of proper distribution of patients to medical facilities
9. Lack of recognizable EMS command in the field
10. Lack of proper preplanning and lack of adequate training of all personnel
[Alex M. Butman, "Responding to the MCI: A Guide for EMS Personnel", © 1982]

IV. Group or sector functions

- A. Safety officer
 1. Staff role to monitor safety of workers at incident
 2. Authority to stop unsafe procedures or institute safety procedures
 3. Necessary at large scale incidents
- B. Logistics
 1. Provides essential equipment and medical supplies
 2. Generally established and pre-positioned during the pre-MCI/ planning phase
 3. Supports the operational needs of the incident
- C. Rehabilitation
 1. Locates and sets up the rehabilitation area
 2. Rehabilitation area set up
 - a. In safe area with thermal control
 - b. Away from exhaust fumes and crowds
 3. Monitors personnel and assures proper rest and hydration
 4. Work with logistics to assure proper hydration and personnel monitoring supplies
- D. Staging
 1. Locates and sets up sufficient area to stage equipment/ personnel
 - a. Lining vehicles up to facilitate egress
 2. Formal staging area with staging officer assigned
 3. Assures apparatus is parked to allow egress when deployed
 4. Confers with command about additional resources needed
 5. Releases resources for deployment when ordered by command
 6. Ensures personnel stay with vehicle until deployed
 7. Supervises personnel within sector
 8. Tracks unit arrival and deployment from staging
 9. Prevents premature commitment of resources
- E. Treatment
 1. Locates and sets up the treatment area according to the situation

2. Generally away from immediate action area
 3. Provides for treatment areas for priority 1,2,3 patients
 4. Provides for secondary triage of patients as they arrive in treatment
 5. Assures patients receive adequate care in each sub-area
 6. Communicates/ coordinates with command, triage and transportation
 7. Moves patients to transportation appropriately
 8. Supervises personnel within the group
- F. Triage
1. Works at the incident or action site
 2. Assures initial primary triage is conducted to minimize re-triage
 3. Determines site treatment needs and assures initial triage/ treatment
 4. Organizes resources to deliver patients to the treatment area
 5. Responsible for supervising safety and treatment of entrapped patients
- G. Transportation
1. Establishes ambulance staging and landing zones if necessary
 2. Determines availability of receiving facilities and treatment capabilities
 3. Coordinates transportation and distribution of patients to appropriate receiving facilities
 4. Tracks patients leaving the site and maintains tracking log with
 - a. Patient ID
 - b. Unit transporting
 - c. Destination facility
- H. Extrication/ rescue
1. Determines type of equipment and resources needed
 2. Identifies the need for specialized equipment and personnel with unique expertise
 3. Assures special safety equipment is available to all personnel (e.g. SCBA, protective clothing, etc.)
 4. Supervises personnel within group
 5. Ensures that support materials (e.g. gasoline, electricity, compressed air, etc.) for extrication equipment and materials are readily available
 6. Works with treatment personnel with extended extrication or special rescue situations
 7. Coordinates with safety officer, staging, and triage
- I. Disposition of deceased
1. Works with medical examiner, coroner, law enforcement and other appropriate agencies to coordinate disposition of deceased (attempt to leave deceased victims in location found, if possible, until a decision and plan for disposition can be determined)
 2. Assists in establishing an appropriate and secure area for a morgue, if needed

3. Monitors personnel for signs of stress
- J. Communications
 1. Modification of communications techniques
 - a. Calm communications (helps sets an orderly tone)
 - b. Avoid use of radio codes/ signals
 - c. Plain English and terminology is used
 - d. Need for a common radio channel between command, sectors (groups), divisions
 - e. Radio traffic should be minimized
 - f. Face-to-face communication is encouraged to limit radio traffic
 2. Importance of communications at an MCI
 3. Communication requirements of command post and emergency operations center
- V. On-scene physicians in multiple casualty incident management
 - A. Triage function
 1. Increased ability to make difficult triage decisions
 2. Use at treatment area to make secondary triage decisions
 3. Emergency surgery to facilitate extrication
 - B. Treatment capabilities
 1. On-scene ability to perform specialized invasive procedures
 2. More accurate assessment and direction of specific treatments
 - C. Medical direction
 1. On-scene medical direction of paramedics
- VI. Principles and techniques of triage
 - A. Primary versus secondary triage
 1. Primary triage used at site to rapidly categorize patients condition for treatment
 - a. Document location of patient and transport needs
 - b. Triage tape or labels used
 - c. Focus on speed to sort patients quickly
 2. Secondary triage used at treatment area
 - a. Retriage of patients
 - b. Usually accomplished at the treatment area
 - c. Paper tags usually used
 - d. Not always necessary especially at small incidents
 - B. START technique of primary triage
 1. Developed at Hoag Memorial Hospital, Newport Beach, CA
 2. Stands for "simple triage and rapid treatment"
 3. Rapidly allows sorting of patients
 4. Accurate with practice

5. Focuses on
 - a. Ability to walk
 - b. Respiratory effort
 - c. Pulses/ perfusion
 - d. Neurologic status
- C. START technique
 1. Walking wounded verbally directed to a designated location
 2. Initial triage effort is directed to non-walking patients
 3. Only treatment effort directed to correction of airway and severe bleeding
 4. Respiratory effort assessed
 - a. No respirations Priority-0 (P-0)
 - b. Above 30 Priority-1 (P-1)
 - c. Below 30 Go to next assessment
 5. Perfusion assessed
 - a. Absence of radial pulse Priority-1 (P-1)
 - b. Radial pulse Go to next assessment
 6. Neurologic assessed
 - a. Unresponsive Priority-1 (P-1)
 - b. Altered LOC Priority-2 (P-2)
 - c. Alert Priority-3 (P-3)
 7. Walking wounded need to be carefully triaged
- D. Triage tagging/ labeling
 1. International agreement on color coding and priorities
 - a. Immediate Red Priority-1 (P-1)
 - b. Delayed Yellow Priority-2 (P-2)
 - c. Hold Green Priority-3 (P-3)
 - d. Deceased Black Priority-0 (P-0)
 2. Many variations of tags, tape and labels available
 3. Purpose of tagging
 - a. Identify the priority of the patient
 - b. Prevent re-triage of the same patient
 - c. Serve as a tracking system during treatment/ transport
 4. Tags/ labels should be
 - a. Easy to use
 - b. Rapidly identify priority
 - c. Allow for easy tracking
 - d. Allow for some documentation
 - e. Prevent patients from re-triaging themselves
 5. Should be used routinely so their use becomes familiar
- E. Tracking systems for patients

1. Destination log must be maintained by the transportation officer
 2. Log and tagging system must be integrated in order to track patients
 3. Either name or triage label ID# should be used
 4. Tracking log is similar to a shipping manifest with
 - a. Patient identification
 - b. Unit transporting
 - c. Priority
 - d. Destination
- F. Transportation of patients
1. Method of transportation driven by triage priority and situation
 2. Ambulance (s) are the typical method of transportation
 3. Buses should be considered for transporting large numbers of P-3s
 4. Air ambulances are often used for transport of critical patients
- VII. Critical incident stress and MCIs
- A. Critical incident stress in personnel exposed to major events
 - B. Critical incident stress debriefing should be part of post-incident SOP
 - C. Access to defusing during the MCI
 - D. Role of debriefing for an MCI
 - E. Access to debriefing

UNIT TERMINAL OBJECTIVE

8-3 At the completion of this unit, the paramedic student will be able to integrate the principles of rescue awareness and operations to safely rescue a patient from water, hazardous atmospheres, trenches, highways, and hazardous terrain.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 8-3.1 Define the term rescue. (C-1)
- 8-3.2 Explain the medical and mechanical aspects of rescue situations. (C-1)
- 8-3.3 Explain the role of the paramedic in delivering care at the site of the injury, continuing through the rescue process and to definitive care. (C-1)
- 8-3.4 Describe the phases of a rescue operation. (C-1)
- 8-3.5 List and describe the types of personal protective equipment needed to safely operate in the rescue environment to include: (C-1)
 - a. Head protection
 - b. Eye protection
 - c. Hand protection
 - d. Personal flotation devices
 - e. Thermal protection/ layering systems
 - f. High visibility clothing
 - g. Specialized footwear
- 8-3.6 Explain the differences in risk between moving water and flat water rescue. (C-1)
- 8-3.7 Explain the effects of immersion hypothermia on the ability to survive sudden immersion and self rescue. (C-1)
- 8-3.8 Explain the phenomenon of the cold protective response in cold water drowning situations. (C-1)
- 8-3.9 Identify the risks associated with low head dams and the rescue complexities they pose. (C-1)
- 8-3.10 Given a picture of moving water, identify and explain the following features and hazards associated with: (C-2)
 - a. Hydraulics
 - b. Strainers
 - c. Dams/ hydro-electric sites
- 8-3.11 Explain why water entry or go techniques are methods of last resort. (C-1)
- 8-3.12 Explain the rescue techniques associated with reach-throw-row-go. (C-1)
- 8-3.13 Given a list of rescue scenarios, identify the victim survivability profile and which are rescue versus body recovery situations. (C-1)
- 8-3.14 Explain the self rescue position if unexpectedly immersed in moving water. (C-1)
- 8-3.15 Given a series of pictures identify which would be considered "confined spaces" and potentially oxygen deficient. (C-3)
- 8-3.16 Identify the hazards associated with confined spaces and risks posed to potential rescuers to include: (C-1)
 - a. Oxygen deficiency
 - b. Chemical/ toxic exposure/ explosion
 - c. Engulfment
 - d. Machinery entrapment
 - e. Electricity
- 8-3.17 Identify components necessary to ensure site safety prior to confined space rescue attempts. (C-1)
- 8-3.18 Identify the poisonous gases commonly found in confined spaces to include: (C-1)

- a. Hydrogen sulfide (H₂S)
 - b. Carbon dioxide (CO₂)
 - c. Carbon monoxide (CO)
 - d. Low/ high oxygen concentrations (FiO₂)
 - e. Methane (CH₄)
 - f. Ammonia (NH₃)
 - g. Nitrogen dioxide (NO₂)
- 8-3.19 Explain the hazard of cave-in during trench rescue operations. (C-1)
- 8-3.20 Describe the effects of traffic flow on the highway rescue incident including limited access superhighways and regular access highways. (C-1)
- 8-3.21 List and describe the following techniques to reduce scene risk at highway incidents: (C-1)
- a. Apparatus placement
 - b. Headlights and emergency vehicle lighting
 - c. Cones, flares
 - d. Reflective and high visibility clothing
- 8-3.22 List and describe the hazards associated with the following auto/ truck components: (C-1)
- a. Energy absorbing bumpers
 - b. Air bag/ supplemental restraint systems
 - c. Catalytic converters and conventional fuel systems
 - d. Stored energy
 - e. Alternate fuel systems
- 8-3.23 Given a diagram of a passenger auto, identify the following structures: (C-1)
- a. A, B, C, D posts
 - b. Fire wall
 - c. Unibody versus frame designs
- 8-3.24 Describe methods for emergency stabilization using rope, cribbing, jacks, spare tire, and come-a-longs for vehicles found on their: (C-1)
- a. Wheels
 - b. Side
 - c. Roof
 - d. Inclines
- 8-3.25 Describe the electrical hazards commonly found at highway incidents (above and below ground). (C-1)
- 8-3.26 Explain the difference between tempered and safety glass, identify its locations on a vehicle and how to break it safely. (C-3)
- 8-3.27 Explain typical door anatomy and methods to access through stuck doors. (C-1)
- 8-3.28 Explain SRS or "air bag" systems and methods to neutralize them. (C-1)
- 8-3.29 Define the following terms: (C-1)
- a. Low angle
 - b. High angle
 - c. Belay
 - d. Rappel
 - e. Scrambling
 - f. Hasty rope slide
- 8-3.30 Describe the procedure for stokes litter packaging for low angle evacuations. (C-1)
- 8-3.31 Explain the procedures for low angle litter evacuation to include: (C-1)
- a. Anchoring
 - b. Litter/ rope attachment
 - c. Lowering and raising procedures

- 8-3.32 Explain techniques to be used in non-technical litter carries over rough terrain. (C-1)
- 8-3.33 Explain non-technical high angle rescue procedures using aerial apparatus. (C-1)
- 8-3.34 Develop specific skill in emergency stabilization of vehicles and access procedures and an awareness of specific extrication strategies. (C-1)
- 8-3.35 Explain assessment procedures and modifications necessary when caring for entrapped patients. (C-1)
- 8-3.36 List the equipment necessary for an "off road" medical pack. (C-1)
- 8-3.37 Explain specific methods of improvisation for assessment, spinal immobilization and extremity splinting. (C-1)
- 8-3.38 Explain the indications, contraindications and methods of pain control for entrapped patients. (C-1)
- 8-3.39 Explain the need for and techniques of thermal control for entrapped patients. (C-1)
- 8-3.40 Explain the pathophysiology of "crush trauma" syndrome. (C-1)
- 8-3.41 Develop an understanding of the medical issues involved in providing care for a patient in a rescue environment. (C-1)
- 8-3.42 Develop proficiency in patient packaging and evacuation techniques that pertain to hazardous or rescue environments. (C-1)
- 8-3.43 Explain the different types of "stokes" or basket stretchers and the advantages and disadvantages associated with each. (C-1)

AFFECTIVE OBJECTIVES

None identified for this unit.

PSYCHOMOTOR OBJECTIVES

At the completion of this lesson, the paramedic student should be able to:

- 8-3.44 Using cribbing, ropes, lifting devices, spare tires, chains, and hand winches, demonstrate the following stabilization procedures: (P-1)
 - a. Stabilization on all four wheels
 - b. Stabilization on its side
 - c. Stabilization on its roof
 - d. Stabilization on an incline/ embankments
- 8-3.45 Using basic hand tools demonstrate the following: (P-1)
 - a. Access through a stuck door
 - b. Access through safety and tempered glass
 - c. Access through the trunk
 - d. Access through the floor
 - e. Roof removal
 - f. Dash displacement/ roll-up
 - g. Steering wheel/ column displacement
 - h. Access through the roof
- 8-3.46 Demonstrate methods of "stokes" packaging for patients being: (P-1)
 - a. Vertically lifted (high angle)
 - b. Horizontally lifted (low angle)
 - c. Carried over rough terrain
- 8-3.47 Demonstrate methods of packaging for patients being vertically lifted without stokes litter stretcher packaging. (P-1)
- 8-3.48 Demonstrate the following litter carrying techniques: (P-1)
 - a. Stretcher lift straps
 - b. "Leap frogging"

- c. Passing litters over and around obstructions
- 8-3.49 Demonstrate litter securing techniques for patients being evacuated by aerial apparatus. (P-1)
- 8-3.50 Demonstrate in-water spinal immobilization techniques. (P-1)
- 8-3.51 Demonstrate donning and properly adjusting a PFD. (P-1)
- 8-3.52 Demonstrate use of a throw bag. (P-1)

DECLARATIVE

- I. Role of the paramedic in rescue operations
 - A. Definition of rescue according to Webster - the act of delivery from danger or imprisonment
 - 1. Humans who are traumatized or stranded need rescue
 - 2. No patient - no rescue
 - 3. Rescue is a patient driven event
 - B. Rescue involves both medical and mechanical skills with the correct amount of each applied at the appropriate time
 - 1. Patients must be accessed and assessed for treatment needs
 - 2. Patient treatment must begin at the site
 - 3. Patient must be released from entrapment or imprisonment
 - 4. Medical care must continue throughout the incident
 - 5. There is no army in the world that does not train and deploy medical people into combat
 - 6. Medical and mechanical skills must be carefully balanced to ensure that patients obtain effective treatment and timely extraction
 - 7. Must have a well coordinated effort between medical care and specialized rescue effort
 - 8. Rescue effort must be driven by the patient's medical and physical needs
 - C. Role of the paramedic in rescue operations
 - 1. Have proper training and PPE to allow access and the provision of treatment at the site and continuing throughout the incident
 - 2. As first responders to many incidents
 - a. Understand hazards associated with various environments
 - b. Know when it is safe/ unsafe to gain access or attempt rescue
 - c. Have skills to effect a rescue when safe and necessary
 - d. Understand the rescue process and when certain techniques are indicated or contraindicated
 - 3. Be skilled in specialized patient packaging techniques to allow safe extraction and medical care
 - D. Phases of a rescue operation
 - 1. Arrival and size-up
 - a. Responders must understand the environment and risks
 - b. Establish command and conduct a scene assessment
 - c. Determine the number of patients and triage as necessary
 - d. Determine if situation is a search, rescue or body recovery
 - e. Risk versus benefit analysis
 - f. Request additional resources
 - g. ICS used as a command/ control mechanism
 - h. Make a realistic "time" estimate in accessing and evacuating
 - 2. Hazard control
 - a. Control as many of the hazards as possible
 - b. Manage, reduce and minimize the risks from the uncontrollable hazards
 - c. Make the scene as safe as possible
 - d. Ensure all personnel are in PPE appropriate for the situation
 - 3. Gain access to the patient
 - a. Determine the best method to gain access to the patient
 - b. Deploy personnel to the patient
 - c. Stabilize the physical location of the patient

4. Medical treatment
 - a. Medical treatment provided appropriate to the situation
 5. Disentanglement
 - a. Release from physical entrapment
 - b. Methods must be driven by patient's needs
 - c. Risk versus benefit assessment
 - d. Could involve use of specialized equipment and techniques
 6. Patient packaging
 - a. Patient packaged to ensure their medical needs are addressed
 - b. Physically secure to prevent additional injury
 7. Transportation
 - a. Often as simple as carrying the patient to an ambulance
 - b. Could involve air evacuation
 - c. Could involve specialized operations
- II. Rescuer personal protective equipment (PPE)
- A. Rescuer protection
 1. The same PPE is not appropriate in all situations
 - a. PPE must be appropriate for/ to the situation encountered
 - b. PPE may not prevent exposure to infectious disease but it does minimize risk
 - c. Most PPE is not specifically designed for EMS workers
 2. EMS PPE historically has been adapted from other fields
 - a. EMS does not have a national uniform trauma reporting system to identify potential work related exposures
 - b. Risk management and PPE design needs to be driven by data
 - B. Head/ eye/ hearing/ hand/ foot protection
 1. Adequate head protection depends on the environment
 - a. Compact firefighter's helmet meeting NFPA standards adequate for most vehicle/ structural applications
 - b. Climbing helmet used for many confined space and technical rescue applications
 - c. Padded rafting/ kayaking helmet for water rescue
 - d. Must meet safety standards for the appropriate application
 2. Eye protection
 - a. Face shield on most fire helmets is inadequate
 - b. ANSI approved safety glasses/ goggles with side shields is best
 3. Hearing protection
 - a. For high noise areas
 - b. Ear plugs or ear muffs
 4. Hand protection
 - a. Gloves to protect the hands
 - b. Must allow for adequate dexterity
 - c. Protection from cuts/ puncture
 5. Foot protection
 - a. Ankle support to limit range of motion
 - b. Tread to provide traction and prevent slips
 - c. Insulated in some environments
 - d. Steel toe/ shank required to meet some safety requirements
 - C. Flame/ flash protection

1. Nomex/ PBI/ flame retardant cotton designed to provide limited flash protection
 - a. Turnout clothing
 - b. Jump-suits/ flyers coveralls
 2. Does not provide complete protection from puncture or cuts
 3. Thermal protection from turnout clothing increases heat stress
 4. Should be used when danger from fire exists
 - D. Personal flotation devices (PFD)
 1. Meet Coast Guard standards for flotation
 2. Must be used when operating on or around the water
 3. Type III preferred for most rescue work
 - a. Should have whistle and strobe light attached
 - b. Knife for cutting should be attached
 - E. Visibility
 1. Reflective trim should be on all outer-wear
 2. Orange clothing or safety vests should be used when in highway operations
 - F. Extended, remote or wilderness protection
 1. Additional/ different PPE must be considered for bad weather conditions not normally encountered (cold, rain, snow, wind)
 2. Personal drinking water
 3. Personal snacks for a few hours
 4. Possible shelter needs
- III. Surface water rescue
- A. Moving water and common hazards
 1. Hydraulics of moving water change with many variables
 - a. Water depth
 - b. Velocity
 - c. Obstructions to flow
 2. Force of moving water is very deceptive
 3. Rescue using "go" techniques requires special skills
 4. Rescuer perception
 - a. People are drawn to moving water for recreation
 - b. Many underestimate the power of the water
 - c. Unaware rescuers also underestimate the power of the water
 - d. Fail to understand the hazards involved
 5. "Drowning machines"- recirculating currents
 - a. Water moving over a uniform obstruction to flow
 - b. Most commonly found on "low head" dams
 - c. Commonly found on many rivers
 - d. Innocuous in appearance
 - e. Victims caught in the recirculating flow of the current
 - f. Escape very difficult
 - g. Same hydraulic can be created by many other obstructions
 - h. Hazardous rescue
 6. Strainers
 - a. Water moving through obstructions in flood or river
 - (1) Trees
 - (2) Grating/ wire mesh

- b. Current may move victim into strainer
 - c. Force of water against victim makes escape difficult
 - d. Hazardous rescue
7. Foot/ extremity pin
- a. Unsafe to walk in fast moving water over knee depth
 - b. If extremity becomes trapped force of water forces victim under the surface
 - c. Extremity must be extricated the same way it went in
 - d. Hazardous rescue
8. Dams, hydroelectric intakes
- a. Height of dam no indication of the degree of hazard
 - b. Intakes can act as strainers
 - c. Most dams create recirculating currents
 - d. Hazardous rescue
- B. Flat water (slow moving or still water)
1. Most people who drown never planned on being in the water
- a. PFDs routinely worn and fastened properly when on or around the water save lives
 - b. Having the PFD available but unworn is not enough
2. Alcohol consumption is a contributory factor to many flat water boating incidents
- a. Alcohol alters mental ability and reason
3. Water temperature and hypothermia can quickly incapacitate and lead to drowning
- a. Routine use of PFDs decreases the likelihood of drowning
- C. Water temperature
1. Immersion in cold water can rapidly lead to hypothermia
- a. Any water temperature less than 98 degrees will cause hypothermia
 - b. Cannot maintain body heat in water less than 92 degrees
 - c. Colder water causes a faster rate of heat loss
 - d. Water causes heat loss 25 times faster than air
 - e. A 15-20 minute immersion in 35 degree water is likely to kill
2. Hypothermic patients rapidly lose the ability for self rescue
- a. Sudden immersion in cold water may trigger laryngospasm
 - b. Hypothermic victims are unable to follow directions
 - c. Hypothermia makes it difficult for a victim to grab anything
 - d. Hypothermia increases the likelihood of drowning
 - e. Victims become incapacitated and unable to help themselves
3. Water temperature varies widely with seasons and run off
- a. Even on warm days water temperature can be very low
4. PFDs lessen heat loss and energy required for flotation
- a. If sudden immersion occurs assume HELP position
 - b. If multiple people are in the water huddle to decrease heat loss
- D. Cold protective response
1. Increases the chances of a cold water drowning victim's survival
- a. Documented saves from cold immersion of up to 45 minutes
 - b. Colder water seems to increase chances of survival
 - c. How long is the head above water during the cooling process
2. Protective physiologic response
- a. Face immersion causes parasympathetic stimulation
 - b. Heart rate decreases/ bradycardia

- c. Peripheral vasoconstriction and blood shunted to the core
 - d. Blood pressure drop
 - 3. Survivability profile affected by
 - a. Age
 - b. Posture
 - c. Lung volume
 - d. Water temperature
 - 4. You are never cold and dead - only warm and dead
 - a. Hypothermic patients should be presumed salvageable
 - b. A patient must be re-warmed before an accurate assessment can be made
 - 5. Rescue versus body recovery
 - a. Length of time submerged
 - b. Any known or suspected trauma
 - c. Age and physical condition
 - d. Water temperature and environmental conditions
 - e. Time until rescue or removal
- E. Scenario options for water rescue training
 - 1. Rescuer safety - equipment
 - a. Properly fitting personal flotation device (USGA approved)
 - b. Helmet - for head protection
 - c. Knife - for entanglement protection
 - d. Whistle - for location if in trouble
 - e. Thermal protection
 - 2. Rescuer safety - training
 - a. Confined water situations - pool, stock tank
 - b. Flat water situations - lakes, ponds, marsh
 - c. Moving water - rivers, streams, creeks
 - d. Fast water - spring runoffs, mountain streams
 - e. Floods and debris flows
 - f. Heavy surf - ocean, Great Lakes
 - g. Man made barriers - dams, piers, weirs
 - 3. Victim safety - equipment
 - a. Flotation for victim
 - b. Immobilization equipment
 - c. Extrication equipment
 - d. Thermal protection equipment
 - e. Resuscitation equipment
 - f. Transportation equipment
 - 4. Victim safety - training
 - a. Victim recognition skills
 - b. In-water patient management skills
 - c. Airway management skills
 - d. In-water immobilization skills
 - e. Extrication from water skills
 - f. In-water thermal loss skills
 - g. Resuscitation skills - in-water, land and boat
 - 5. Factors determining - rescue or recovery
 - a. Number of victims

- b. Number of trained and equipped rescuers
- c. Environmental conditions present and expected
- d. Age of victims
- e. Length of submersion of victims
- f. Known trauma to victims
- g. Temperature and speed of water
- 6. Location of submerged victims - witness interviews
 - a. Separate witnesses and have them return to where they were during the incident
 - b. Have each witness locate an object across water to form a line
 - c. Use the point of convergence of lines to locate last seen point
 - d. Use last seen point as "datum" point to begin search
 - e. Search in area where last seen point is center and radius out is equal to depth of water
- 7. In-water spinal immobilization
 - a. Head-splint technique (rescuer PFD inhibits other techniques)
 - b. Approach victim from the side
 - c. Move victim's arms over their head
 - d. Hold victim's head in place by using victim's arms as a "splint"
 - e. If victim is face-down, perform steps 1-4, then rotate victim toward rescuer to face-up position
 - f. Assure open airway
 - g. Maintain position until C-collar is applied
- 8. C-collar application
 - a. Second rescuer determine collar size
 - b. Second rescuer holds open collar under victim's neck
 - c. Primary rescuer maintains immobilization and patent airway
 - d. Second rescuer brings collar up to back of victim's neck, primary rescuer allows second rescuer to bring collar around victim's neck and throat while second rescuer maintains airway
 - e. Second rescuer secures fastener on collar while primary rescuer maintains airway
 - f. Second rescuer secures victim's hands at waist of victim
- 9. Back boarding and extrication of victim
 - a. Submerge board under victim at their waist
 - b. Never lift the victim to the board, allow the board to float up to the victim (if board does not float, lift it gently to the victim)
 - c. Secure victim with straps, cravats or other devices
 - d. Move victim to extrication point at shore or boat
 - e. Always extricate victim head first, so that body weight will not compress possible spinal trauma
 - f. Avoid extrication of victim through surf - board could capsize
 - g. Maintain airway management during extrication
- 10. Overview of rescue techniques
 - a. Never underestimate the power of moving water
 - (1) Moving water is very deceptive
 - (2) Do not enter without highly specialized training
 - b. The water rescue model is reach-throw-row-go
 - c. As a first responder, a shore based rescue attempt (either by talking the victim into self-rescue, reaching or throwing) are the methods of choice

- (1) Either boat based or go techniques require specialized training
- d. Even with shore based rescue techniques a PFD must be worn
 - (1) Reach with a pole or long rescue device
 - (2) Throw a floatation device
 - (3) Become proficient with a water throw bag
- e. Self rescue if fallen into flat or moving water
 - (1) Cover mouth/ nose during entry
 - (2) Protect your head and keep face out of the water
 - (3) If flat water assume the HELP position
 - (4) In moving water do not attempt to stand up
 - (5) Float on back with feet downstream and head pointed towards the nearest shore at 45 degree angle

IV. Hazardous atmospheres

- A. Oxygen deficient environments/ confined spaces (CFR 1910.146)
 - 1. Defined as a space with limited access/ egress not designed for human occupancy or habitation
 - 2. Has a limited or restricted means for entry or exit and is not designed for continuous employee occupancy
 - a. Tanks
 - b. Vessels
 - c. Silos
 - d. Storage bins
 - e. Vaults
 - f. Pits
 - 3. NIOSH estimates that 60% of the fatalities associated with confined spaces are people attempting a rescue of someone
 - 4. Examples of confined spaces
 - a. Grain bins and silos
 - b. Wells and cisterns
 - c. Storage tanks
 - d. Manholes, pumping stations
 - e. Drainage culverts
 - f. Underground vaults
- B. Hazards associated with confined spaces
 - 1. Oxygen deficient atmospheres
 - a. Oxygen deficient atmospheres are not a visible problem
 - b. Rescuers often presume an atmosphere is safe
 - c. Be aware that increased oxygen content can give atmospheric monitoring meters a false reading
 - 2. Chemical/ toxic exposure/ explosion
 - a. Toxicity of chemicals and the displacement of oxygen
 - b. Explosion is a hazard in some environments
 - 3. Engulfement
 - a. Grain, coal or substances that can bury a person
 - b. Dusts can also create an explosion hazard
 - 4. Machinery entrapment
 - a. Spaces often have auger/ screws which can entrap

- 5. Electricity
 - a. Motors and materials management equipment have power
 - b. Risk of stored energy
 - c. Physiology of oxygen deficiency
- 6. Structural concerns
 - a. I beams inside space
 - b. Not all spaces are cylindrical - L, T and X shaped spaces compound extrication pathway
- C. Emergencies in confined spaces
 - 1. OSHA requires a permit process before workers may enter a confined space
 - a. Area must be made safe or workers must don PPE
 - b. Retrieval devices must be in place
 - c. Environmental monitoring of the site before entry
 - 2. Non-permitted sites are likely locations for emergencies
 - a. No atmospheric monitoring is done
 - b. Entrants are likely to encounter oxygen deficient atmosphere
 - 3. Types of emergencies
 - a. Falls
 - b. Medical emergencies
 - c. Oxygen deficiency/ asphyxia
 - d. Explosion
 - e. Entrapment
 - 4. Types of gases found in confined spaces
 - a. Hydrogen sulfide (H₂S)
 - b. Carbon dioxide (CO₂)
 - c. Carbon monoxide (CO)
 - d. Low/ high oxygen concentrations
 - e. Methane (CH₄)
 - f. Ammonia (NH₃)
 - g. Nitrogen dioxide (NO₂)
- D. Safe entry for rescue requires specialized training
 - 1. Safe entry cannot be made without the following
 - a. Atmospheric monitoring to determine
 - (1) Oxygen concentration
 - (2) Hydrogen sulfide level
 - (3) Explosive limits
 - (4) Flammable atmosphere
 - (5) Toxic air contaminants
 - b. Lock out/ tag out/ all power
 - c. Blank out of all flow into the site
 - d. Dissipation of stored energy
 - e. Area is ventilated
 - 2. No rescuers are allowed to make entry until a rescue team has made the area safe
 - 3. Access to confined spaces is often limited making access and extraction difficult
 - a. SCBA use is usually dangerous
 - (1) Limited air supply
 - (2) Removal of SCBA to make some entries
 - b. Supplied air breathing apparatus is preferred

- c. Rescuer lowering and retrieval system is in place
 - d. Limited space makes extraction difficult
 - 4. Arriving EMS personnel should
 - a. Establish a safe perimeter
 - b. Not allow any additional entry to the space
 - c. Assist in attempting remote retrieval
 - d. Determine from permit/ entry supervisor what type of work is being done
 - e. Determine from entry supervisor how many workers are inside
 - E. Rescue from trenches/ cave ins
 - 1. Most trench collapses occur in trenches less than 12' deep and 6' wide
 - a. Weight of soils - 1 cubic foot = 100 pounds
 - b. 2 feet of soil on the chest or back = 700-1000 pounds
 - c. Being buried rapidly leads to asphyxia
 - 2. Reasons for cave in/ collapse
 - a. Federal law requires either shoring or trench box for excavations deeper than 5'
 - b. Contractors forsake safety due to increased costs
 - c. Lip of one or both sides of trench caves in
 - d. Wall shears way and falls in
 - e. Spoil pile too close to edge causing collapse
 - 3. Factors contributing to collapse
 - a. Previously disturbed soil
 - b. Intersecting trenches
 - c. Ground vibrations
 - d. Dirt (spoil) pile too close to edge of trench
 - e. Water seepage
 - 4. Initial response
 - a. If collapse has occurred causing burial, secondary collapse is likely to occur
 - b. Secure the scene, establish command, and secure a perimeter
 - c. Call for a team specializing in trench rescue
 - d. Do not allow entry into the trench or cave in area
 - e. Safe access only when proper shoring is in place
- V. Highway operations
 - A. Hazards in highway operations
 - 1. Traffic flow is the largest hazard associated with EMS highway operations
 - a. Response to limited access highways
 - b. Response to unlimited access highways
 - c. Risk of apparatus and rescuers being struck
 - d. Back-up impedes flow to and from scene
 - e. EMS must work closely with law enforcement
 - 2. Traffic hazard reduction techniques
 - a. Staging of unnecessary apparatus off highway
 - (1) Essential on limited access highways
 - (2) Use staging area away from scene
 - b. Place apparatus in position to protect scene
 - (1) Attempt minimal reduction to traffic flow
 - (2) Have a safe ambulance loading area
 - c. Use only essential warning lights

- (1) Too many lights distract/ confuse/ blind drivers
- (2) Turn off headlights
- (3) Consider use of amber scene lighting
- d. Use traffic cones/ flares to redirect traffic
 - (1) Create a safe zone
 - (2) Move traffic away from workers
 - (3) Caution on use of flares and their proximity to scene
 - (a) Allow flares to burn out
 - (b) Do not extinguish once ignited
- e. All rescuers should be in high visibility clothing
 - (1) Orange highway vests
 - (2) High visibility clothing
 - (3) Reflective trim
- 3. Other scene hazards
 - a. Fuel/ fire hazards
 - (1) Fuel spilled on the highway increases fire risk
 - (2) Catalytic converters can ignite spilled fuel
 - b. Alternate fuel systems
 - (1) Natural gas in high pressure cylinders
 - (2) Electrical power and storage cells
 - c. Sharp metal and glass
 - (1) Cut and puncture hazard to patients and rescuers
 - d. Electrical power
 - (1) Downed power lines and contact with underground electrical feeds
 - e. Energy absorbing bumpers
 - (1) When exposed to fire can explode
 - (2) When "loaded" can spring out causing rescuer trauma
 - f. Air bags/ supplemental restraint systems(SRS)
 - (1) Can deploy during rescue operations
 - (2) Must be deactivated prior to mechanical extrication
 - g. Vehicles carrying hazardous cargoes
 - (1) Most hazardous substances travel by road
 - (2) Be suspicious with crashes involving commercial vehicles
 - (3) Look for UN numbers and placarding
 - h. Vehicles in unstable positions
 - (1) On side
 - (2) On roof
 - (3) On incline or unstable area/ terrain
 - (4) Weather conditions
 - (5) On-site spills/ leaks
- B. Auto anatomy
 - 1. Roof and roof support posts
 - a. "A" post
 - b. "B" post
 - c. "C" post
 - d. "D" post
 - e. Cutting the supports interrupts the unibody construction
 - 2. Fire wall

- a. Separates engine and occupant compartment
 - b. Frequently collapses onto occupants legs during high speed head on collisions
 - 3. Engine compartment and power train
 - a. Battery usually in the engine compartment
 - 4. Under-carriage and unibody versus frame construction
 - a. Roof posts, floor, firewall, trunk support integral to unibody
 - b. Most cars are of unibody construction
 - c. Light trucks are usually of frame construction
 - 5. Safety versus tempered glass
 - a. Safety glass usually in windshield
 - (1) Glass-plastic laminate-glass
 - (2) Designed to stay intact when shattered/ broken
 - (3) Fractures into long shards
 - b. Tempered glass
 - (1) Glass with high tensile strength
 - (2) Does NOT stay intact when shattered/ broken
 - (3) Fractures into small pieces when broken
 - 6. Doors
 - a. Reinforcing bar in most car doors
 - b. Bar designed to protect occupant in side impact collisions
 - c. Case hardened steel "Nader" pin designed to prevent car door from opening during collisions
 - d. If Nader pin/ latch engaged difficult to pry door open
 - e. Latch must be disengaged first
 - 7. Deactivation of the SRS
 - a. Power removal
 - b. Power dissipation
 - C. Rescue strategies
 - 1. Initial size-up, hazard control
 - a. Establish command
 - b. Scene size-up
 - c. Call appropriate back-up
 - d. Control the hazards
 - e. Locate and triage patients
 - 2. Assess degree of entrapment and fastest means of extraction
 - a. Try all of the doors
 - b. Considerations for door removal
 - c. Considerations for roof removal
 - d. Considerations for dash roll-up maneuver
 - e. Considerations for door removal and making a new door
 - 3. Inner circle/ outer circle rescue concept
- VI. Hazardous terrain
- A. Types of hazardous terrain
 - 1. Steep slope or "low angle" terrain
 - a. Slope capable of being walked on without using hands
 - b. Footing may be difficult
 - c. Difficult to carry a litter even with multiple people

- d. Rope used to counteract gravity during litter carry
 - e. Consequence of error likely to be a fall and tumble
 - 2. Vertical or "high angle" terrain
 - a. Cliff, building side or terrain so steep hands must be used for balance when scaling it
 - b. Total dependence on rope or aerial apparatus for litter movement
 - c. Consequence of error likely to be fatal
 - 3. Flat terrain with obstructions
 - a. Rocks, scree, creeks etc.
- B. Patient access in hazardous terrain
 - 1. Specialized training and equipment required for the high angle environment
 - a. Rappelling and retrieval of personnel (ascending or raising) once rappelled in
 - b. Belaying
 - c. High angle litter evacuation
 - d. Use of ladders
 - e. Serious consequence of errors
 - f. High degree of training required for access and evacuation
 - 2. Low angle environment
 - a. Access often gained by walking or scrambling
 - b. Rope sometimes used as a hand line to assist with balance
 - c. Less severe consequence of error
 - d. High degree of training required for low angle rope evacuation of litter
 - e. Hasty rope slide to assist with balance and footing on rough terrain
- C. Patient packaging
 - 1. Basket stretcher is the standard for rough terrain evacuation
 - a. Rigid frame for patient protection
 - b. Easy to carry with adequate personnel
 - c. Standard EMS patient handling device
 - d. Alternative spinal immobilizers can be used in them (KED, OSS)
 - e. Can be used as a spinal immobilizer by itself as a last resort
 - 2. Wire mesh stokes baskets
 - a. Generally strongest of baskets
 - b. Better air/ water flow through the basket
 - c. Inexpensive
 - d. With flotation, better for water rescue
 - e. Older "military style" will not accept backboard
 - 3. Plastic basket stretchers
 - a. Generally weaker than steel baskets
 - b. Provide better patient protection
 - c. Plastic bottom with steel frame is best
 - 4. Most basket stretchers are not equipped with adequate restraints
 - a. All require additional strapping or lacing for rough terrain evacuation/ extraction
 - b. Plastic litter shield for patient protection
 - c. High angle restraint
 - (1) Harness applied to patient
 - (2) Leg stirrups applied
 - (3) Lifters applied to prevent movement
 - (4) Tail of 1 litter line to patient's harness

- (5) Helmet or litter shield on patient
- (6) Fluids (IV or PO)
- (7) Accessibility for BP, suction, distal perfusion assessment
- (8) Padding is crucial
- (9) Patient heating/ cooling system
- (10) Airway clearing system via gravity "tip line"
- d. Low angle restraint
 - (1) Same restraint as for high angle
- e. Flat rough terrain
 - (1) Lacing or securing to prevent movement
- D. Patient movement
 - 1. Non-technical/ non-rope evacuation is usually faster
 - 2. Flat rough terrain
 - a. Litter carrying procedures
 - b. Leapfrogging
 - c. Adequate numbers of bearers
 - d. Load lifting straps to assist with carry
 - 3. Low angle/ high angle evacuation
 - a. Secure anchors
 - b. Rope lowering systems
 - c. Rope hauling systems
 - d. Specialized knowledge and skill required for use
 - 4. Use of aerial apparatus
 - a. Tower-ladder or bucket trucks
 - (1) Litter belay during movement to bucket
 - (2) Attachment of litter to bucket
 - b. Aerial ladders
 - (1) Upper sections not wide enough to slot litter
 - (2) Litter must be belayed if being slid down ladder
 - c. Ladder or aerial apparatus should not be used as a crane to move a litter
- E. Use of helicopters in hazardous terrain rescue
 - 1. Difference in mission, crew and capabilities of medical versus rescue and military helicopters
 - 2. Need for constant reassessment of risk of rescue technique involving a helicopter
 - 3. Need for non-aircrew-member rescue training, specific to helicopter rescue techniques
 - a. Know general safety around helicopters
 - b. Be familiar with these uses of helicopters for rescue - the advantages, disadvantages, hazards and local restrictions for each of these
 - (1) Boarding, deboarding, riding
 - (2) One-skids, hovers, toe-ins
 - (3) Short hauls or sling loads (personnel and equipment)
 - (4) Cable hoists
- VII. Vehicle rescue
 - A. Practice initial stabilization of vehicles using cribbing, lifting devices, spare tires, 2 ton come-a-long on (be certain all fluids are drained)
 - 1. Wheels
 - 2. Roof

- 3. Side
 - 4. Embankments
 - B. Gain access using hand tools through
 - 1. Non-deformed door
 - 2. Deformed door
 - 3. Safety and tempered glass
 - 4. Trunk
 - 5. Floor
 - C. Package and extricate simulated patients
 - 1. Rapid extraction of patients using long spine boards
 - 2. Vertical extrication of patients from vehicles using spineboards
 - D. Observe the following procedures being accomplished using heavy hydraulic equipment
 - 1. Door removal
 - 2. Roof removal
 - 3. Making of a "third door"
 - 4. Dashboard/ firewall "roll-up"
- VIII. Assessment procedures
- A. Environmental issues affecting assessment
 - 1. Weather/ temperature extremes
 - a. Difficulty in completely exposing patients for full assessment and treatment
 - b. Physical examination compromised
 - c. Patients susceptible to hypo/ hyperthermia
 - d. Rescuer mobility restricted due to clothing/ PPE
 - 2. Access to patient may be limited
 - a. Parts may not be accessible for examination
 - b. Cramped space
 - c. Limited lighting
 - 3. Typical street equipment may not be transportable to patient
 - a. Boxes and street "packaging" of equipment
 - b. Downsizing of initial assessment/ management equipment
 - 4. Patient may be entrapped for an extended period of time
 - 5. Rescuer PPE essential but cumbersome
 - a. PPE must be used
 - b. Some must be removed to perform skills
 - c. Reapply as soon as possible
 - B. Specific assessment/ management considerations
 - 1. Equipment considerations
 - a. Must be downsized and capable of being brought to patient
 - b. Capable of being carried hands free
 - c. Have lighting to facilitate assessment/ treatment in dark
 - d. Have the following
 - (1) Airway control
 - (a) OPA/ NPA
 - (b) Manual suction
 - (c) Intubation
 - (2) Breathing
 - (a) Thoracic decompression

- (b) Small oxygen tank/ regulator
 - (c) Masks/ cannulas
 - (d) Pocket mask/ BVM
 - (3) Circulation
 - (a) Bandages/ dressings
 - (b) Triangular bandages
 - (c) Occlusive dressings
 - (d) IV administration
 - (e) BP cuff and stethoscope
 - (4) Disability
 - (a) Extrication collars
 - (5) Expose
 - (a) Scissors
 - (6) Miscellaneous
 - (a) Headlamp/ flashlight
 - (b) Space blanket
 - (c) SAM splint
 - (d) PPE (leather gloves/ latex gloves/ eye shields)
- 2. Exposure of patients
 - a. Cover patient and assure thermal protection
 - b. During extrication place hard protection (spine board)
 - c. Prevent glass shards from contacting patient
- 3. ALS skills only if really necessary (good BLS skills are mandatory)
 - a. More wires and tubing complicate the extraction process
 - b. Definitive airway control and volume may be essential
 - c. Continuous oxygenation
- 4. Patient monitoring
 - a. In high noise areas take BP by palpation
 - b. Pulse oximetry compact and helpful
 - c. ECG cumbersome during extrication
 - d. Continue talking to patient
 - e. Explain what is being done and answer questions
- 5. Improvisation
 - a. Upper extremity fractures tied to torso
 - b. Lower extremity fractures tied to uninjured leg
 - c. SAM splints very useful
- C. Pain control
 - 1. Non-pharmacological management
 - a. Splinting
 - b. Distraction - talking to the patient and asking questions
 - c. Scratching or creating sensory stimuli when doing painful procedure
 - 2. Pharmacologic agents
 - a. Pain control with isolated extremity trauma
 - b. Pain control with multiple trauma
- D. Crush and compartment syndromes secondary to entrapment
 - 1. Compartment syndromes can be caused by crushing mechanisms
 - a. Increased pressure in the muscle compartment enclosed by fascia
 - b. Pressure increase causes ischemic muscle damage

- c. Tissue necrosis and nerve injury can occur
 - 2. Crush syndrome
 - a. Compressive forces crush and cause prolonged hypoxia
 - b. Prolonged compression 4-6 hours or longer
 - c. May appear stable with compressive forces in place
 - d. Compressive force removed - part is reperfused
 - e. Vascular volume lost into the tissue
 - f. Myoglobin, lactic acid and other toxins released into circulation
 - g. Rapid decompensation may occur
- E. Patient packaging
 - 1. Stokes basket orientation and practice with
 - a. Types of basket stretchers and their uses
 - b. Patient comfort and packaging
 - c. Patient immobilization and restraint
 - 2. Other patient devices for rough terrain and practice with
 - a. SKED
 - b. Half-spine devices
 - 3. High angle-non-technical evacuation using aerial apparatus
 - 4. Low angle-non-technical evacuation using manpower
 - 5. Handing a litter over terrain
 - 6. Litter carry over rough terrain and practice the following
 - a. Litter carry sequence with six people
 - b. Use of litter lifting or load slings
 - c. Passing litter over uneven terrain
 - 7. It is required that the EMS response team fully understands the capability of the rescue response team thereby circumventing any "turf" issues

UNIT TERMINAL OBJECTIVE

8-4 At the completion of this unit, the paramedic student will be able to evaluate hazardous materials emergencies, call for appropriate resources, and work in the cold zone.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 8-4.1 Explain the role of the paramedic/ EMS responder in terms of the following: (C-1)
 - a. Incident size-up
 - 2. Assessment of toxicologic risk
 - 3. Appropriate decontamination methods
 - 4. Treatment of semi-decontaminated patients
 - 5. Transportation of semi-decontaminated patients
- 8-4.2 Size-up a hazardous materials (haz-mat) incident and determine the following: (C-1)
 - a. Potential hazards to the rescuers, public and environment
 - 2. Potential risk of primary contamination to patients
 - 3. Potential risk of secondary contamination to rescuers
- 8-4.3 Identify resources for substance identification, decontamination and treatment information including the following: (C-1)
 - a. Poison control center
 - 2. Medical control
 - 3. Material safety data sheets (MSDS)
 - 4. Reference textbooks
 - 5. Computer databases (CAMEO)
 - 6. CHEMTREC
 - 7. Technical specialists
 - 8. Agency for toxic substances and disease registry
- 8-4.4 Explain the following terms/ concepts: (C-1)
 - 1. Primary contamination risk
 - 2. Secondary contamination risk
- 8-4.5 List and describe the following routes of exposure: (C-1)
 - a. Topical
 - 2. Respiratory
 - 3. Gastrointestinal
 - 4. Parenteral
- 8-4.6 Explain the following toxicologic principles: (C-1)
 - 1. Acute and delayed toxicity
 - 2. Route of exposure
 - 3. Local versus systemic effects
 - 4. Dose response
 - 5. Synergistic effects
- 8-4.7 Explain how the substance and route of contamination alters

- triage and decontamination methods. (C-1)
- 8-4.8 Explain the limitations of field decontamination procedures. (C-1)
- 8-4.9 Explain the use and limitations of personal protective equipment (PPE) in hazardous material situations. (C-1)
- 8-4.10 List and explain the common signs, symptoms and treatment for the following substances: (C-1)
1. Corrosives (acids/ alkalis)
 2. Pulmonary irritants (ammonia/ chlorine)
 3. Pesticides (carbamates/ organophosphates)
 4. Chemical asphyxiants (cyanide/ carbon monoxide)
 5. Hydrocarbon solvents (xylene, methylene chloride)
- 8-4.11 Explain the potential risk associated with invasive procedures performed on contaminated patients. (C-1)
- 8-4.12 Given a contaminated patient determine the level of decontamination necessary and : (C-1)
1. Level of rescuer PPE
 2. Decontamination methods
 3. Treatment
 4. Transportation and patient isolation techniques
- 8-4.13 Identify local facilities and resources capable of treating patients exposed to hazardous materials. (C-1)
- 8-4.14 Determine the hazards present to the patient and paramedic given an incident involving hazardous materials. (C-2)
- 8-4.15 Define the following and explain their importance to the risk assessment process: (C-1)
1. Boiling point
 2. Flammable/ explosive limits
 3. Flash point
 4. Ignition temperature
 5. Specific gravity
 6. Vapor density
 7. Vapor pressure
 8. Water solubility
 9. Alpha radiation
 10. Beta radiation
 11. Gamma radiation
- 8-4.16 Define the toxicologic terms and their use in the risk assessment process: (C-1)
1. Threshold limit value (TLV)
 2. Lethal concentration and doses (LD)
 3. Parts per million/ billion (ppm/ ppb)
 4. Immediately dangerous to life and health (IDLH)

5. Permissible exposure limit (PEL)
6. Short term exposure limit (TLV-STEL)
7. Ceiling level (TLV-C)
- 8-4.17 Given a specific hazardous material be able to do the following: (C-1)
 1. Research the appropriate information about it's physical and chemical characteristics and hazards
 2. Suggest the appropriate medical response
 3. Determine risk of secondary contamination
- 8-4.18 Determine the factors which determine where and when to treat a patient to include: (C-1)
 1. Substance toxicity
 2. Patient condition
 3. Availability of decontamination
- 8-4.19 Determine the appropriate level of PPE to include: (C-1)
 1. Types, application, use and limitations
 2. Use of chemical compatibility chart
- 8-4.20 Explain decontamination procedures when functioning in the following modes: (C-1)
 1. Critical patient rapid two step decontamination process
 2. Non-critical patient eight step decontamination process
- 8-4.21 Explain specific decontamination procedures. (C-1)
- 8-4.22 Explain the four most common decontamination solutions used to include: (C-1)
 1. Water
 2. Water and tincture of green soap
 3. Isopropyl alcohol
 4. Vegetable oil
- 8-4.23 Identify the areas of the body difficult to decontaminate to include: (C-1)
 1. Scalp/ hair
 2. Ears/ ear canals/ nostrils
 3. Axilla
 4. Finger nails
 5. Navel
 6. Groin/ buttocks/ genitalia
 7. Behind knees
 8. Between toes, toe nails
- 8-4.24 Explain the medical monitoring procedures of hazardous material team members to be used both pre and post entry, to include: (C-1)
 1. Vital signs
 2. Body weight

3. General health
 4. Neurologic status
 5. ECG
- 8-4.25 Explain the factors which influence the heat stress of hazardous material team personnel to include: (C-1)
1. Hydration
 2. Physical fitness
 3. Ambient temperature
 4. Activity
 5. Level of PPE
 6. Duration of activity
- 8-4.26 Explain the documentation necessary for Haz-Mat medical monitoring and rehabilitation operations. (C-1)
1. The substance
 2. The toxicity and danger of secondary contamination
 3. Appropriate PPE and suit breakthrough time
 4. Appropriate level of decontamination
 5. Appropriate antidote and medical treatment
 6. Transportation method
- 8-4.27 Given a simulated hazardous substance, use reference material to determine the appropriate actions. (C-3)
- 8-4.28 Integrate the principles and practices of hazardous materials response in an effective manner to prevent and limit contamination, morbidity, and mortality

AFFECTIVE OBJECTIVES

None identified for this unit.

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 8-4.29 Demonstrate the donning and doffing of appropriate PPE. (F-1)
- 8-4.30 Set up and demonstrate an emergency two step decontamination process. (F-1)
- 8-4.31 Set up and demonstrate an eight step decontamination process. (F-1)

DECLARATIVE

- I. Role of paramedic in hazardous materials response
 - A. Incident size-up
 - 1. Recognition that incident involves hazardous materials
 - a. Transportation incidents
 - b. Highway crashes
 - c. Storage of materials
 - d. Manufacturing operations
 - e. Acts of terrorism
 - 2. Use of the following to identify the substance
 - a. Department of Transportation (DOT) emergency response guide
 - b. United Nations (UN) numbers
 - c. National Fire Protection Agency (NFPA) 704 placard system
 - d. DOT placards
 - e. Shipping papers
 - f. Material safety data sheets (MSDS)
 - 3. Immediate need for evacuation or other action
 - 4. Immediate action with ambulatory patients
 - 5. Determine zones
 - a. Hot zone - dangerous area
 - b. Warm zone - entry/ decontamination point
 - c. Cold zone - safe area
 - B. Assessment of toxicologic risk
 - 1. Determine type of chemical
 - 2. Actions of chemical
 - 3. Potential for secondary contamination
 - 4. Out-of-hospital medical treatment
 - C. Appropriate decontamination methods
 - 1. Techniques to decontaminate patients
 - 2. Recognition that no patient is completely decontaminated
 - D. Treatment of semi-decontaminated patients
 - 1. Appropriate use of PPE
 - E. Transportation of semi-decontaminated patients
 - 1. Methods to prevent vehicle contamination
 - F. NFPA levels of response
 - 1. All personnel who may arrive first must be trained to an awareness level
 - 2. Paramedics who may transport "semi-decontaminated patients" be trained to the NFPA 473 "Level-1"
 - 3. Paramedics who may have to rapidly "decon" and assist in

the decontamination corridor be trained to the 473
"Level-2"

G. Monitoring of hazardous materials personnel

II. Hazardous materials size-up

A. High degree of awareness

1. Vehicle crashes
 - a. Commercial vehicles
 - b. Pest control vehicles
 - c. Tankers
 - d. Cars with alternative fuels
 - e. Tractor-trailers
2. Transportation
 - a. Railroads
 - b. Pipelines
3. Storage
 - a. Tanks/ storage vessels
 - b. Warehouses
 - c. Hardware/ agricultural stores
 - d. Agriculture
4. Manufacturing operations
 - a. Chemical plants
 - b. All manufacturing operations
5. Terrorism
 - a. Workplace
 - b. Shopping
 - c. Other public environments

B. Recognition of hazard

1. Placarding of vehicles
 - a. Required by law
 - b. Some vehicles not placarded
 - c. Placarding in emergency response guide
2. UN/ DOT placard classifications
 - a. Explosives
 - b. Gasses
 - c. Flammable liquids
 - d. Flammable solids
 - e. Oxidizers and organic peroxides
 - f. Poisonous and etiologic agents
 - g. Radioactive materials
 - h. Corrosives
 - i. Miscellaneous hazardous materials
3. Recognition of UN numbers

4. NFPA 704 System for fixed facilities
 - a. Blue = health hazard
 - b. Red = fire hazard
 - c. Yellow = reactivity hazard
- C. Identification of substances
 1. The "crux" of dealing with a hazardous material
 2. Often difficult-especially with unknown substances
 3. Material safety data sheets (MSDS)
 - a. Detailed substance information
 4. Shipping papers
 - a. Substance ID
 5. DOT Emergency Response Guide
 - a. UN numbers
 - b. Names of substances
 - c. Emergency action guide
 - d. Placard facsimiles
 - e. Evacuation/ isolation information
 6. Poison control centers
 - a. Detailed toxicology information
 - b. Decontamination methods
 - c. Treatment
 7. CAMEO computer database
 - a. Information
 - b. Computer modeling
 8. CHEMTREC
 - a. 24 hour toll free hotline
 - b. Product and emergency action information
 9. Other reference sources
 - a. Textbooks
 - b. Handbooks
 - c. Technical specialists
 10. Monitors and testing for unknown materials
 - a. Air monitoring equipment
 - b. Gas monitoring equipment
 - c. Ph testing
 - d. Chemical testing
 - e. Colormetric tube testing
- D. Hazardous material zones
 1. Hot zone
 - a. Contamination actually present
 - b. Site of incident
 - c. Entry with high level PPE
 - d. Entry limited

2. Warm zone
 - a. Buffer zone outside of hot zone
 - b. Where decontamination corridor is located
 - c. Corridor has "hot" and "cold" end
3. Cold zone
 - a. Safe area
 - b. Staging for personnel and equipment
 - c. Where medical monitoring occurs
 - d. One end of corridor
- E. Specific terminology for medical hazardous materials operations
 1. Boiling point
 2. Flammable/ explosive limits
 3. Flash point
 4. Ignition temperature
 5. Specific gravity
 6. Vapor density
 7. Vapor pressure
 8. Water solubility
 9. Alpha radiation
 10. Beta radiation
 11. Gamma radiation
- F. Specific toxicologic terms and their use in the risk assessment process
 1. Threshold limit value (TLV)
 2. Lethal concentration and doses (LD)
 3. Parts per million/ billion (ppm/ ppb)
 4. Immediately dangerous to life and health (IDLH)
 5. Permissible exposure limit (PEL)
 6. Short term exposure limit (TLV-STEL)
 7. Ceiling level (TLV-C)

III. Contamination and toxicology review

- A. Types of contamination
 1. Primary contamination
 - a. Exposure to substance
 - b. Only harmful to individual
 - c. Little chance of exposure to others
 2. Secondary contamination
 - a. Exposure to substance
 - b. Substance easily transferred
 - c. Touching patient results in contamination
 - d. Key concept in hazardous materials medical

- operations
- e. Gas exposure rarely results in secondary contamination
- f. Liquid and particulate matter more likely to result in secondary contamination
- B. How poisons are absorbed
 - 1. Topical absorption
 - a. Skin and mucous membranes
 - b. Not all skin absorbs at same rate
 - c. Not all poisons easily absorbed
 - 2. Respiratory inhalation
 - a. Absorption through bronchial tree
 - b. Oxygen deficient atmospheres
 - 3. Gastrointestinal ingestion
 - a. Ingestion of substances
 - b. Factors affecting absorption
 - 4. Parenteral injection
 - a. Injection
 - b. Wound entry
 - c. Invasive medical procedures
- C. Cycle of poison actions
 - 1. Absorption
 - a. Time to delivery into blood stream
 - 2. Distribution
 - a. Distribution to target organs
 - b. Poison or drug binds to tissues/ molecules
 - c. Actions
 - d. Deposits
 - 3. Biotransformation
 - a. Liver
 - 4. Elimination
 - a. GI
 - b. Kidney
 - c. Respiratory
- D. Poison actions
 - 1. Acute toxicity
 - a. Immediate effect from substance
 - 2. Delayed toxicity
 - a. No immediate effect
 - b. Symptoms later appear
 - c. Delayed pathology or disease
 - 3. Local effects
 - a. Effect immediate site

- b. Burn model
- c. Progression of effects like burn
- d. Topical or respiratory
- e. Skin irritation - acute bronchospasm
- 4. Systemic effects
 - a. Cardiovascular
 - b. Neurologic
 - c. Hepatic
 - d. Renal
- 5. Dose response
 - a. Physiologic response to dosage
 - b. How much to get an effect
 - c. Essential concept for decontamination
- 6. Synergistic effects
 - a. Combinations may react synergistically
 - b. Standard pharmacologic approach
 - c. Standard treatment can result in synergy
 - d. Medical control/ poison control reference
- E. Treatment for commonly encountered hazardous materials
 - 1. Corrosives (acids/ alkalis)
 - a. Typical exposures
 - b. Actions
 - c. Decontamination methods
 - d. Treatment
 - e. Transportation precautions
 - 2. Pulmonary irritants (ammonia/ chlorine)
 - a. Typical exposures
 - b. Actions
 - c. Decontamination methods
 - d. Treatment
 - e. Transportation precautions
 - 3. Pesticides (carbamates/ organophosphates)
 - a. Typical exposures
 - b. Actions
 - c. Decontamination methods
 - d. Treatment
 - e. Transportation precautions
 - 4. Chemical asphyxiants (cyanide/ CO)
 - a. Typical exposures
 - b. Actions
 - c. Decontamination methods
 - d. Treatment
 - e. Transportation precautions

5. Hydrocarbon solvents (xylene/ methylene chloride)
 - a. Typical exposures
 - b. Actions
 - c. Decontamination methods
 - d. Treatment
 - e. Transportation precautions
6. Considerations for performing invasive procedures
 - a. Risk versus benefit
 - b. Patient need

IV. Decontamination approaches

- A. Purpose of decontamination
 1. Reduce the patient's dosage of material
 2. Decrease threat of secondary contamination
 3. Reduce risk of rescuer injury
- B. Environmental considerations
 1. Major consideration If there are no life-threats
 - a. Prevent run off of material
 2. If there are life-threats, patient comes first
 - a. Environmental considerations last
- C. Methods of decontamination
 1. Dilution
 - a. Lavage with water
 - b. Water is universal decontamination solution
 - c. Dilution decreases dose and action
 - d. Reduction of topical absorption
 2. Absorption
 - a. Use of pads to "blot" up the material
 - b. Towels to dry the patient after lavage
 - c. Usually a secondary method to lavage
 - d. Common for environmental clean up
 3. Neutralization
 - a. Almost never used in patient decontamination
 - b. Hazard of exothermic reactions
 - c. Time to determine neutralizing substance
 - d. Lavage usually dilutes and removes faster
 - e. More practical with equipment, etc.
 4. Disposal/ isolation
 - a. Removal of clothing
 - b. Removal of substances which contain substances
- D. Decontamination decision making
 1. Field considerations
 - a. Flight of walking contaminated to rescuers -"fast

- break" event - action required now
- b. Conscious, contaminated people will "self rescue" by walking out of hot zone
- c. Immediate decontamination often not avoidable
- d. Speed of hazardous material team response
 - (1) Patients often can't wait that long
 - (2) Patients become impatient and leave
- e. EMS gross decontamination and treatment
 - (1) All EMS needs gross decontamination capability
 - (2) EMS preparedness for quick decontamination
 - (3) Need for rapid EMS PPE
 - (4) Need quick transport isolation methods
- 2. "Fast break" incident decision making
 - a. Critical patient - unknown/ life-threatening material
 - (1) Decontamination and treatment simultaneous
 - (2) Remove clothing
 - (3) Treat life-threatening problems
 - (4) Lavage - water universal decontamination solution
 - (5) Contain/ isolate patient
 - (6) Transport
 - b. Non-critical - unknown/ life-threatening material
 - (1) More contemplative approach
 - (2) Decontamination and treatment simultaneous
 - (3) Remove clothing
 - (4) Treat life-threatening problems
 - (5) Lavage - water universal decontamination solution
 - (6) Contain/ isolate patient
 - (7) Transport
 - c. Non-critical - substance known
 - (1) Slower approach
 - (2) Environmental/ privacy considerations
 - (3) More thorough decontamination
 - (4) Clothing removal
 - (5) Thorough lavage/ wash
 - (6) Drying/ reclothing PRN
 - (7) Medical monitoring
 - (8) Patient isolation PRN
 - (9) Transport
- 3. Longer duration event decision making
 - a. Patients in hot zone - non-ambulatory

- (1) No rescue attempted
 - (2) Wait for hazardous material team
 - (3) Team will set up decontamination corridor
 - b. Team will not make entry until
 - (1) Medical monitoring of entry team
 - (2) Decontamination corridor established
 - c. Longer duration event
 - (1) Often 60 minutes for team deployment
 - (2) Set up time
 - d. Better opportunity for thorough decontamination
 - e. Better PPE
 - f. Less chance of secondary contamination
 - g. Better environmental protection
4. When in doubt - better grossly decontaminated and alive than perfectly decontaminated and dead
- a. Deal with patient emergencies first
 - b. Have some type of chemical PPE
- E. Decontamination methods
- 1. Decontamination and PPE is ideally driven by the substance encountered
 - a. Sometimes unknown
 - 2. Decontamination solutions
 - a. Do not attempt to neutralize
 - b. Lavage with copious amounts of water
 - c. Water is the universal solution
 - d. Tincture of green soap used to improve wash
 - e. Isopropyl alcohol is used for some isocyanates
 - f. Vegetable oil is used for some water reactive substances
 - 3. Remove the clothing
 - a. Also remove rings and jewelry
 - b. Shoes and socks
 - c. Cut off clothing PRN
 - 4. Thorough wash and rinse
 - a. Allow fluid to drain away
 - b. Don't allow them to stay in the run-off
 - 5. Rewash and rinse
 - a. Careful attention to difficult areas
 - b. Difficult decontamination areas
 - (1) Scalp/ hair
 - (2) Ears/ ear canals/ nostrils
 - (3) Axilla
 - (4) Finger nails

- (5) Navel
 - (6) Groin/ buttocks/ genitalia
 - (7) Behind knees
 - (8) Between toes, toe nails
 - c. Post "field decontamination" all patients should be presumed to still have some degree of contamination
 - d. They must be handled accordingly
 - 6. Rapid decontamination
 - a. Two step process described
 - b. For fast breaking event
 - 7. Decontamination corridor - eight step process
 - a. Entry point at hot end
 - b. Tool drop and outer glove removal
 - c. Surface contamination removed
 - d. SCBA doffed
 - e. Protective equipment doffed
 - f. Clothing doffed
 - g. Thorough wash/ dry
 - h. Medical evaluation
- V. Rescuer personal protective equipment/ transport protection
- A. Levels of hazardous materials personal protection
 - 1. Level "A" protection
 - a. Highest level of personal protection
 - b. High degree of chemical break through time
 - c. Encapsulated suit
 - (1) Covers everything including SCBA
 - d. Impermeable
 - e. Sealed
 - f. Typically used by hazardous material team for entry into hot zone
 - 2. Level "B" protection
 - a. Level of protection typically worn by decontamination team
 - (1) Decontamination wears one level below entry
 - b. Usually non-encapsulating protection
 - (1) SCBA worn outside suit
 - (2) Easier entry and SCBA bottle changes
 - c. Much easier to work in
 - d. High degree of repellence
 - 3. Level "C" protection
 - a. Non-permeable clothing
 - b. Eye and hand protection

- c. Foot covering
 - d. Used during transport of patients with potential of secondary contamination
 - 4. Level "D" protection
 - a. Firefighter turnout clothing
- B. Determining appropriate PPE
 - 1. Ideally the chemical is known
 - 2. A permeability chart is consulted to determine "breakthrough" time
 - 3. Double or triple gloves are used or chemical resistant gloves
 - 4. Nitrile gloves have a high resistance to chemicals
 - 5. If situation is emergent
 - a. Take maximal barrier precautions
 - b. Full turnouts or Tyvek suit/ gowns
 - c. Use HEPA filters and eye protection
 - d. Double or triple glove
 - e. Remove leather shoes, use rubber boots
 - 6. Ideally at least level "B" protection should be used
 - 7. Ideally use disposable protection
- C. Transportation of semi-decontaminated patients
 - 1. Use as much disposable equipment as possible
 - a. Reduces decontamination later
 - 2. Practicality of lining an ambulance interior with plastic
 - a. Impractical
 - b. Time consuming
 - c. If airborne contaminants can permeate cabinets it is unsafe for the driver to operate the ambulance
 - d. Better to isolate the patient
 - 3. Patient isolation
 - a. Stretcher decontamination pool
 - b. Continue decontamination and contain run-off
 - c. Plastic can be used to cover pool
 - d. Fits on stretcher
 - 4. Transport to facilities predetermined to handle hazardous materials

VI. Medical monitoring and rehabilitation

- A. Entry team/ decontamination team readiness prior to entry
 - 1. Assessment of vital signs and documentation
 - 2. Team members should have normal values on file
 - 3. Documentation flow sheet must be started
 - a. Blood pressure

- b. Pulse
- c. Respiratory rate
- d. Temperature
- e. Body weight
- f. ECG
- g. Mental/ neurologic status
- 4. Rescuer PPE can cause considerable heat stress
- 5. Prehydration prior to entry
 - a. 8-16 ounces of water or sport drink
- B. After exit personnel should return to the medical sector for "rehab"
 - 1. Re-assessment of vital signs and documentation
 - 2. Documentation flow sheet must be started
 - a. Blood pressure
 - b. Pulse
 - c. Respiratory rate
 - d. Temperature
 - e. Body weight
 - f. ECG
 - g. Mental/ neurologic status
 - 3. Re-hydration at exit
 - a. 8-16 ounces of water or sport drink
 - 4. Use weight to estimate fluid losses
 - a. Medical control/ protocol determination
 - (1) PO fluids
 - (2) IV Fluids
 - 5. No re-entry until
 - a. Vitals back to normal
 - (1) Non-tachycardic
 - (2) Alert
 - (3) Normotensive
 - (4) Body weight within percentage of normal
- C. Heat stress factors
 - 1. Prehydration of member
 - 2. Degree of physical fitness
 - 3. Ambient air temperature
 - 4. Degree of activity and duration
 - 5. Rescue PPE
 - a. Suits protect but prevent cooling
 - b. There is no way to lose heat by
 - (1) Evaporation
 - (2) Conduction
 - (3) Convection

- (4) Radiation
- c. Like being in a sauna

VII. Practice the following

- A. Donning and doffing level B and C PPE
- B. Set up a rapid 2 step decontamination process
- C. Set up 3 step decontamination process
- D. Give a simulated chemical determine PPE and decontamination methods
- E. Pre-entry medical monitoring and documentation
- F. Exit medical monitoring and documentation
- G. Preparing a patient and ambulance for transport

UNIT TERMINAL OBJECTIVE

8-5 At the completion of this unit, the paramedic student will have an awareness of the human hazard of crime and violence and the safe operation at crime scenes and other emergencies.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 8-5.1 Explain how EMS providers are often mistaken for the police. (C-1)
- 8-5.2 Explain specific techniques for risk reduction when approaching the following types of routine EMS scenes: (C-1)
 - a. Highway encounters
 - b. Violent street incidents
 - c. Residences and "dark houses"
- 8-5.3 Describe warning signs of potentially violent situations. (C-1)
- 8-5.4 Explain emergency evasive techniques for potentially violent situations, including: (C-1)
 - a. Threats of physical violence.
 - b. Firearms encounters
 - c. Edged weapon encounters
- 8-5.5 Explain EMS considerations for the following types of violent or potentially violent situations: (C-1)
 - a. Gangs and gang violence
 - b. Hostage/ sniper situations
 - c. Clandestine drug labs
 - d. Domestic violence
 - e. Emotionally disturbed people
 - f. Hostage/ sniper situations
- 8-5.6 Explain the following techniques: (C-1)
 - a. Field "contact and cover" procedures during assessment and care
 - b. Evasive tactics
 - c. Concealment techniques
- 8-5.7 Describe police evidence considerations and techniques to assist in evidence preservation. (C-1)

AFFECTIVE OBJECTIVES

None identified for this unit.

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 8-5.8 Demonstrate the following techniques: (P-1)
 - a. Field "contact and cover" procedures during assessment and care
 - b. Evasive tactics
 - c. Concealment techniques

DECLARATIVE

- I. Hazard awareness control and avoidance
 - A. Determining the need
 1. Increasing violence
 - a. Street violence (assault, robbery, etc.)
 - b. Threat groups
 - c. Domestic violence
 - d. Drugs and drug users
 2. EMS providers on the street
 - a. Violent crimes require EMS response
 - b. EMS may arrive before police
 3. Local issues of concern
 - B. Approach to the scene
 1. Approach is part of scene size-up
 - a. Key point - identify and respond to dangers before they threaten
 - b. Safety concerns begin with dispatch information
 - c. Use available resources before arrival
 - (1) Computer aided dispatch (CAD) information
 - (2) You or your partner's prior calls at this location or area
 - (3) Information from other crews and rigs
 - d. Retreat from the scene if the scene cannot be made safe; there is no such thing as dead hero!
 - e. Know local protocols
 - f. Begin observation several blocks before the scene
 - g. Use red lights and siren appropriate for the call
 - (1) Urban scene - excess use could draw a crowd
 - (2) Highway scene - lights required for safety
 - (3) Joint law enforcement agency/ EMS response posturs
 - (a) EMS code 3 but law enforcement agency code 1
 - (b) Need for inter-agency cooperation and understanding
 - h. Remember non-violent dangers such as hazardous materials, power lines, dangerous pets, etc.
 - i. Scene safety considerations must continue throughout the call
 - (1) Violence can resume
 - (2) Crowds gather or turn violent
 - (3) Additional persons can enter the scene
 - (4) Violence may occur even with police present
 - (5) EMS personnel may be mistaken for police
 - (a) Uniform colors
 - (b) Badges
 - (c) Exiting a vehicle with lights and sirens
 - (d) This could cause aggression toward you as an authority figure
 - (6) Others could expect you to intervene in violent situations
 - (7) Remember to include an "escape and strategic escape plan" in your protocols
 2. Known violent scenes
 - a. Stage safe distance from the scene until police advise scene "secure"

- (1) Out of sight of the scene
 - (2) If you can be seen, people will come to you
 - (3) Entering an unsafe scene adds another potential victim
 - (4) You may be injured or killed
 - (5) You may become a hostage (hostage negotiations techniques)
 - (6) You may be another patient in a scene which is already an MCI
- C. Specific dangerous scenes
1. Approach to residences
 - a. Everyday response - all calls require a certain level of caution
 - (1) Even calls that appear "routine" require size-up
 - (2) Begin assessment of scene even before exiting your vehicle
 - b. Warning signs of danger - residential calls
 - (1) Past history of problems or violence
 - (2) Known drug or gang area
 - (3) Loud noises or items breaking
 - (4) Seeing or hearing fighting
 - (5) Intoxication or drug use
 - (6) Evidence of dangerous pets (droppings, barking, signs)
 - (7) Unusual silence or darkened residence
 - c. Approach - choose tactics that match threat or situation
 - (1) If actual danger is present - retreat and call for police
 - (2) Do not broadcast approach with lights/ sirens
 - (3) Foot approach using unconventional path (i.e. not sidewalk)
 - (4) Do not backlight yourself (getting between rig and residence)
 - (5) Stand to the side of door opposite hinges (doorknob side)
 - (6) Listen for signs of danger before announcing presence
 2. Highway encounters
 - a. Danger from vehicular traffic
 - (1) Vehicle positioning to protect scene (fire truck in back - ambulance close to patient)
 - (2) Wear reflective clothing (be aware there is some controversy about use of this clothing)
 - (3) Stay out of traffic flow
 - (4) Beware of speeding and/ or intoxicated drivers
 - b. Danger from violence - application
 - (1) Disabled vehicles
 - (2) "Man slumped over wheel" calls
 - (3) Motor vehicle crashes
 - (4) Occupants may be
 - (a) Intoxicated/ drugged
 - (b) Wanted or fleeing felons
 - (c) Armed
 - (d) Violent/ abusive from altered mental status etiology
 - (e) Warning signs of danger
 - (f) Suspicious movements within vehicle
 - i) Grabbing or hiding items
 - ii) Arguing or fighting between passengers
 - iii) Lack of activity where activity is likely

- (5) Signs of alcohol or drug use
- (6) Open or unlatched trunks
 - (a) May occasionally hide people
- c. Approach to vehicles
 - (1) One person approach
 - (2) Drive remains in ambulance which is elevated and provides greater visibility
 - (3) If nighttime, use ambulance lights to illuminate vehicle
 - (4) Notify dispatch of situation, location, license plate number and state
 - (5) Approach passenger side of vehicle
 - (a) Protection from vehicular traffic
 - (b) Not usually expected - police approach to driver's side
 - (6) Do not walk between ambulance and other vehicle
 - (a) Ambulance lights cause backlighting
 - (b) Could be injured if vehicle backs up
 - (c) For EMT to approach passenger side of vehicle, walk around rear of ambulance then to passenger side of vehicle
 - (7) Posts (a, b, c) provide best ballistic protection
 - (8) Observe rear seat; do not move forward of "c" post unless there are no threats in the back seat
 - (a) Observe front seat from behind "b" post
 - (b) Move forward only after assuring safety
 - (9) Retreat at the first sign of violence or problem
- 3. Violent street incidents
 - a. Murder, assault, robbery
 - (1) Involve dangerous weapons
 - (2) Perpetrators may be on-scene or return to scene
 - (3) Even patients may be violent toward EMS
 - b. Dangerous crowds and bystanders
 - (1) Crowds may quickly become large and volatile
 - (2) Violence directed against everything/ everyone in it's path
 - (3) EMS status not immunity from violence
 - c. Warning signs of danger - street scenes
 - (1) Voices become louder
 - (2) Pushing, shoving
 - (3) Hostilities toward any other persons at scene (perpetrator, police, victim, etc.)
 - (4) Rapid increase in crowd size
 - (5) Inability of law enforcement to control crowds
 - d. Safety actions - crowds
 - (1) Constantly monitor crowd
 - (2) Retreat from scene if necessary
 - (3) Take patient with you if possible and safe to do so
 - (a) Prevents return to scene later
 - (b) May require limited or tactical assessment of the patient at the scene
- D. Violent groups and situations
 - 1. Street gang awareness

- a. Threat groups
 - (1) Crips
 - (2) Bloods
 - (3) Latin Kings (Almighty Latin King Nation)
 - (4) Hell's Angels
 - (5) Outlaws
 - (6) Pagans
 - (7) Banditos
 - (8) Other gangs
 - (9) Local variations
 - (10) Drug distribution groups
 - b. Gang characteristics
 - (1) Clothing
 - (a) Unique clothing - specific to group
 - (b) Identifies affiliation and rank within group
 - (c) Defiguring or disrespecting gang colors may provoke violence from member
 - (2) Graffiti
 - (a) Identifies gang presence
 - (b) Marks gang territory
 - c. Safety issues in gang areas
 - (1) Potential for violence
 - (2) We appear to look like law enforcement and, therefore, we must be extremely cautious
2. Clandestine drug labs
- a. Identification
 - (1) Chemical odors
 - (2) Chemistry equipment
 - (a) Glassware
 - (b) Chemical containers
 - (c) Heating mantles, burners
 - (3) Suspicious persons, activities, deliveries
 - (4) Area fits the needs for a clan lab
 - (a) Privacy
 - (b) Utilities
 - (c) Ventilation
 - (5) Types of drug labs
 - (a) Synthesis - creates drugs from chemical precursors (LSD, methamphetamine)
 - (b) Conversion - change drug forms (cocaine HCl to base form)
 - (c) Other types (i.e. tableting, extraction)
 - b. Hazards
 - (1) Toxic inhalation
 - (2) Fire and explosion
 - (3) Booby traps
 - (4) Armed or otherwise violent occupants
 - (5) Actions if lab identified
 - (a) Leave area immediately

- (b) Notify law enforcement
 - (c) Initiate ICS and hazardous materials procedures
 - (d) Local hazardous materials teams/ fire service
 - (e) Police/ Drug Enforcement Administration
 - (f) Chemist/ chemistry specialists
 - (g) EMS concerns
 - i) Area evacuation?
 - ii) Do not touch anything
 - iii) Never stop any reaction or alter equipment
3. Domestic violence (refer to the abuse and assault unit)
- a. Definition
 - (1) Violence between persons in a domestic relationship
 - (2) May be spousal, boy/ girlfriend, same-sex relationships
 - (3) Victims may be male or female
 - (4) Violence may be physical, emotional, sexual, verbal, economic
 - b. Indications
 - (1) Apparent fear of household member
 - (2) Different or conflicting accounts by parties at the scene
 - (3) One party preventing another from speaking
 - (4) Patient reluctant to speak
 - (5) Injuries do not match reported mechanism of injury
 - (6) Unusual or unsanitary living conditions or hygiene
 - c. EMS actions
 - (1) Treat the patient
 - (2) Do not be judgmental about the situation
 - (3) Provide phone number for domestic violence hot line or shelter
 - (4) Notify authorities
 - (a) If consistent with policy/ regulations
 - (b) Mandatory reporting may be required
 - (c) Notify ED staff of your concerns
- II. Tactical considerations for safety and patient care
- A. Tactics for safety
 - 1. Avoidance is always preferable to confrontation
 - a. Observation
 - b. Knowledge of warning signs
 - c. Knowledge of proper tactical response
 - (1) To avoid danger
 - (2) To deal with danger when you can't avoid
 - d. Staging - dispatcher learns of danger and advises not to approach scene until danger is handled by appropriate authorities
 - 2. Tactical retreat
 - a. Leaving the scene when danger is observed
 - (1) Violence or indicators of violence displayed
 - (2) Immediate, decisive actions required
 - (3) Retreat in a calm, safe manner
 - (4) Be aware of the danger which is now behind you
 - (5) Retreat may be on foot or via vehicle (there is nothing in your ambulance

- that is worth your life!
 - (6) Choose mode and route of retreat that provides least exposure to danger
 - b. How far to retreat
 - (1) Must protect you from any potential danger
 - (2) Must be out of immediate line of sight
 - (3) Must be protected from gunfire (cover)
 - (4) Must be far enough away to react if danger re-approaches
- 3. Retreat - other considerations
 - a. Notify other responding units and agencies of danger
 - (1) EMS agency's SOP
 - (a) Code RED
 - (b) Other
 - (2) Law enforcement agency's reaction/ response
 - (a) Their SOPs
 - (b) Inter-agency agreement
 - (3) Document your observations of danger
 - (4) Document your response to danger
 - (a) Who was notified of danger
 - (b) Your actions
 - (c) Time left/ time returned to scene
 - (5) Documentation is key to reducing liability
 - (6) Retreat for appropriate circumstances is not abandonment
- 4. Cover and concealment
 - a. Concealment
 - (1) Hides your body
 - (2) Offers no ballistic protection
 - (3) Examples
 - (a) Bushes
 - (b) Wallboard
 - (c) Vehicle door
 - b. Cover
 - (1) Hides your body
 - (2) Offers ballistic protection
 - (3) Examples
 - (a) Large trees
 - (b) Telephone pole
 - (c) Vehicle engine block
 - c. Application
 - (1) Be aware of your surroundings
 - (2) Cover/ concealment should be integrated in retreat from danger
 - (3) Cover/ concealment should be used when "pinned down"
 - (4) Cover/ concealment must be used properly
 - (a) Place as much of your body as possible behind cover
 - (b) Constantly look to improve your protection and location
 - (5) Be conscious of reflective clothing that may make you stand out
- 5. Distraction and evasive tactics
 - a. Use of equipment
 - (1) Wedge stretcher in doorway to block aggressor

- (2) Throw equipment to trip or slow aggressor
 - b. Evasion
 - (1) Use unconventional path while retreating
 - (2) Anticipate moves of aggressor
 - 6. Contact/ cover tactics
 - a. Specific evasive techniques for
 - (1) Threats of physical violence
 - (2) Firearms encounters
 - (3) Edged weapons encounters
 - b. Providers have preassigned roles
 - (1) "Contact" provider
 - (a) Initiates and provides direct patient care
 - (b) Performs patient assessment
 - (c) Handles most interpersonal scene contact
 - (2) "Cover" provider
 - (a) In tactical context, main function to "cover" or observe scene for danger while "contact" provider takes care of patient
 - (b) Generally avoids patient care duties that would prevent observation of the scene
 - (c) In small crews "cover" provider likely to have other functions (equipment, etc.)
 - c. Communication between providers
 - (1) Warning signals
 - (a) Crews should develop methods of alerting other providers to danger without alerting aggressors
 - (b) Verbal and non-verbal signals needed
 - (2) Involve dispatch in danger signal process
 - (a) Code RED
- B. Tactical patient care
 - 1. Body armor
 - a. Also known as "bullet-proof vests"
 - b. Offers protection from
 - (1) Most handgun bullets
 - (2) Most knives
 - (3) Reduction of blunt trauma (i.e. steering wheel in MVC)
 - c. Does not offer protection
 - (1) High velocity (rifle) bullets
 - (2) Thin or dual-edged weapons (ice pick)
 - (3) When not worn
 - (4) Reduced protection when wet
 - d. Wearer may feel false sense of security
 - (1) Never do anything you wouldn't do without body armor
 - (2) Body armor doesn't cover all of your body
 - (3) Cavitation even with body armor may be severe (but without penetration)
 - 2. Tactical EMS
 - a. Providing EMS in violent or tactically "hot" zone
 - (1) Requires special training and authorization
 - (2) Body armor and tactical uniform

- (3) Compact, functional equipment in small cases
 - (4) May require risks not taken in standard EMS situations
 - b. Patient care differences
 - (1) Extraction of patient from the area safely is a major concern
 - (2) Frequent care of trauma patients
 - (3) Care may be modified to meet tactical considerations
 - (4) Medical and transport interventions must be coordinated with incident commander
 - (5) Move patient to tactically cold zone for complete patient care and transportation
 - (6) Use of metal clipboard or chemical agent as a defensive tool
 - c. Local protocols, standing orders, and medical control issues
 - d. Joint law enforcement agency/ EMS operation
 - (1) Law enforcement agency/ SWAT team member
 - (a) CONTOMS
 - (b) SWAT-Medic
 - (c) EMT-T
- III. EMS at crime scenes
- A. Crime scenes
 - 1. Definition
 - a. A location where any part of a criminal act occurred
 - b. A location where evidence relating to a crime may be found
 - 2. Evidence
 - a. Prints
 - (1) Fingerprints
 - (a) Ridge characteristics left behind on a surface with oils and moisture from skin
 - (b) Unique - no two people have identical fingerprints
 - (2) Footprints
 - b. Blood and body fluids
 - (1) DNA and ABO blood typing
 - (2) Blood spatter evidence
 - c. Particulate evidence
 - (1) Hairs
 - (2) Carpet and clothing fibers
 - d. EMS provider's observations of the scene
 - (1) Patient (victim) position
 - (2) Patient's injuries
 - (3) Conditions at the scene
 - (a) Lights
 - (b) Curtains
 - (c) Signs of forced entry
 - (4) Statements of persons at the scene
 - (5) Statements of the patient/ victim
 - (6) Dying declarations
 - 3. Preserving evidence
 - a. Patient care is the ultimate priority (you may be restricted to only one team

- member entrance)
- b. Evidence protection is performed while caring for the patient (carry in only necessary equipment)
- c. Evidence preservation techniques
 - (1) Be observant
 - (2) Touch only what is required for patient care
 - (3) If necessary to touch something, remember it and tell police
 - (4) Wear latex gloves
 - (a) Infection control
 - (b) Prevents you leaving your fingerprints
 - (c) Will not prevent you from smudging other fingerprints
 - (5) Report pertinent observations
- 4. Documentation
 - a. Note observations objectively, not subjectively
 - (1) Put patient's or bystanders' words in quotes
 - (2) Patient care records are legal documents
 - (3) Avoid opinions not relevant to patient care
 - (4) Patient care records will be used in court
 - b. Mandatory reporting (refer to unit dealing with abuse and assault)
 - (1) EMS providers may be required to report certain types of crimes (your protocols, state laws and ethical versus legal considerations)
 - (2) Child abuse and geriatric/ elder abuse/ neglect
 - (3) Domestic violence
 - (4) Certain violent crimes (i.e. rape, gunshot, etc.)
 - (5) Follow local policies and regulations regarding confidentiality

The following goals must be successfully accomplished within the context of the learning environment. Clinical experiences should occur after the student has demonstrated competence in skills and knowledge in the didactic and laboratory components of the course. Items in **bold** are essentials and must be completed. Items in *italics* are recommendations to achieve the essential and should be performed on actual patients in a clinical setting. Recommendations are not the only way to achieve the essential. If the program is unable to achieve the recommendations on live patients, alternative learning experiences (simulations, programed patient scenarios, etc.) can be developed. If alternatives to live patient contact are used, the program should increase the number of times the skill must be performed to demonstrate competence.

These recommendations are based on survey data from Paramedic Program Directors and expert opinion. Programs are encouraged to adjust these recommendations based on thorough program evaluation. For example, if the program finds that graduates perform poorly in airway management skills, they should increase the number of intubations and ventilations required for graduation and monitor the results.

PSYCHOMOTOR SKILLS

The student must demonstrate the ability to safely administer medications.

The student should safely, and while performing all steps of each procedure, properly administer medications at least 15 times to live patients.

The student must demonstrate the ability to safely perform endotracheal intubation.

The student should safely, and while performing all steps of each procedure, successfully intubate at least 5 live patients.

The student must demonstrate the ability to safely gain venous access in all age group patients.

The student should safely, and while performing all steps of each procedure, successfully access the venous circulation at least 25 times on live patients of various age groups.

The student must demonstrate the ability to effectively ventilate unintubated patients of all age groups.

The student should effectively, and while performing all steps of each procedure, ventilate at least 20 live patients of various age groups.

AGES

The student must demonstrate the ability to perform a comprehensive assessment on pediatric patients.

The student should perform a comprehensive patient assessment on at least 30 (including newborns, infants, toddlers, and school age) pediatric patients.

The student must demonstrate the ability to perform a comprehensive assessment on adult patients.

The student should perform a comprehensive patient assessment on at least 50 adult patients.

The student must demonstrate the ability to perform a comprehensive assessment on geriatric patients.

The student should perform a comprehensive patient assessment on at least 30 geriatric patients.

PATHOLOGIES

The student must demonstrate the ability to perform a comprehensive assessment on obstetric patients.

The student should perform a comprehensive patient assessment on at least 10 obstetric patients.

The student must demonstrate the ability to perform a comprehensive assessment on trauma patients.

The student should perform a comprehensive patient assessment on at least 40 trauma patients.

The student must demonstrate the ability to perform a comprehensive assessment on psychiatric patients.

The student should perform a comprehensive patient assessment on at least 20 psychiatric patients.

COMPLAINTS

The student must demonstrate the ability to perform a comprehensive assessment, formulate and implement a treatment plan for patients with chest pain.

The student should perform a comprehensive patient assessment, formulate and implement a treatment plan on at least 30 patients with chest pain.

The student must demonstrate the ability to perform a comprehensive assessment, formulate and implement a treatment plan for patients with dyspnea/respiratory distress.

The student should perform a comprehensive patient assessment, formulate and implement a treatment plan on at least 20 adult patients with dyspnea/respiratory distress.

The student should perform a comprehensive patient assessment, formulate and implement a treatment plan on at least 8 pediatric patients (including infants, toddlers, and school age) with dyspnea/respiratory distress.

The student must demonstrate the ability to perform a comprehensive assessment, formulate and implement a treatment plan for patients with syncope.

The student should perform a comprehensive patient assessment, formulate and implement a treatment plan on at least 10 patients with syncope.

The student must demonstrate the ability to perform a comprehensive assessment, formulate and implement a treatment plan for patients with abdominal complaints.

The student should perform a comprehensive patient assessment, formulate and implement a treatment plan on at least 20 patients with abdominal complaints (for example: abdominal pain, nausea/vomiting, GI bleeding, gynecological complaint, etc.)

The student must demonstrate the ability to perform a comprehensive assessment, formulate and implement a treatment plan for patients with altered mental status.

The student should perform a comprehensive patient assessment, formulate and implement a treatment plan on at least 20 patients with altered mental status.

TEAM LEADER SKILLS

The student must demonstrate the ability to serve as a team leader in variety of prehospital emergency situations.

The student should serve as the team leader for at least 50 prehospital emergency responses.