Department of
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Office of Construction & Facilities Management

designguide

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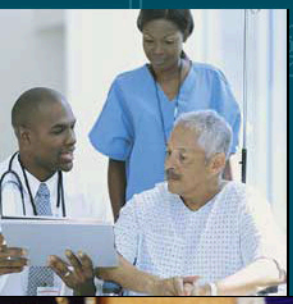
POLYTRAUMA REHABILITATION CENTER



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Foreword

The material contained in the Polytrauma Rehabilitation Center Design Guide is the culmination of a partnering effort within the Department of Veterans Affairs by the Veterans Health Administration and the Office of Construction & Facilities Management. The goal of this Design Guide is to facilitate the design process and to ensure the quality of VA facilities, while controlling construction and operating costs.

This document is intended to be used as a guide and to supplement VA Space Planning Criteria, other technical criteria, and related VA programs and policies for Polytrauma Rehabilitation. Use of this Design Guide does not preclude the need for a functional and physical design program for each specific project. It is the responsibility of the Project Architect and the Project Engineer to develop a complete and accurate project design that best meets the users' needs, applicable standards, and code requirements.

Lloyd H. Siegel, FAIA
Director
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Introduction

The Polytrauma Rehabilitation Center Design Guide is intended to be a graphic consolidation of new and existing Department of Veterans Affairs standards and criteria. It contains data from the following sources:

1. Standards and Criteria Sources
    a. Master Construction Specifications PG-18-1
    b. Construction Standards H-18-3
    c. Standard Details PG-18-4
    d. Equipment Guide List PG-7610
    e. List of Equipment symbols PG-18-6
    f. Space Planning Criteria PG-7610
    g. Barrier-Free Design Handbook H-18-13
    h. Room Finish and Door Hardware Schedule
    i. PG-18-14
    j. Various Technical Criteria (Design Manuals)pertaining to Architectural, HVAC, Plumbing, and Electrical
    k. Consensus information from various VA medical centers

The Design Guide refers to the above mentioned sources when data is either too detailed or too broad to be included in this guide. The Design Guide for Polytrauma Rehabilitation Center was developed as a design tool to assist the medical center staff and the contracting officers in better understanding the choices that designers ask them to make, and to help designers understand the functional requirements necessary for proper operation of Inpatient, Outpatient, and Transitional Polytrauma Rehabilitation.

The Guide Plates contained in the Polytrauma Rehabilitation Center Design guide are intended as illustrations of VA's furniture, equipment and personnel space needs. They are not meant to limit design opportunities. This Design Guide is not intended to be project specific. While it does contain the vast majority of department / program specific spaces required in a Polytrauma Rehabilitation Center, it is not possible to foresee all future requirements. Additionally, the Design Guide does not include every room listed in the Space Planning Criteria (PG-7610). The project-specific space program is the basis for an individual project design. It is important to note that the guide plates are a generic graphic representation only. Equipment manufacturers should be consulted at time of design to ensure specific dimensions and utility requirements.

Use of this Design Guide does not supersede the project architect's and engineers' responsibilities to develop a complete and accurate design that meets the user's needs and the appropriate code requirements.

Glossary

Adjacency Matrix:	A diagram illustrating the relative proximity of each workspace to other workspaces
Americans with Disabilities Act (ADA)	Legislates access for disabled persons in most privately owned buildings or businesses that serve the public
Assignable Space:	A measurement of space attributable to a distinct function or service including support areas and intradepartmental circulation. Defines Net Square Feet
Bay:	The space in a building generally bounded by four columns.
Case Mix:	Case Mix categorizes patients into statistically and clinically homogenous groups based on the collections of clinical and administrative data. Adjusting for patients of different levels of acuity forms the basis for healthcare organization comparisons and case mix adjusted resource utilization
Certificate of Need (CON)	Certificate of Need (CON) is a formal statement that a health care facility, medical equipment purchase, or new medical or expanded service is needed, or that a reduction or termination in service will not have an adverse affect on health care access.
Circulation Area:	Entrances, vestibules, (interdepartmental) corridors, passages, elevators, escalators, stairs, etc; included in gross areas and excluded in net areas.
Correlated Color Temperature (CCT):	Describes the degree to which a color appears warm (reddish), neutral or cool (bluish) and is measured in Kelvin (K).
Departmental Gross Square Feet	The sum gross spaces in a department.
Footprint:	Describes the actual floor area for a function or activity; it does not include circulation space. Also refers to the building floor plate.
Gross Square Feet (GSF):	Total building gross areas measured from exterior faces of exterior walls.
Indoor Air Quality (IAQ):	Refers to the quantitative level of contaminations in the air as well as the qualitative level of satisfaction of those exposed to the air. Standards for acceptable IAQ have been developed by the U.S. Environmental Protection Agency.

Glossary

Layout:	A floor plan showing the specific placement of walls, doors, furniture, and equipment.
Leadership in Energy and Environmental Design (LEED™)	LEED™ includes a rating system for building design as well as professional accreditation for people working in the design and building industry.
Mechanical Area	Main boiler room and other mechanical and electrical areas: included in gross areas and excluded in net areas.
National Fire Protection Association (NFPA):	Produces a code used in many jurisdictions to define fire protection requirements of building codes.
Net Area:	The area of rooms or spaces as measured from inside wall to inside wall and assigned to functional use by occupants.
Net-to-Gross:	A measure of the ration of assignable space to total space in a building: typically expressed as a percentage.
Nurses' Station:	Location at which nursing staff traditionally performs charting and related activities throughout the day.
Off-gassing:	The release of chemicals from non-metallic substances used in construction or furnishing. Off-gassing compromises indoor air quality (IA). Common sources of off-gassing included interior-grade pressed wood materials and synthetic furnishing such as carpeting.
Resident Bed Room:	A room in the facility licensed for one or more patient beds.
Residential Model:	Design philosophy based on incorporating home like elements while minimizing institutional aspects.
Responsible Design:	Architecture that respects the natural environment and integrates it into building design, addresses the health of individuals and community, and is sensitive to the cultural context of the site.
Site:	The land parcel on which the building(s) sits or will be built. It includes the grounds, driveways, and walkways associated with the building(s).

Glossary

Uninterruptible Power Supply (UPS):	Generators, batteries, and/or associated equipment that provide continuous electrical power, preventing power loss to critical functions that rely on absolute continuity of service.
United States Green Building Council (USGBC)	The United States Green Building Council is a national coalition of leaders in the building industry that developed the LEED™ system.
Veterans Integrated Service Network (VISN):	The VA healthcare system consists of 21 integrated networks across the US and Puerto Rico that are focused on pooling and aligning resources to better meet local health care needs and provide greater access to care.

Abbreviations

A	Amps
ABA	Architectural Barriers Act
AC/HR	Air Changes per Hour
ADA	Americans with Disability Act
ADAAG	ADA Accessibility Guidelines
AHJ	Authority Having Jurisdiction
AIA	American Institute of Architects
ANSI	American National Standards Institute
AR	As Required
BOMA	Building Owners and Management Association
CAD	Computer Assisted Design
CARES	Capital Asset Realignment for Enhanced Services
CFM	Office of Construction & Facilities Management
CFM	Cubic Feet per Minute
CON	Certificate of Need
DAG	Design Advisory Group
EPA	Environmental Protection Agency
FC	Foot Candle
FTEE	Full Time Equivalent Employee
GRECC	Geriatric Research, Education and Clinical Center
GSF	Gross Square Feet
GSM	Gross Square Meters
HIPAA	Healthcare Insurance Portability and Accountability Act
HP	Horsepower
HPD	Hours per Day
HVAC	Heating, Ventilating and Air Conditioning
IAQ	Indoor Air Quality
IBC	International Building Code
JCAHO	Joint Commission on Accreditation of Healthcare Organizations
LB	Pound, Pounds

Abbreviations (cont'd)

LEED	Leadership in Energy and Environmental Design
LUX	Lumen Per Square Meter
MDS	Minimum Data Set
NFPA	National Fire Protection Association
NSF	Net Square Feet
NSM	Net Square Meters
NTS	Not to Scale
OBRA	Omnibus Budget Reconciliation Act (of 1987)
OSHA	Occupational Safety and Health Administration
OT	Occupational Therapy
PG	Program Guide
PRC	Polytrauma Rehabilitation Center
PT	Physical Therapy
RUG	Resource Utilization Group
RH	Relative Humidity
RT	Recreation Therapy
SF	Square Feet, Square Foot
SVH	State Veterans Home
SqM	Square Meters
TV	Television
UBC	Uniform Building Code
UFAS	Uniform Federal Accessibility Standards
UPS	Uninterruptible Power Supply
USGBC	United States Green Building Council
V	Volts
VA	Department of Veterans Affairs
VACO	Veterans Affairs Central Office

Abbreviations (cont'd)

VAMC	Veterans Affairs Medical Center
VHA	Veterans Health Administration
VISN	Veterans Integrated Service Network
VSO	Veterans Service Organizations
W	Watts

1.0. NARRATIVE

1.1. General Considerations

The Polytrauma Patient

The polytrauma (PT) patient has sustained multiple life-threatening injuries and disability at the same time requiring specialized intensive rehabilitation and coordination of medical care. Injuries are sustained during active duty service as the result of Improvised Explosive Device (IED) explosions and blasts. Traumatic Brain Injury (TBI) is a key component of the polytrauma injury and results in brain injury (mild, moderate, and severe), PTSD, pain, fractures, hearing loss, spinal cord injury, loss of vision, and burns. Due to the symptoms of the blast injuries, coordinated interdisciplinary care in provided to address cognitive, emotional and physical rehabilitation.

The varied pattern of severe and disabling injuries include, but are not limited to traumatic brain injury (TBI), amputation, visual and hearing impairment, spinal cord injury (SCI), musculoskeletal injuries, wounds and psychological trauma. In addition to a team of physiatrists or physicians who specialize in physical medicine and rehabilitation, specialists in surgery, neurosurgery, internal medicine, psychiatry, infectious disease, prosthetics, orthotics, and spinal cord injury as part of the day-to-day planning and patient care. Physiatrists lead an interdisciplinary rehabilitation team consisting of physical therapists, occupational therapists, speech therapists, rehabilitation nurses, kinesiotherapists, vocational therapists, social workers, neurophysiologists, psychologists, advance nurse practitioners, wound care nurses, respiratory therapists, recreational therapists, rehabilitation counselors, military liaisons, chaplains, blind occupational therapy case managers, physical therapy amputee case managers, social worker case managers, education specialist and veteran benefit specialist. Each one of these medical specialties and health care disciplines has specialized expertise in caring for the polytrauma patient and family and are essential to ensuring the comprehensive care results in optimal outcomes.

Due to the nature of the injuries sustained and the length of time required for rehabilitation, the polytrauma patient has extended hospital stays. Treatment is provided in the acute inpatient, outpatient, and transitional setting. Patients can be expected to access the polytrauma network of care in an outpatient setting for many years post injury.

The Polytrauma Patient's Family

When patients sustain Polytrauma, the entire family is affected. The family experiences multiple stressors including often being away from home and support systems, caring for children and/or elderly parents and possible job loss or financial strain due to the length of time away. The need for adequate family space within the inpatient room and on the inpatient floor is supported by the extensive role the family plays in recovery and long-term care of the patient.

Unlike a typical med-surg patient, the polytrauma patient will typically require long-term assistance from family members for activities of daily living (ADL). The family member acts as an extension of the medical staff by assisting with ADLs as they participate in the patient's care. Oftentimes the family will spend much of the day (and night) in the inpatient room for fear of leaving the patient alone.

Research also indicates the need for "decompression" areas that allow the family to leave the patient room, yet remain on the unit. These areas can also be utilized for family counseling as the family dynamics are drastically changed when family member suffers a brain injury.

The Polytrauma Interdisciplinary (Medical) Team

The Polytrauma Rehabilitation of Care system is comprised of the **Polytrauma Rehabilitation Center (PRC).** A PRC provides comprehensive interdisciplinary rehabilitation and coordinates complex medical, surgical, and mental health care, as well as long-term follow-up. The individual with overall responsibility and authority in the care of patients identified within the medical system with Polytrauma is the **PRC Medical Director.** The PRC Medical Director is a board-certified or board-eligible Physical Medicine and Rehabilitation (PM&R) physician or a board-certified or board-eligible physician in another medical specialty with at least two years of experience in rehabilitation of brain injury, amputation and other complex impairments.

An essential component to the PRC system of care is the **Admission and Follow-up Clinical Case Management.** The clinical case managers provide clinical case management of referrals and follow-up for the ongoing rehabilitation plan of care after discharge. Individuals assigned to this function require knowledge and clinical reasoning skills necessary to review the medical status of the patient, identify all of the current medical problems, evaluate the acuity level, assess factors surrounding readiness for inpatient rehabilitation, and monitor patient status until transfer is completed. The clinical case manager makes recommendations for alternative care settings when appropriate. The clinical case manager organizes the rehabilitation health care services that promote optimal outcomes for patients. This includes assessing patients' strengths, challenges, prognosis, functional status, goals, and needs for specific services and resources, and developing a plan that identifies short- and long-term goals. Additional responsibilities may include coordinating resources to implement the plan and evaluation of the effectiveness and appropriateness of the services provided throughout the entire spectrum of care.

Polytrauma injuries and care create a dramatic change in the lifestyle and family interactions of the patients. For this reason, a strong component of the program is **Social Work Case Management.** In collaboration with the clinical case management, the PRCs provide social work case management services for all patients and their families. VHA Directive 2005-017, Social Work Case Management in Polytrauma Centers, provides additional guidance on the provision of these case management services. Social work case management differs from clinical case management in that the social worker case manager addresses the psychosocial needs of the patient, advocates for the patient and family, provides supportive services for the family and caregivers, and addresses home

and community environment issues. A social worker case manager conducts a comprehensive psychosocial assessment, which includes review of cultural issues, patient support systems, family and caregiver support systems, financial and vocational status, and the living situation. In partnership with the clinical case manager, patient, and family, the social worker case manager develops treatment and discharge plans and provides ongoing case management services including post-discharge. The social worker case manager may provide clinical services, such as individual and family counseling and grief counseling. The social worker case manager contacts the patient or family prior to transfer to answer questions they may have and to assist with the transition. Social worker case management services continue through the rehabilitation process and post-discharge, providing assistance with transitions to the referring military treatment facility (MTF) or other VHA facility, or to the home and community.

PERSONNEL DESCRIPTION	**Full-time Equivalent (FTE)**
Rehabilitation Physician	1
Nurse Manager	1
Registered Nurse (2.0 must be Certified Rehabilitation Registered Nurse (CRRN)	11
Licensed Practical Nurse and/or Certified Nursing Assistant	8
Nurse Educator	1
Clinical Nurse Leader (CNL)**	1
Admission and Follow-up Nurse Case Manager	1
Social Worker	3
Speech-Language Pathologist	3.0
Physical Therapist	3.5
Occupational Therapist	3.5
Recreation Therapist	2
Neuropsychologist	1
Counseling Psychologist	1
Family Therapist	1
Neuropsychologist	1
Blind Rehabilitation Outpatient Specialist	1
Certified Prosthetist	1
Certified Driver Trainer	1
Program Administrator	1
Program Assistant	1

Table 1.1

REQUIRED* CORE DEDICATED STAFFING PER TWELVE BEDS FOR EACH POLYTRAUMA REHABILITATION CENTER

* Variances from the staffing model will have to be approved by the Physical Medicine and Rehabilitation Service Program Office.
** The CNL is a mandated position for all patient care settings in all VAMCs by 2016 and the rapid implementation of this role in the polytrauma network is a high priority. Office of Nursing Service will assist sites as needed with the implementation.

Audiology
Clinical Nutrition
Clinical Chaplain
Clinical Pharmacy
Dentistry and/or Oral and Maxillofacial Surgery
Driver Training
Ear, Nose, and Throat (ENT)
Gastroenterology
General Medicine
General Surgery
Infectious Disease
Neurology
Neuroophthalmology
Neurosurgery
Optometry
Orthopedic Surgery
Plastic Surgery
Psychiatry
Post-traumatic Stress Disorder (PTSD) Clinic Team
Pulmonary
Radiology
Urology
Vocational Rehabilitation

Table 1.2

DEDICATED CONSULTATIVE SERVICES RECOMMENDED AT EACH MEDICAL CENTER WITH A POLYTRAUMA REHABILITATION CENTER

The Polytrauma Interdisciplinary (Medical) Team consists of the medical team devoted to the care and rehabilitation of the Polytrauma patient. The Each Medical Center Director is responsible for ensuring all polytrauma patients are initially referred to the VA Polytrauma Center or SCI Center in their respective referral region.

The respective medical center Director at each of the four facilities with a PRC is responsible for facilitating transfers of care between MTFs and the PRC; ensuring that

medical center leadership is a visible participant in the admission and hospital stay, recognizing the importance of the service these individuals have provided to their country; meeting environmental and staffing requirements for the PRC; provision is made for patients with polytrauma to have basic medical and primary care, and emergent medical and surgical care; and facilitating access to the next appropriate level of care, e.g., transition of care back to the MTF, or transition of care to the VHA facility closest to the service member's home with the capability of meeting care needs.

The Chief of Staff (COS) at each of the Four Facilities with a PRC at each of the Four Facilities with a PRC is responsible for ensuring availability of a PM&RS staff physician 24 hours a day, 7 days a week; establishing local policy to ensure that a multidisciplinary assessment is performed immediately upon admission and an interdisciplinary treatment plan is documented. Medical and surgical specialty services (e.g., physical medicine and rehabilitation, surgery, psychiatry, medicine, orthopedics, infectious disease, etc.) are essential and to be involved in the pre-admission assessment of patients with polytrauma.

The Chief Nurse Executive (CNE) at each of the Four Facilities with a PRC is responsible for ensuring availability of nursing and other assigned program services 24 hours a day, 7 days a week. Collaborating with the COS to ensure that results and recommendations of multidisciplinary evaluations and interdisciplinary treatment are documented in the patient's medical record is crucial to the interdisciplinary nature of care provided to Polytrauma patients.

1.1.1. General Trends in Polytrauma Rehabilitation Center Design

The specialized Polytrauma Rehabilitation Center (PRC) is designed to provide the full range of care for patients who have sustained polytraumatic injuries requiring a comprehensive interdisciplinary rehabilitation, medical care and coordination of emotional, cognitive and emotional care.

The purpose of the PRC is to concentrate the specialty trained staff and resources required in an environment dedicated to the unique needs of the polytrauma patient. Polytrauma patient care goals include the initial rehabilitation, additional outpatient rehabilitation, proactive case management, telehealth, and long term follow-up. This care occurs in three phases and the PRC designs provided for the differing needs.

1. Admission criteria (ref. VHA Handbook 1172.1) include:
    a. The individual with polytrauma is an eligible veteran or an active duty military service member; and
    b. The individual has sustained multiple physical, cognitive, and/or emotional impairments secondary to trauma; and
    c. The individual has the potential to benefit from inpatient rehabilitation; or
    d. The individual ahs the potential to benefit form a transitional community re-entry program; or
    e. The individual requires an initial comprehensive rehabilitation evaluation and care plan.

2. Inpatient Care

Due to the medical complexity of the patients the inpatient care provided to the PRC patient is a 24 hours per day program coordinated by a multidisciplinary team. This team identifies and addresses medical and rehabilitation needs associated with the initial blast injury of the patient. Average length of stay for a PRC Inpatient is currently 48 hours.

The physical design of the inpatient program is patient and family centered. The units are designed to increases staff efficiency and create a safe, supervised and structured environment. The goal is to closely monitor patients for safety, while still allowing them access around the unit.

Inpatient units have therapy gyms, as well as smaller, less stimulating therapeutic areas, including activity rooms, and "Quiet rooms" in which individual therapy or co-treatments (more than one therapeutic discipline providing treatment simultaneously) can be provided without distraction. The goal is to provide the least restrictive and most home-like environment possible.

3. Transitional Care

The Polytrauma Transitional Rehabilitation Program (PTRP) provides comprehensive, post-acute cognitive retraining and community re-entry rehabilitation to TBI patients. The program lasts an average range of 3 to 6 months, but continues as long as the patient is making significant progress. Most rehabilitation treatment takes place in a group setting; however, all patients receive one-on-one therapy as needed. As the patient prepares to leave the Program, vocational rehabilitation services, work preparation, or school activities are supported by the staff and other members of the rehabilitation team.

Care Coordinators work closely with their assigned patients throughout the rehabilitation process to ensure they are getting every treatment necessary to make the fullest recovery possible. These Coordinators conduct follow-up assessments for patients after their discharge for a minimum of one year to support a seamless transition to home, work, school, or a return to active duty.

4. Outpatient Care

Outpatient treatment maintains the continuum of care from the inpatient stay and is the point of entry into the system for patients with delayed onset of TBI symptoms. The outpatient care component of the PRC is a separate level of care than Transitional Care and is utilized by individuals living and working in their communities. The physical facilities required for the delivery of outpatient care are minimal, in support of utilizing PM&R resources within the hospital.

The Outpatient Program is a combination of multiple individual patient programs, not a prescribed day treatment model. It is a process of improvement, often of adjustment, uniquely designed and delivered for each patient based on individual medical, functional and clinical needs. Outpatients commute from home and typically attend visits with family members. The overall goal is multidisciplinary outpatient treatment coordination in support of patient independence in the community.

1.1.2. Codes, Standards and Executive Orders

VA functions as the Authority Having Jurisdiction (AHJ) for all VA facilities and projects and has the responsibility to guard public health and safety through enforcement of its adopted codes. VA is not subject to enforcement of local and state codes.

Local authorities should be notified about planning projects and given the opportunity to review drawings. Although there are exceptions, formal drawing reviews, building permits, inspections and fees do not generally apply to Federal facilities.

Design, construction, renovation and installation of all VA Polytrauma Rehabilitation Centers must be in accordance with this document and with the latest editions and/or revisions of all applicable codes and standards. The more stringent code and/or standard are to be applied to VA facilities. Nothing in this Design Guide should be construed as authorization or permission to disregard or violate local and legal requirements.

1.2. Functional Concepts

1.2.1. Operations: Services

1. Scope of Services

PRCs provide specific inpatient, transitional, and outpatient rehabilitation tailored to individual patterns of impairment sustained in the trauma as well as management of associated conditions through consultation with other specialties, as necessary. These programs include, but are not limited to:

2. Comprehensive Interdisciplinary Inpatient Evaluations

The PRCs offer short-term admissions to inpatient rehabilitation for comprehensive interdisciplinary evaluations for patients with varying levels of acuity and severity. A patient at any level on the Rancho Los Amigos Level of Cognitive Function Scale may be appropriate for admission. These evaluations help determine the range and types of services needed to manage the full scope of medical, rehabilitation, and psychosocial symptoms resulting from combat injury and the most appropriate setting in which to deliver those services. Members of the IDT administer a variety of assessment instruments and then meet as a group to integrate results and recommendations. Suggestions for optimal care settings vary depending upon the extent and severity of injury, family and institutional support, and availability of services in the community.

3. Acute Comprehensive Interdisciplinary Inpatient Rehabilitation

Acute comprehensive interdisciplinary inpatient rehabilitation is a highly-specialized level of care designed to treat patients as soon as they are sufficiently medically stable to tolerate initial rehabilitation programming. The primary emphasis is to provide intensive interdisciplinary rehabilitation services in the early months after the injury. The focus of acute rehabilitation is on cognitive, physical, emotional, and behavioral improvement. Goals include: increased cognition, self-awareness, functional communication, mobility,

psychosocial skills, activities of daily living, productive activity, and preparation for home and community. The treatment program is goal-oriented with a focus on practical life-skills training, individualized and cost-effective treatment, and patient and family education, support, and preparation. Patients remain in acute rehabilitation until goals are met or maximal improvement is realized.

4. Transitional Community Re-entry

Patients at high-levels of cognitive function who have progressed beyond the need for basic rehabilitation interventions may be admitted for high-level cognitive rehabilitation, advanced gait training, advanced prosthetic training, vocational evaluation, evaluation for return to school, and other transitional or community re-entry programming.

5. Outpatient Interdisciplinary Rehabilitation

The PRCs provide individualized, coordinated, and outcome focused outpatient services including medical support, therapy services, education, and psychosocial treatment and support to patients who live in their local service areas.

6. Reevaluations

Reevaluations at a PRC are available as needed. These interdisciplinary reevaluations of polytrauma patients are an important component of the continuum of care for patients sustaining severe injury and disabling impairments. In some instances, use of telerehabilitation technology may be appropriate.

7. Ongoing Case Management and Follow-up

Ongoing clinical and social work case management services are provided to patients requiring continued rehabilitation services. These services involve acting as the point of contact for emerging medical, psychosocial, or rehabilitation problems; managing the continuum of care; care coordination; acting as patient and family advocate; and assessing clinical outcomes and satisfaction. The assigned clinical and social work case managers make proactive regular and routine contacts with the patient and family as long as active treatment goals remain.

8. Consultation

The PRCs serve as consultants to the VA system, the military health care system, and non-VA care providers. Their staff reviews patient records, provides recommendations for care, assists with identifying an appropriate care setting, and provides continued support as needed. Consultation through telerehabilitation is also available.

1.2.2. Operations: Concepts, Classification of Polytrauma Symptoms

Combat injuries are often the result of a blast. Blasts cause injuries through multiple mechanisms. Severe blasts can result in total body disruptions and death to those closest to the blast site or they can result in burns and inhalation injuries. Blast injuries typically

are divided into four categories: primary, secondary, tertiary, and quaternary or miscellaneous injuries.

1. Primary Blast Injuries

Primary blast injuries are caused by overpressure to gas-containing organ systems, with most frequent injury to the lung, bowel, and inner ear (tympanic membrane rupture). These exposures may result in traumatic limb or partial limb amputation.

2. Secondary Blast Injuries

Secondary blast injuries occur via fragments and other missiles, which can cause head injuries and soft tissue trauma.

3. Tertiary Blast Injuries

Tertiary blast injuries result from displacement of the whole body by combined pressure loads (shock wave and dynamic overpressure).

4. Miscellaneous Blast-related Injuries

These are miscellaneous blast-related injuries such as burns and crush injuries from collapsed structures and displaced heavy objects. Soft tissue injuries, fractures, and amputations are common.

Animal models of blast injury have demonstrated damaged brain tissue and consequent cognitive deficits. Indeed, the limited data available suggests that brain injuries are a common occurrence from blast injuries and often go undiagnosed and untreated as attention is focused on more “visible” injuries. A significant number of casualties sustain emotional shock and may develop PTSD. Individuals may sustain multiple injuries from one or more of these mechanisms. Explosions can produce unique patterns of injury seldom seen outside combat.

System or Organ	Injury or Condition
Auditory or vestibular	Tympanic membrane rupture, ossicular disruption, cochlear damage, foreign body, hearing loss, distorted hearing, tinnitus, earache, dizziness, sensitivity to noise.
Eye, orbit, face	Perforated globe, foreign body, air embolism, fractures.
Respiratory	Blast lung, hemothorax, pneumothorax, pulmonary contusion and hemorrhage, atrioventricular fistula (source of air embolism), airway epithelial damage, aspiration pneumonitis, sepsis.
Digestive	Bowel perforation, hemorrhage, ruptured liver or spleen, mesenteric ischemia from air embolism, sepsis, peritoneal irritation, rectal bleeding.
Circulatory	Cardiac contusion, myocardial infarction from air embolism, shock, vasovagal hypotension, peripheral vascular injury, air embolism-induced injury.

Central nervous system	Concussion, closed or open brain injury, petechial hemorrhage, edema, stroke, small blood vessel rupture, spinal cord injury, air embolism-induced injury, hypoxia or anoxia, diffuse axonal injury .
Renal and/or urinary tract	Renal contusion, laceration, acute renal failure due to rhabdomyolysis, hypotension, hypovolemia.
Extremity	Traumatic amputation, fractures, crush injuries, burns, cuts, lacerations, infections, acute arterial occlusion, air embolism-induced injury.
Soft tissue	Crush injuries, burns, infections, slow healing wounds.
Emotional or psychological	Acute stress reactions, PTSD, survivor guilt, post-concussion syndrome, depression, generalized anxiety disorder.
Pain	Acute pain from wounds, crush injuries, or traumatic amputations; chronic pain syndromes.

Table 1.3

Blast-Related Injury Table

Source: Centers for Disease Control and Prevention (CDC) Classification of Blast Injuries

Understanding blast injury as a common mechanism-of-injury for polytrauma patients helps guide assessments beyond the most obvious physical problem. Understanding common associated injuries guides a more comprehensive evaluation and care plan process to prevent more disabling conditions from arising in the future. Such a mechanism-of-injury-based approach to evaluation and treatment is more proactive and efficient and, ultimately, cost effective.

1.2.3. Space Planning and Design

1. Flexibility

The design of a PRC needs to respond to changing workloads, care objectives, and technologies such as wireless technologies for staff.

a. Spaces should be universally designed to accommodate a range of related functions.
b. Generic plans should be developed to respond to changes in use and assignment.
c. Special spaces need to be designed and grouped to accommodate a range of functions and to accommodate change if possible.

2. Efficiency

The design of a PRC should provide resources to accommodate increasing health care demands.

a. Support spaces, such as storage and utility rooms, should be designed to be shared where possible to reduce the overall need for space.
b. Functions with requirements, such as facility supply and transport areas, should be grouped or combined to achieve efficiency of operation.
c. Duplication of facilities should be minimized where limited resources are available.

3. User Needs

Patient dignity and respect for individuality should be accommodated while considering operational realities. Patient vulnerability to stress from noise, lack of privacy, poor or inadequate lighting and other causes, and the subsequent harmful effect on well being, are known and documented phenomena.

A key architectural objective should be to reduce emphasis on the institutional aspects of care and to surround the patient and family with furniture, furnishings and fixtures that are more homelike, i.e., residential and comfortable. Proper planning and design appeal to the spirit and sensibilities of both patients and care providers. A spirit of neighborhood or household should be encouraged.

PRC facilities need to be environments of healing that allow the building itself to be part of the therapeutic setting. The technical requirements to operate the building should be unobtrusive and integrated in a manner to support this concept.

Sufficient space should be allocated for equipment and supplies to avoid storing or parking of medical equipment including medication carts and assistive devices in public view, in corridors, or in showers. Patient privacy needs to be provided while encouraging socialization and other group activities.

Security, both from a patient and a facility perspective, needs to be addressed by planning, design and detail considerations.

Access needs to be provided by application of UFAS design standards to room and fixed equipment layouts.

1.3. Functional Diagrams

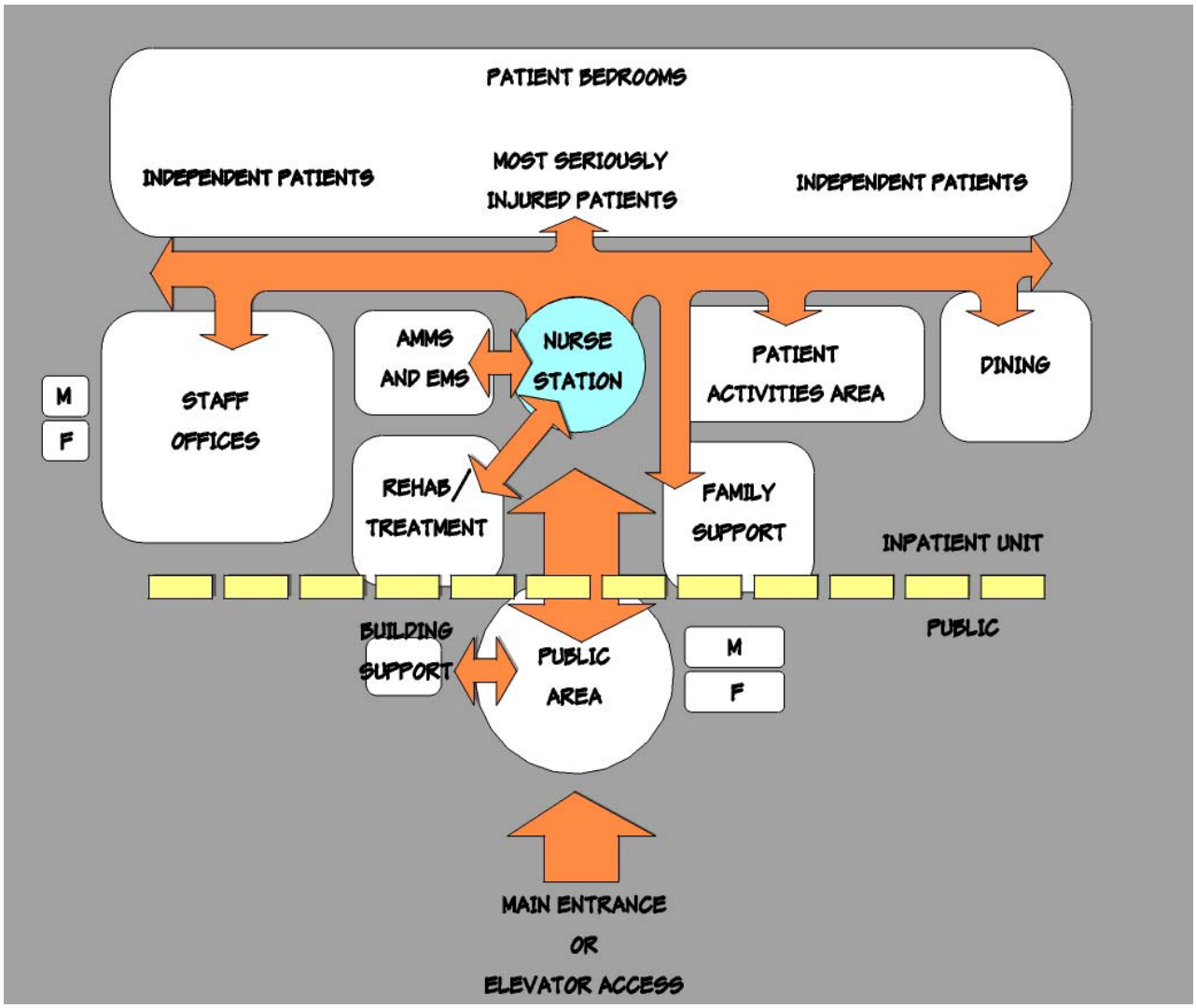

Figure 1.3.1

Inpatient Nursing Unit – Central Nurse Station

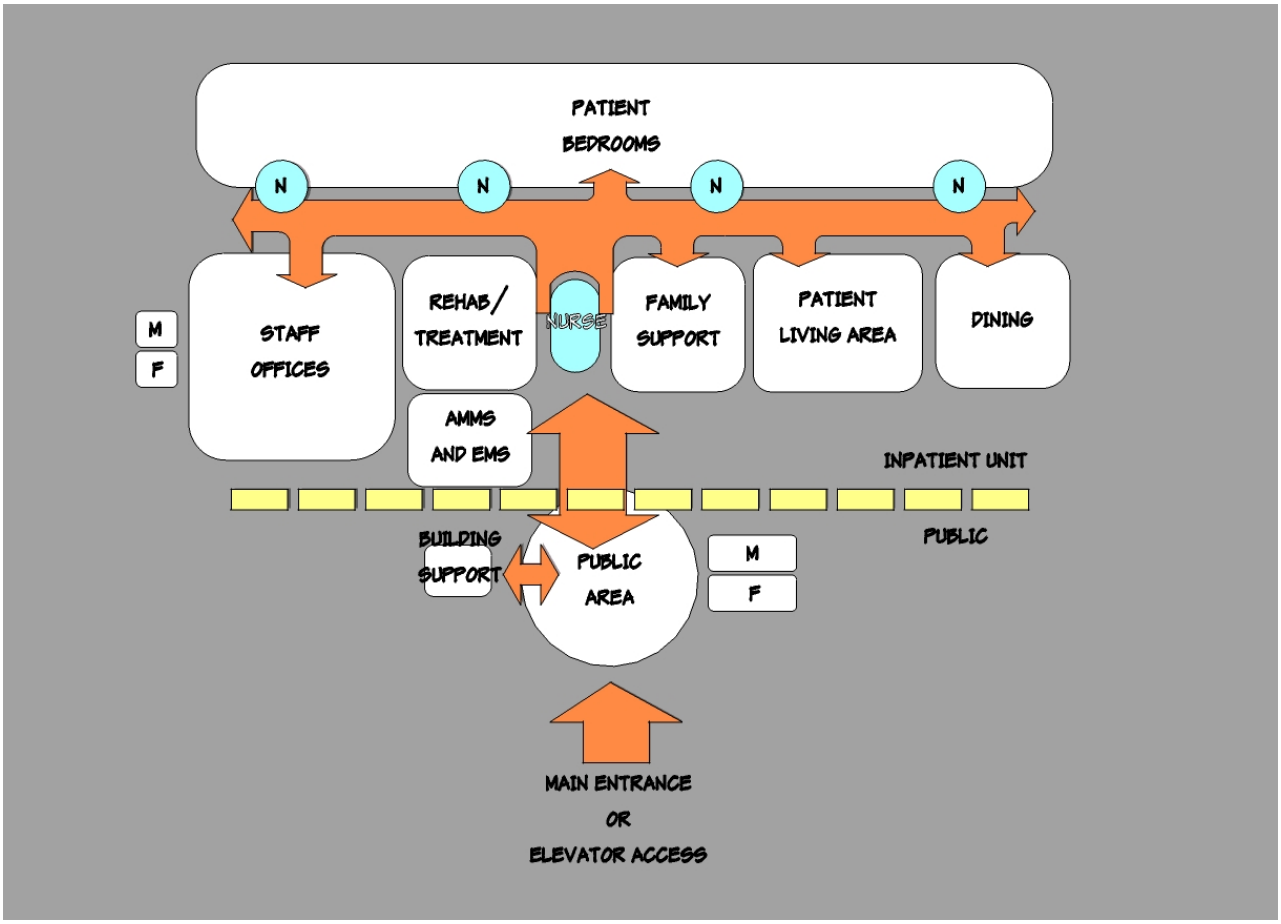

Figure 1.3.2

Inpatient Nursing Unit – Decentralized Monitoring Stations

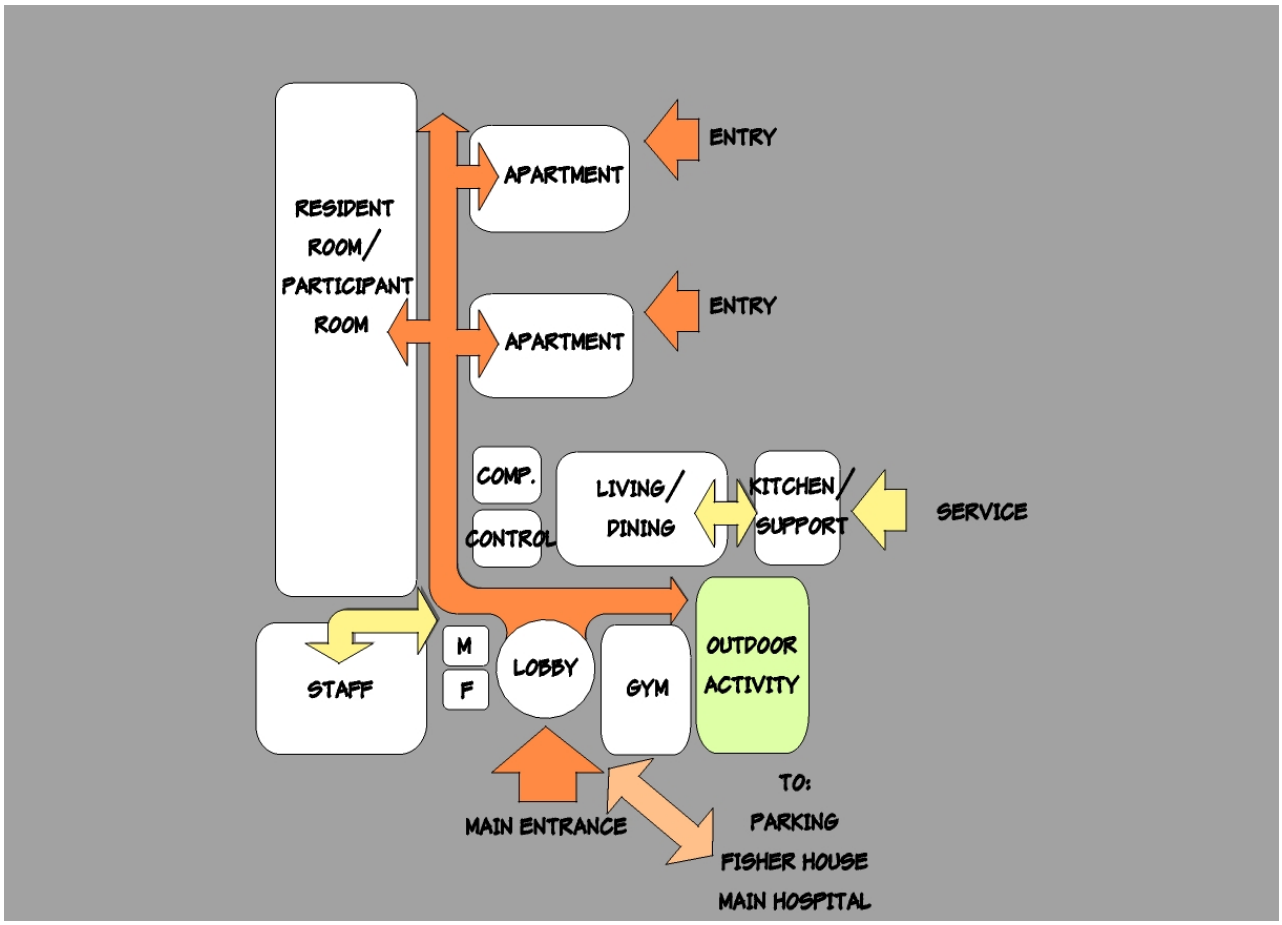

Figure 1.3.3

Transitional Rehabilitation Unit

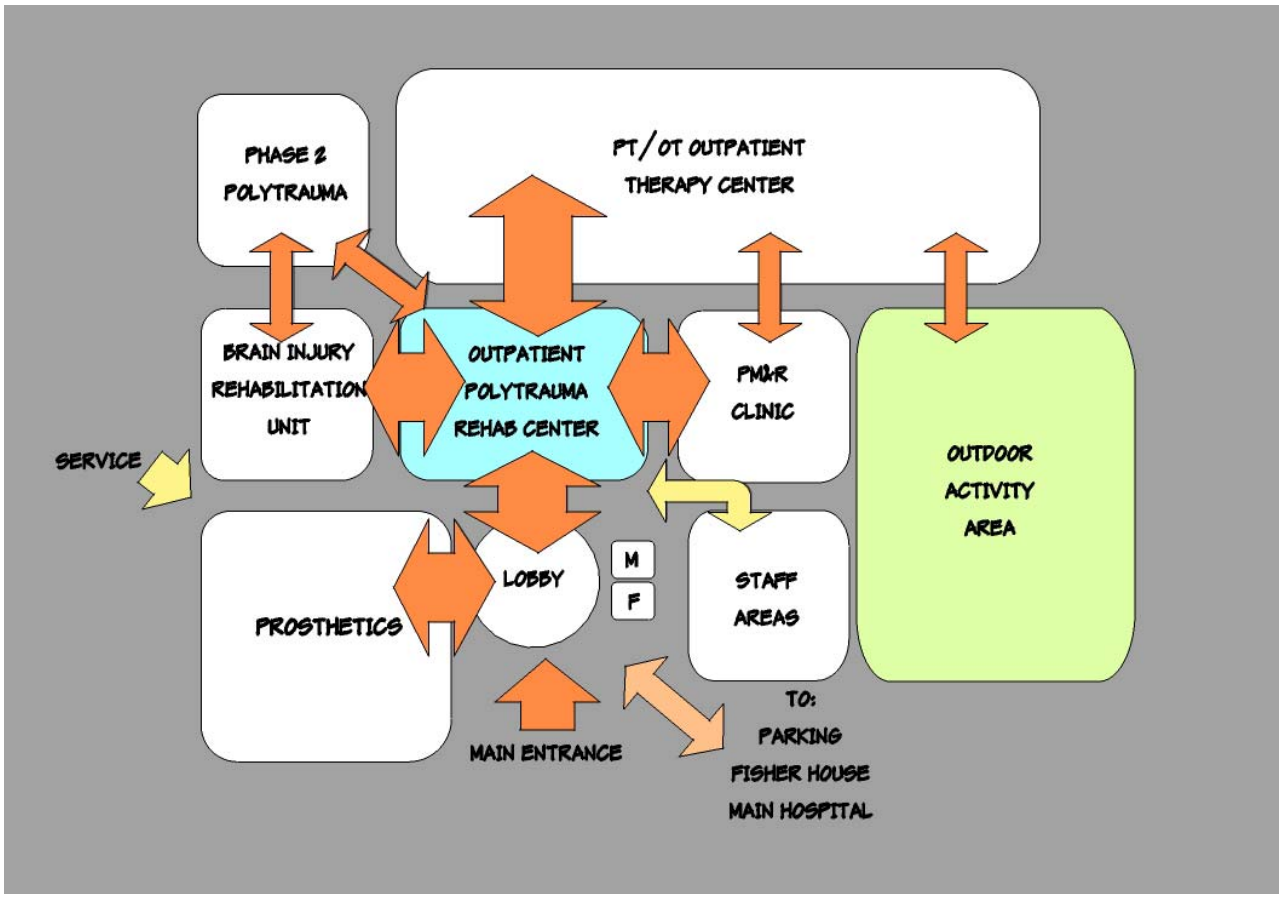

Figure 1.3.4

Outpatient Services

1.3.1. Functional Relationships

1. Work Flow

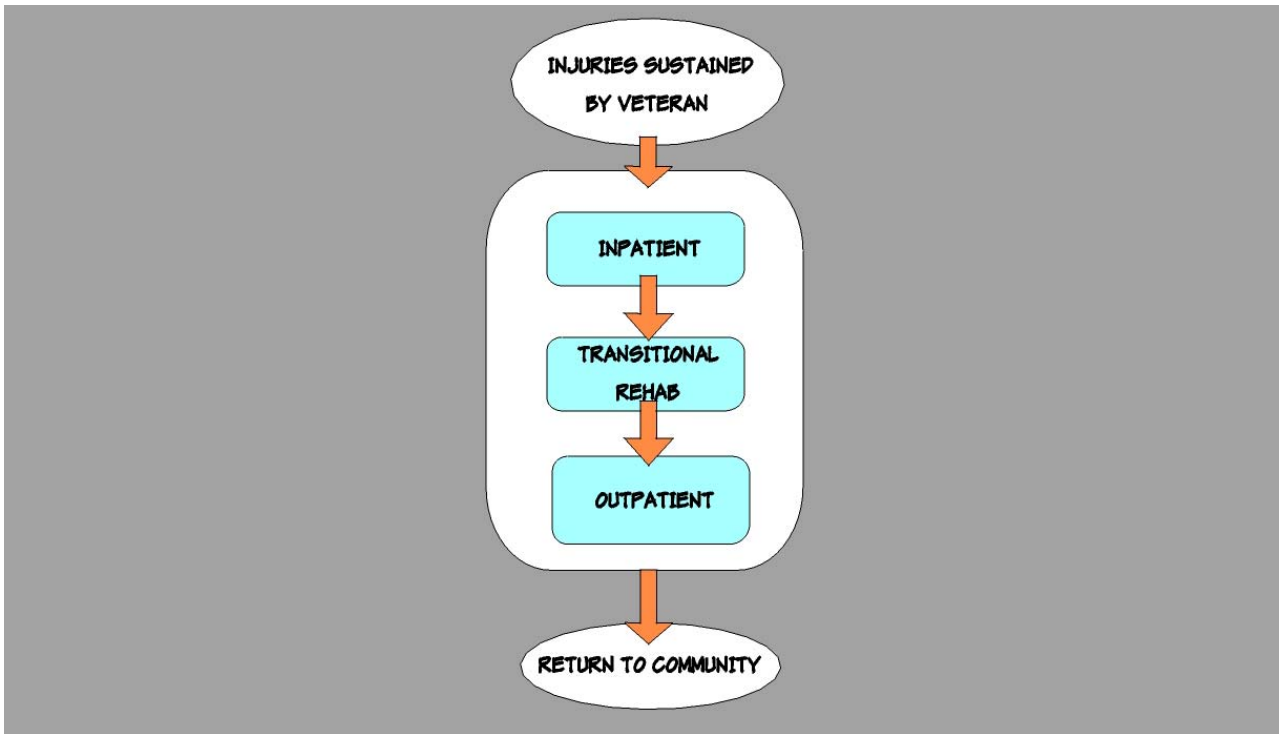

Figure 1.1

Work Flow Variation #1

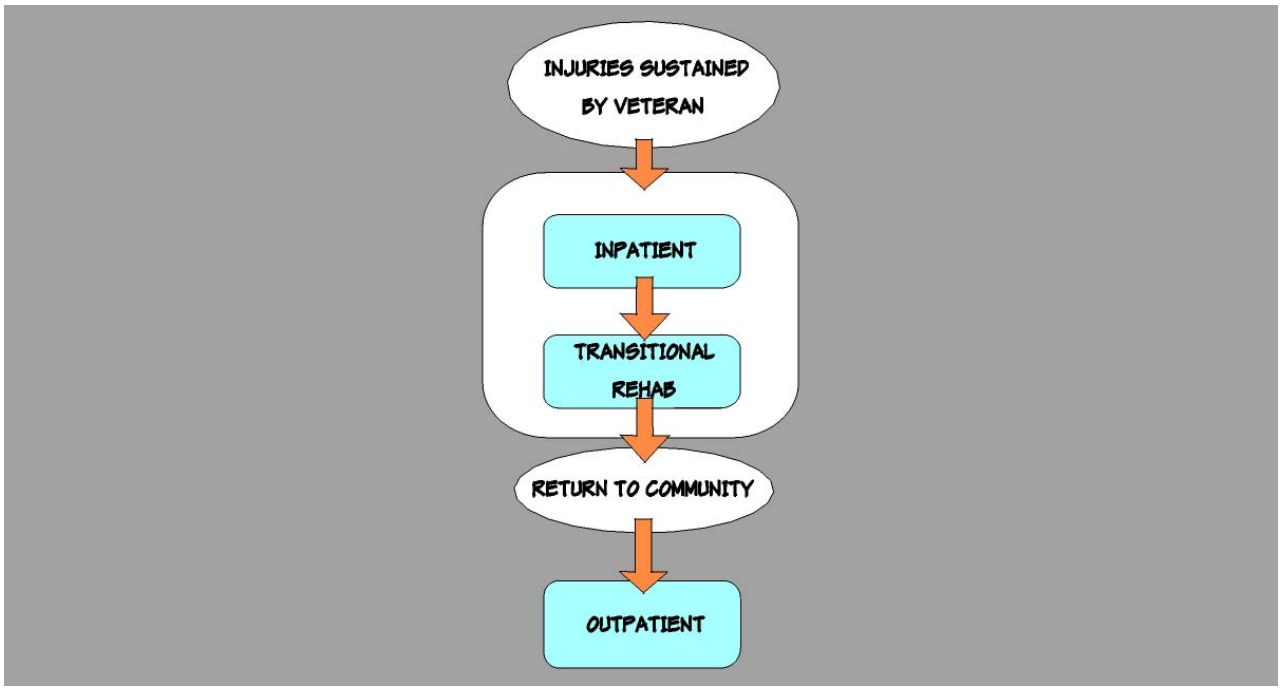

Figure 1.2

Work Flow Variation #2

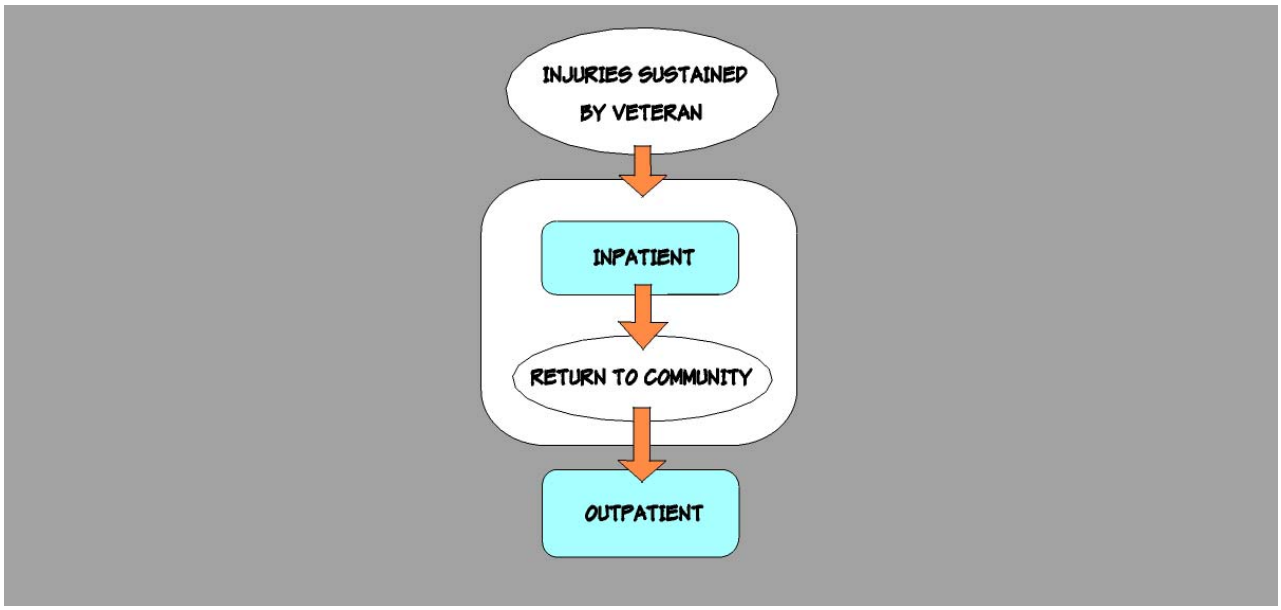

Figure 1.3

Work Flow Variation #3

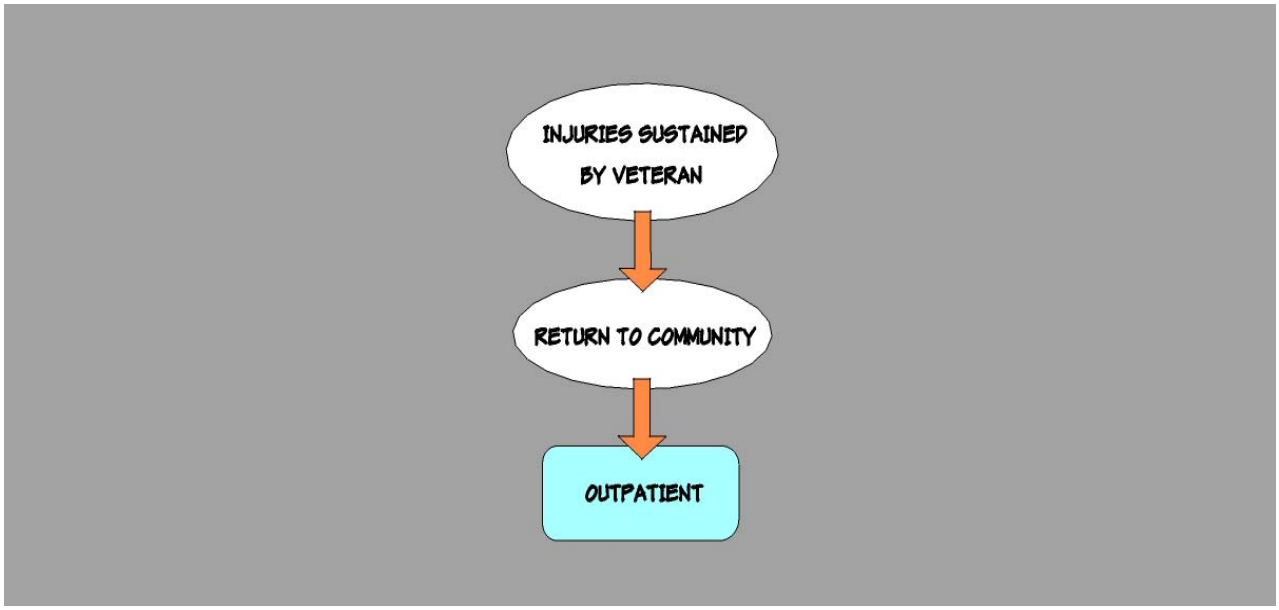

Figure 1.4

Work Flow Variation #4

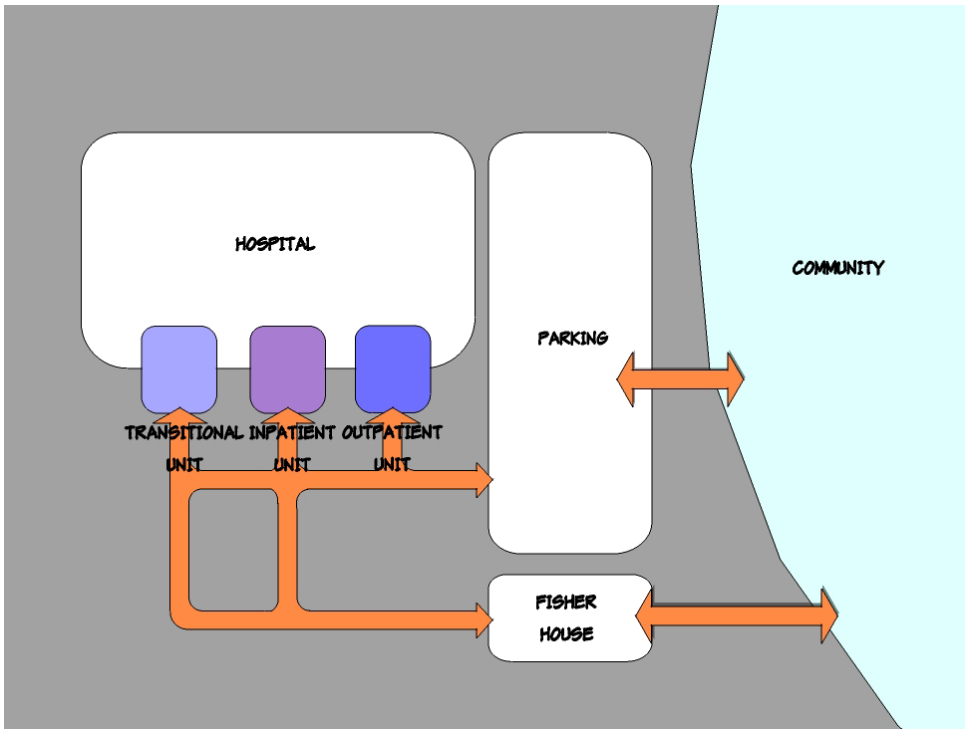

Figure 1.5

Overall PRC Diagram – Option 1

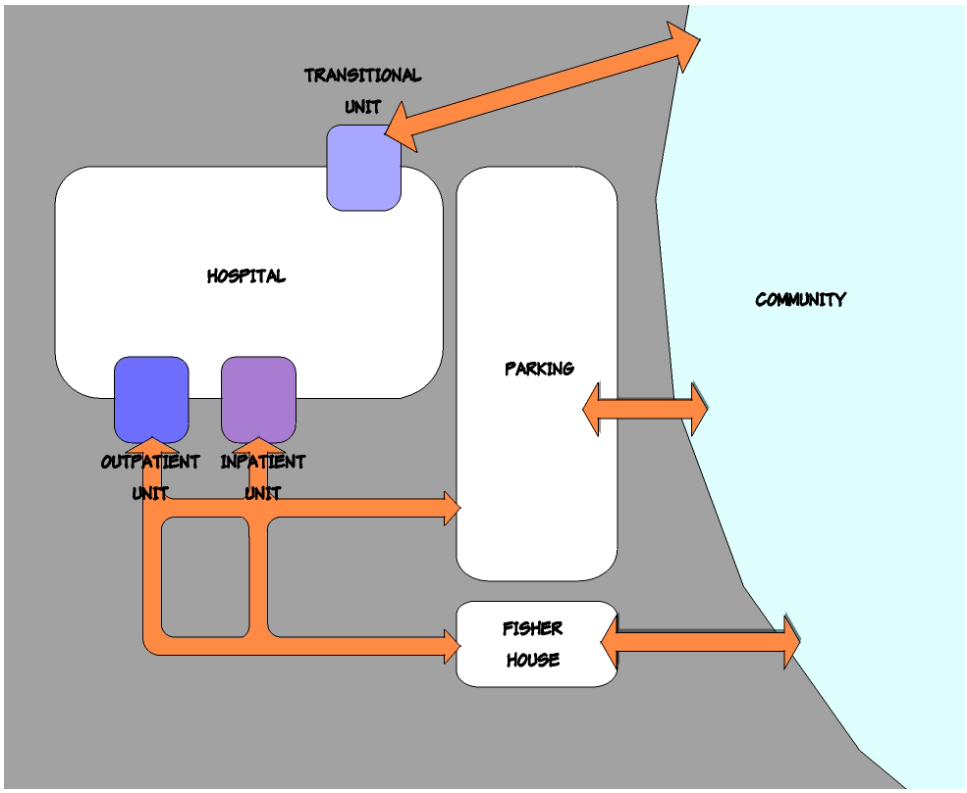

Figure 1.6

Overall PRC Diagram - Option 2

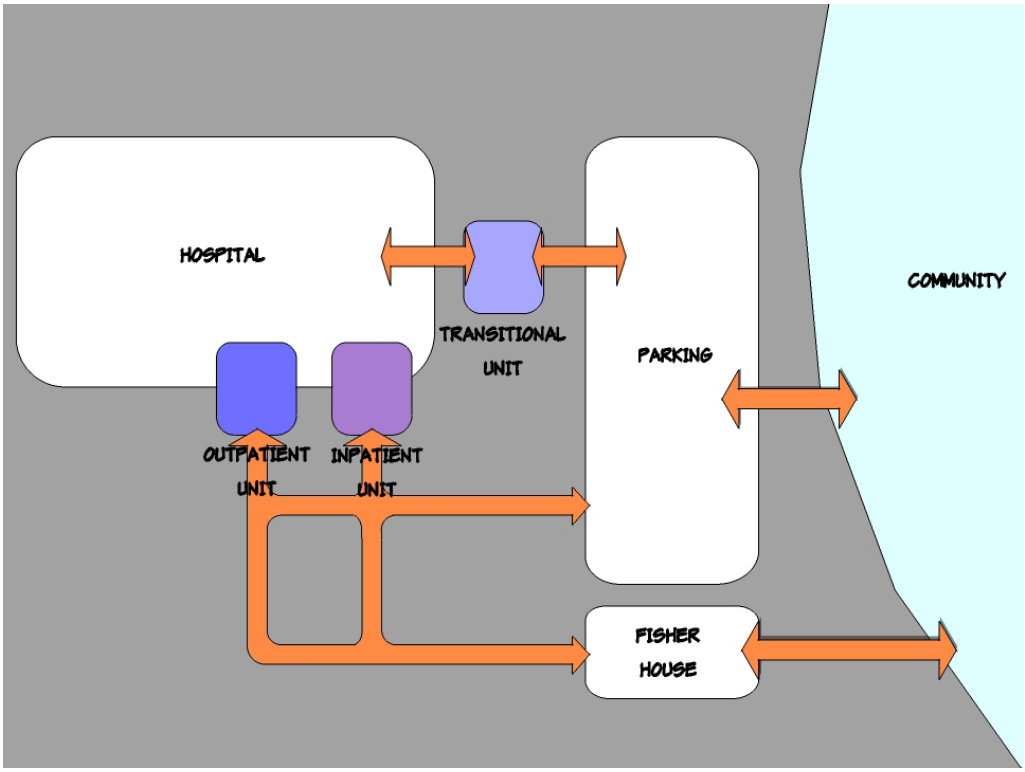

Figure 1.7

Overall PRC Diagram – Option 3

2. Organizational Concepts

Where possible, facility planning and design should follow a modular concept to promote flexibility, encourage construction efficiencies, and promote staff orientation.

3. Space Allocation

Net square footage requirements discussed and shown in guide plates are intended to be consistent with revisions to space planning criteria. Refer to Section 2.5 Guideplates, Reflected Ceiling Plans and Data Sheets.

1.4. Technical Considerations

1.4.1. Architectural

1. Partitions
Interior partitions primarily should be gypsum wallboard on metal studs that are either painted or wallpapered. Interior partitions around patient rooms should have sound attenuation features such as batts between studs. Other areas where significant noise may be generated also should have sound attenuation features.

2. Floors

Flooring should be readily cleanable and unaffected by germicidal cleaning solutions. In food consumption and preparation areas, floors should be water resistant.

Floors in patient, support and other areas at high risk for spread of infections should be of non-porous material other than carpet such as vinyl composition tile.

Floors in high-traffic areas such as offices and administrative service areas should be carpeted with a 4" [100 mm] high resilient base.

Floors in toilet/shower rooms and bathing suites should be non-slip, ceramic tile with a non-slip, ceramic tile base. Floors in medical exam rooms, therapeutic services and most other spaces should be vinyl composition tile with a 4" [100 mm] high resilient base.

3. Ceilings

Ceilings primarily should be lay-in acoustic ceiling tile installed in an exposed or semi-concealed suspension system.

4. Protection/Safety

Continuous handrails should be used within Inpatient and Transitional Rehabilitation hallways and other pathways. Wall and ceiling guard protection should be used in all areas subject to damage from cart or other service traffic.

5. Interior Doors and Hardware

Interior doors should be 1 ¾" [44 mm] thick, solid-core, flush-panel wood doors or hollow metal doors in hollow metal frames. Hollow metal doors should be used where high impact is a concern and where fire rated doors are required.

Interior door width for a typical patient rooms and toilet/shower rooms should be 48" [1220 mm]. Interior door width for special care patient rooms and toilet/shower rooms should be 48" [1220 mm]. Accessible hardware should be used throughout the PRC facility.

1.4.2. Structural

Executive Orders 12699 and 12941 require that all new and existing buildings constructed or leased by the Federal Government be seismically safe. The EOs require that nationally recognized building codes be used for the seismic design and construction of new buildings, and for the seismic safety assessment of existing buildings. For structural systems, International Building Code should be followed.

1.4.3. Equipment

1. Casework

Modular casework storage systems should be chosen for flexibility including the incorporation of dimensions for ease of multiple re-use applications. Casework systems should be integrated with space planning to avoid corner installations and filler panels.

2. Management Information Systems

Management Information Systems (MIS) should be planned and designed on an individual facility basis to meet needs. The amount of information that is assembled and distributed through MIS is increasing at a rapid rate and expansion to meet future needs should be considered.

3. Headwall Equipment Management Systems

The headwall requirements for the PRC Inpatient rooms are to follow the VA Guidelines for Inpatient Facilities. The Transitional Care Patient rooms will not require medical gasses or oxygen; rather only nursecall and reading light.

1.4.4. Heating, Ventilation and Air Conditioning

1. Operation

HVAC systems should be provided to heat, cool and ventilate individual rooms or areas as required to satisfy design criteria.

2. Capacities

Supply air volume should be established to meet the cooling load requirements of the occupied space. The supply volume should be modified to meet minimum air change requirements or to maintain proper space pressurization relative to room exhaust requirements.

3. Air Quality and Distribution

Typically, clean areas such as clean utility should have positive air pressure and soiled areas such as soiled utility, toilet/shower rooms and storage rooms should have negative air pressure with respect to adjoining areas.

Corridors should not be used to supply or to exhaust/return air from rooms. Corridor air may be used to ventilate toilets, housekeeping closets and small electrical or telephone closets opening directly on corridors.

HVAC design should minimize the short circuiting of air between supply and exhaust vents in rooms or areas.

4. Exhaust System

Exhaust systems should be designed to provide exhaust air to spaces to control the transfer of odors and provide proper room pressurization. Exhaust air and pressurization should be provided to match requirements for specific rooms
or areas as specified in facility design.

5. Seismic (implications)

Where required, earthquake resistant design should be used for HVAC systems in accordance with current codes and standards.

6. Noise Level

HVAC equipment and ductwork should provide resulting sound levels not to exceed 45 maximum NC levels in dining areas, 40 maximum NC levels in toilet/shower rooms, and 35 maximum NC levels in all other occupied spaces.

1.4.5. Plumbing

1. Water and Waste Systems

Plumbing service should be extended to the facility to serve the domestic hot and cold and fire protection systems.
The PRC facility's cold water should be piped to all required plumbing fixtures and equipment. Hot water should be piped to all required plumbing fixtures and equipment. A hot-water recirculation system should be provided.

Plumbing fixture types and flow restrictors should be in accordance with the most current version of the National Standard Plumbing Code (NSPC). Plumbing fixtures should comply with the most current version of ADA.

The facility's plumbing system should be drained by gravity through soil, waste and vent stacks. Medical waste should be drained through corrosion resistant piping into either a local or centralized acid dilution tank.

2. Medical Gas Systems

The PRC facility may be designed to accommodate either in-wall medical gases or portable equipment. Individual facilities should match patient needs for medical gases with the quantities and locations of medical gases during equipment planning.

3. Seismic (implications)

Where required, earthquake resistant design should be used for plumbing and medical gas systems in accordance with current codes and standards.

1.4.6. Electrical

1. Illumination

Lighting should comply with the Illuminating Engineering Society (IES) recommended levels. Natural light should be maximized and artificial light should be adequate for patients and staff.

Patient rooms should have as much natural light as possible from the outside; oversized windows to increase natural light and provide a “healing” view should be considered. General lighting, night lighting, and exam lighting are needed. A reading light should be provided for each patient. Reading light controls should be readily accessible to patients.

A minimum of one night light fixture in each patient room should be controlled at the room entrance. All light controls in patient rooms should be inaudible.

2. Power

General purpose duplex receptacles are typically provided on each wall of a room or area. Patient rooms and toilet/showers should have duplex, grounded receptacles.

Dedicated duplex or special receptacles are provided for selected pieces of equipment such as refrigerators, freezers and ice makers.

Staff work stations and other locations where personal computers (PCs) are used, are typically provided with multiple receptacles for the PC, monitor, printers, and other related electrical devices.

Junction boxes are provided for equipment requiring a hardwired electrical connection.

An emergency generator should be provided as an electrical source for power and lighting during an interruption of the normal electric supply. Duplex receptacles that are marked or colored should be provided to connect key pieces of equipment to the critical branch of the emergency power system.

3. Security

Security for each component of the department will depend upon a perimeter security system. Individual patient rooms and visitor spaces shall not be individually locked, rather depend upon security entry portals. Each VA medical center’s security office will have

specific local requirements which should be addressed at the programming and early planning phase of the project.

4. Life Safety

The life safety program should provide a reliable system to protect building occupants, firefighting personnel, building contents, building structure and continuity of building function. The intent should be to provide an enhanced level of fire safety by reducing the probability of injury, loss of life or diminution of building function due to a fire. By limiting the development and spread of a fire emergency to the area of origin, the need for total occupant evacuation should be minimized.

Facility design aspects that relate to fire and life safety include:

a. Structural fire resistance
b. Building compartmentalization
c. Fire detection, alarm and suppression
d. Smoke control and exhaust
e. Firefighting access/facilities
f. Emergency power

New PRC construction and renovation of areas of existing facilities are required to be fully protected by an automatic fire suppression system.

The minimum width of corridors in areas used by patients is 96” [2440 mm]. Corridors and passageways that are not used by patients may be 44” [1120 mm] or wider.

Staff stations and areas used by patients are permitted to be open to the corridors in the latest edition of codes from NFPA and IBC.

5. Energy Conservation

Energy conservation is emphasized in all aspects of the building design. Refer to the most recent version of ASHRAE Standard 90.1, as well as DOE regulations.

1.4.7. Communications

1. Telephone

Unless restricted by the program of services, a telephone should be available at each patient’s bedside. In addition, there should be one private telephone available per inpatient and transitional unit for patients who do not subscribe to private telephone service.

Telephone outlets are typically provided at each staff work station or in each room.

Wall outlets are 18” [450 mm] AFF and desk outlets are 48” [1200 mm] AFF.

2. Information Systems

Information systems needs include computer and electrical outlets available at all work stations including decentralized charting locations. Desk or workstation outlets are 48” [1200 mm] AFF.

3. Nurse Call

A staff call system is provided for all inpatient and transitional rooms, toilet/showers, and other spaces used by patients.

Specific needs for call system locations should be coordinated with the functional design of patient spaces. Wireless technologies for staff should be studied, along with hard wired or integrated systems, to meet the needs of individual facilities.

4. Television

Cable and electrical outlets for television should be provided at each inpatient and transitional patient bed area.

5. Public Address

Public address systems are required for PRC facilities for code required fire and life safety communications. The use of a public address system for regular paging or staff communications should be avoided in the PRC facility.

1.4.8. Waste Management

1. Medical Waste

Medical waste is generated in medical exam rooms or in patient rooms where it is bagged, collected and transported using specially designated, closed containers to the soiled utility rooms. The waste is held there until it is transported via the loading dock to the medical waste handling facility.

2. General Waste

General waste is generated in all spaces and is held in waste containers for collection. It is then collected by cart and transported via the loading dock to the waste handling facility.

3. Recycling

Means of sorting, collecting, transporting and disposing of recyclable materials should be analyzed by locality and modified to suit local conditions and practices.

Optional use of disposable and recyclable products is an important design consideration in recycling alternatives that impacts physical space for waste disposal volumes.

4. Soiled Linen

Reusable soiled linens are generated in medical exam rooms and patient rooms. They should be collected in carts or hampers in the soiled utility rooms and transported to a soiled linen holding room near the loading dock for pick-up.

5. Utensils

Any washable items incorporated in the plan of care should be transported to the soiled utility room for sanitizing. Some items may be transported to a sterile processing department or service for cleaning and reprocessing.

6. Space Requirements

Space requirements for Waste Management will vary based on selection of waste collection and recycling methods. Space requirements need to be studied for each optional method or system considered.

1.4.9. Transportation

1. Patients

Patients and family members typically arrive at the main entrance via private transportation. Some patients may arrive via ambulance at the ambulance entrance. The main entrance should have a covered drop-off area.

Patients are usually accompanied by family or other caregivers. Clear site and facility organization through the use of directional signage is required to assist in directing the patient and others to their destination.

Vehicles transporting patients for admission via the emergency entrance should be clearly directed to this location. Convenient access from visitor parking should be provided. Features such as clear access routes, public spaces, landmarks and signage are particularly important in the PRC to facilitate wayfinding.

2. Staff

Staff entry be separated from other traffic such as patient/visitor and service. Staff facilities should be located convenient to staff entry.

3. Records

Patient medical and financial records are maintained centrally and may be distributed and accessed electronically.

4. Pharmaceuticals.

Pharmaceuticals including narcotics are transported by pharmacy staff to individual patient units in locked transport containers. Narcotics are delivered to a locked medication cabinet in the medication room.

5. Material

Supply traffic (material) should be separated from patient/visitor traffic. Clean supplies are transported via supply carts to the clean utility rooms on the individual patient units where supplies are accessed by staff.

6. Linen

Supply traffic (linen) should be separated from patient/visitor traffic. Clean and soiled linen are transported in linen carts.

7. Sterile Supplies

Sterile items used in the medical exam rooms are transported via dedicated closed carts. Sterile items also may be stored in the clean utility rooms.

8. Food

Each of the three primary areas within the PRC; Inpatient, Transitional Care and Outpatient will ultimately depend on the centralized food service department (kitchen) and materials handling systems. The Inpatient Unit will receive food directly from the kitchen with final preparation determined by the individual medical center.

Transitional Care will have a working kitchen within the facility to re-teach patients domestic cooking skills. All bulk food deliveries will come by way of the centralized materials handling department.

Outpatient nourishment stations will receive food deliveries and restocking of nourishments via the centralized food service department.

9. Waste

Waste is collected by environmental services staff and transported to soiled utility rooms in the individual patient units and trash collection areas near loading docks where it is disposed according to facility policies.