

**National EMS Advisory Council  
Committee Reporting Template  
FINAL(pending format and grammatical changes)  
September 30, 2009**

**Committee: Systems Committee**

**Report Number: 001-Systems-007-FINAL**

**Title: Guiding Principles and Core Issues in EMS System Design**

**Issue Synopsis:**

- A. **Problem statement.** EMS systems in the United States frequently have no process to design systems that are patient-centered in their approach to all components of the system. Further, fragmentation in system components degrades the potential for patient-centered outcomes. For these reasons the suggested problem statement developed by NEMSAC for use by the committee is:

*“System design in emergency medical systems is equally important in urban, rural and frontier areas, yet most localities fail to take a patient-centered approach to system design.”*

**B. Resources/references related to the issue**

1. National Research Council. 1966. *Accidental Death and Disability: The Neglected Disease of Modern Society*. Washington: National Academy of Sciences.
2. National Highway Traffic Safety Administration. 1996. *Emergency Medical Services Agenda for the Future*. Washington, DC: U.S. Department of Transportation.
3. National Fire Protection Association. 2002. *NFPA 450: Guide for EMS System Design*. Quincy, MA
4. Committee on Trauma Research, National Research Council and Institute of Medicine. 1985. *Injury in America: A Continuing Public Health Problem*. National Academy Press: Washington D.C.
5. EMSC National Resource Center, Children’s National Medical Center. 2009. *Gap Analysis of EMS Related Research. Report to the Federal Interagency Committee on EMS*. Washington, DC.
6. National Association of State EMS Officials/National Association of EMS Physicians. 2009. *Emergency Medical Services Performance Measures Project: Recommended Attributes and Indicators for System/Service Performance*. Falls Church, VA

### **C. Crosswalk with other standards**

1. National Highway Traffic Safety Administration. 1996. *Emergency Medical Services Agenda for the Future*. Washington, DC: U.S. Department of Transportation.
2. National Association of State EMS Officials. 2008. *State Emergency Medical Services Systems: A Model*. Falls Church, VA
3. National Highway Traffic Safety Administration. 2001. *National EMS Research Agenda*. Washington, DC: U.S. Department of Transportation.
4. The Institute of Medicine of the National Academies. 2006. *Emergency Medical Services: At the Crossroads*. Washington, DC

## **Analysis:**

### **A. History of EMS system structures.**

#### **1. EMS System Background**

In 1966, the National Academy of Sciences and the National Research Council published a landmark report on the state of emergency medical services in the United States. That report, *Accidental Death and Disability, the Neglected Disease of Modern Society*, provided the initial framework around which a number of EMS systems were organized.<sup>1</sup> Importantly the report also provided the impetus for states and localities to begin to regulate EMS because prior to 1966 mortuaries operated more than half of the ambulance services in the United States. The authors of that report stated:

*“Adequate ambulance services are as much a municipal responsibility as fire fighting and police services. If the community does not provide ambulance services directly, the quality of these services should be controlled by licensing procedures and by adequate surveillance...”*

In essence, this report promulgated and supported the largely local nature of EMS that still exists today. Several recommendations in the report were focused on the provision of out of hospital EMS services. The EMS Agenda for the Future<sup>i</sup> summarized some of those recommendations, which included:

- i. Preparing nationally acceptable training for rescue-squad personnel, police, firemen, and ambulance attendants;
- ii. Adoption at district, county, and municipal levels of ways and means of providing ambulance services applicable to the conditions of the locality, control and surveillance of ambulance services, and coordination of ambulance services with health departments, hospitals, traffic authorities, and communications services;
- iii. Initiation of pilot programs to evaluate automotive and helicopter ambulance services in sparsely populated areas and in regions where many communities lack hospital facilities adequate to care for seriously injured persons;

Of great concern to the authors of the report was that both the public and government were "insensitive to the magnitude of the problem of accidental death and injury" in the U.S.; that the standards to which ambulance services were held were diverse and "often low"; and that "most ambulances used in this country are unsuitable, have incomplete ... equipment, carry inadequate supplies, and are manned by untrained attendants."

Research compiled since that report makes it clear that EMS systems are much more than simply ambulance transport services and that problems continue to exist in EMS system design.<sup>ii</sup> Yet, the evidence from that report was so compelling that congress passed the Highway Safety Act of 1966 that established the first organized EMS systems in the United States.

EMS systems that are structured based on traditional, historical paradigms are changing rapidly. Many people view EMS as simply ambulance transport or fire department response to medical events. However, those views are being challenged as insurance companies demand more accountability for ambulance transport and emergency treatment, fire departments seek better use of resources, and commercial ambulance firms are caught between strict local requirements, reduced reimbursement by federal agencies, and increasing demand for service.

Emergency medical services *systems* are therefore important considerations for regulators, physicians, and elected officials. In most areas, a body of elected officials has overall responsibility for one or more components of the system, such as fire service first response or transport, or for regulating for-profit ambulance service contracts. In some cases, multiple local agencies exert some level of control over components. In many cases, the systems are fragmented—meaning that few systems have the all-inclusive oversight necessary to manage the interdependence of multiple, autonomous EMS organizations.

## **2. Regulation and Oversight**

Regulation and oversight are key components of EMS system design because regulators must be able to ensure accountability and transparency among the providers, and they must ensure compliance with the guiding principles of the system. Further, regulators should structure oversight to achieve integration in regulatory systems to align with regulatory systems across borders to avoid discontinuity in regulations and regulatory practices. Ultimately, regulators and system administrators must ensure that regulatory processes do not inadvertently or otherwise affect the ability of vertical or horizontal supply chain participants. This means that coordination of the regulatory framework must include considerations of local, county, regional, state, and federal oversight, and operational integration of all providers in the system including multiple ground and air resources.

## **B. System design.**

Current EMS component structures in the United States take many forms. First response may be provided by public agencies such as fire departments using paid or volunteer personnel, tribal members, police agencies, helicopter providers, military personnel, or others; ambulance service may be offered by commercial firms, multi-role fire departments, volunteer agencies, hospitals, police departments, or municipal third-service providers. Emergency communications may be provided by highly sophisticated computerized technology centers, or by more basic centers with basic radio technology and manual data collection.

EMS is fundamentally a local service. That is why variability exists between EMS systems across the United States. Each system has evolved according to the local political, economic, legal, and operating environments. Yet few local governments understand the complexity of comprehensive EMS structures because EMS systems are usually poorly defined. One widely accepted EMS system definition is based on NFPA 450,<sup>iii</sup> which defines an EMS system as

*“A comprehensive, coordinated arrangement of resources and functions which are organized to respond in a timely, staged manner to medical emergencies regardless of their cause.”*

EMS systems include the primary components of system access and dispatch, first response, medical care delivery, ambulance transport, and definitive hospital care. Additional components such as medical oversight, financing, disaster and surge response, facilities and equipment, and quality improvement processes, are interlocking components of successful EMS systems.

## **C. EMS system development.**

While a number of authors have identified the outcomes of successful EMS system design, few have identified how to accomplish those outcomes. The concept of system design, and the purpose of this document, is to provide tools to develop high quality, responsive, and responsible EMS systems that meet local needs.

Importantly, the tools are not prescriptive; rather they are established as a set of guiding principles that are used to describe a number of elements of the EMS system. Local regulators, physicians, elected officials or others can use the guiding principles to assist in developing local systems or can evaluate current system designs based on the guiding principles. Each of the 16 guiding principles provides a method to make improvements to one of the components of EMS system design.

The Guiding Principles are not designed solely for urban EMS systems. They also offer opportunities to provide guidance to rural and frontier systems because these principles

and the activities that surround them are intended to be universal. Although the Guiding Principles and Core Issues will be, for the most part, the same for urban, suburban, rural, and frontier EMS systems, specific operational plans for implementing the Guiding Principles and Core Issues may vary greatly between systems.

The Guiding Principles are collectively intended to provide direction for a community in EMS system design for current and future needs. The Core Issues, while not all-inclusive lists, are intended to be issues that EMS systems can prioritize according to local needs. Together, the Guiding Principles and the Core Issues can be used to weave the principles of the EMS Agenda for the Future and the Institute of Medicine Report into operating plans for local agencies. The Guiding Principles and the Core Issues are intended to be scalable—not only for different sizes and designs of local systems, but also for regional, state, and multi-state applications.

Guiding Principles	Core Issues
<p><b>1. Evidence Based Design Standards.</b> EMS system design should be based on scientific, medical and economic evidence published in peer-reviewed literature as well as evidence provided by the system’s continuous quality improvement processes.</p>	<ul style="list-style-type: none"> <li>● Each EMS system should recognize that evidence-based medicine is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients. The practice of evidence-based medicine means integrating the best available scientific, medical and operations research, and that the evidence should meet publication standards inherent in peer-reviewed journals. The system should make use of each provider’s clinical expertise, while respecting a patient’s autonomy.</li> <li>● Each EMS system should clearly define the roles and responsibilities of their medical authority (see Guiding Principle #10: Medical Oversight for details) and all medical direction (online and offline) should reflect the current standard of care based on Evidence Based Medicine (the best evidence in the literature when it is available or through consensus by specialty when evidence is lacking).</li> <li>● Each EMS system should employ a continuous quality improvement (CQI) process. The CQI process includes monitoring and improving the clinical and operational performance of the system, and uses statistically valid principles and practices of medical and operational performance indicators. All organizations in the EMS system that contribute key system components should be represented in the CQI process if appropriate.</li> <li>● When multiple cities or communities are served by the EMS system, those EMS systems should ensure that every community served by the system has a voice in the system design. EMS system practices must promote effective professional relationships with other components in a community’s healthcare, public safety, and governmental systems.</li> <li>● Each EMS system should ensure that changes to the standard of care can occur within the principles of evidence-based medicine. No EMS system or community is so unique to exclude applicability of the majority of EMS-related peer-reviewed research.</li> <li>● Each EMS system should ensure that all organizations and individuals participating in the EMS system work together to establish that system’s EMS standard of care. This process of broad inclusion, incorporating operational and fiscal impacts, ensures that standard of care changes are</li> </ul>

	<p>clinically, operationally, and fiscally achievable.</p>
<p><b>2. Integrated Response Structure.</b> EMS system design recognizes the unique aspects and essential contributions of both first response and transport components. Component-distinct medical assessments and treatments are combined to form the essential medical care delivered to a “single patient” in the EMS system. Therefore, a successful EMS system design established around the “single patient” depends upon coordinated and integrated response, coordinated medical treatment protocols, and continuing medical education.</p>	<ul style="list-style-type: none"> <li>● EMS systems should be designed to eliminate horizontal and vertical fragmentation. The integration of responders into a single, organized response system reduces the likelihood of error and provides a more consistent level of care throughout the system.</li> <li>● Optimal EMS system performance depends upon integrated first response and transport components. EMS systems should recognize that each component provides an essential aspect of the “single patient’s” needed care from the EMS system; care can only be reliably achieved when these valued aspects are combined in an efficient, effective manner. The patient should be able to appreciate a coordinated response to their perceived emergent health care need(s) with a seamless transition of care.</li> <li>● EMS systems should recognize the autonomous responsibilities of each system component and account for each component’s additional responsibilities. Timely arrival of first response and transport is critical in some cases and overall performance must be delivered from a system infrastructure with sufficient resources to consistently deliver this timely arrival. First response is not necessary on all requests for service. Therefore, systems should use evidence-based medical interrogation protocols to rapidly identify emergent medical conditions that will benefit from first response. Similarly, patient transport is not always time sensitive, especially when (as determined by protocol) first response is promptly on the scene. A synergistic approach in which first response transfers continuing patient care and transport responsibility to the transport component allows for optimal resource availability in the system. The transport component should provide ongoing assessment and treatment according to the patient’s response, as well as ambulance transport of the patient to an appropriate healthcare venue. This duty requires a longer time commitment to nearly all patients served by the EMS system, and resources should reflect this demand.</li> <li>● The EMS system should ensure that sufficient EMS professionals exist in the system to provide care during times of anticipated peak demands and routine disasters.</li> <li>● Each EMS system should make sure that all EMS responders use the same medical treatment</li> </ul>

	<p>protocols and administrative standards promulgated by the medical authority. Fully integrating these components, including protocols, compatible medical equipment, integrated continuing medical education, and a combined re-credentialing process facilitates optimal EMS system performance and patient outcomes.</p>
<p><b>3. Team Approach.</b> Collegial working relationships and collaborative processes among all personnel in this EMS system promote optimal patient care provided by mutually respected professionals.</p>	<ul style="list-style-type: none"> <li>● Each EMS system should determine and understand the local team members by identifying all the stakeholder organizations involved or having an interest in the system, including patient advocates, emergency call takers, emergency responders, mutual aid providers, health care service providers, emergency management, relevant health care specialties, social service agencies, health care facilities and others.</li> <li>● Each EMS system should then collaborate with those regional stakeholder organizations in an effort utilize rather than re-create regional resources and talents.</li> <li>● Each EMS system should establish the roles of participants, including the right to be engaged in the planning and development of the system and the obligation to provide inputs and assist with accountability. While some organizations have more involvement and more at stake than others the team should strive for cooperation and consensus.</li> <li>● Each EMS system should provide for coordinated medical oversight. While there are likely to be many organizations playing a role in the emergency care of patients cared for by the EMS system each having their own medical oversight capability, there should be a commitment to coordinate and develop a common set of evidence based guidelines, standing orders, and protocols, as well as common administrative and credentialing procedures.</li> <li>● Each EMS system should ensure coordinated continuous quality improvement (CQI). While each organization involved in providing emergency medical services can and should have its own internal CQI process, there should be a commitment to share data as needed to implement system wide CQI initiatives.</li> <li>● Each system should provide for joint operational standard operating guidelines (SOGs). In as much</li> </ul>



	<p>as multiple components of the EMS system have points of intersecting, coordinated and overlapping operation, stakeholders in the system should identify those areas of connectivity and strive to develop common operating guidelines to facilitate seamless transition of information, patient care activities, logistics and operations.</p> <ul style="list-style-type: none"> <li>● Each EMS system should provide mechanisms for joint operational review of Key Performance Indicators (KPIs); The EMS system, as a unified operation, should employ a set of KPIs that all the parties agree to in terms of their importance to be measured, monitored and responded to if needed to improve the performance of the system.</li> <li>● The system should employ methods to ensure joint strategic planning. The stakeholders should develop and revise a strategic plan for the system as a whole taking into account current performance and future system and external trends. Ideally, the primary operational players in the EMS system should coordinate the timing and process for their own internal strategic planning process to correspond to the system wide planning.</li> <li>● The EMS system should provide opportunities for joint training and exercises. The EMS system should identify common training needs of various players in the system and sponsor training activities and exercises that bring together staff from the various entities to train and exercise together. This enables training on common SOG's and other shared learning objectives.</li> <li>● Each EMS system should provide for joint disaster planning: The EMS system should plan collaboratively with all the stakeholders in all aspects of disaster management: mitigation, preparedness, response and recovery. Medical surge is very much a team sport and only through cooperative efforts can the sum be greater than the parts.</li> </ul>
<p><b>4. Medical Dispatch Prioritization.</b> EMS communications optimizes the EMS system's patient care</p>	<ul style="list-style-type: none"> <li>● EMS systems are dependent on appropriate 9-1-1 and emergency dispatch systems. Structures should be established for EMS dispatch to rapidly and systematically ascertain what perceived emergency medical condition is being reported. The most potentially serious and time-sensitive of these medical conditions merit rapid notification of first response and transport providers. Evidence-based medical interrogation protocols constitute the foundation for rapidly identifying emergent</li> </ul>

<p>abilities when utilizing evidence-based priority dispatching. Successful priority dispatching initiates patient care and matches necessary resource(s) to the patient, without excessive and inappropriate utilization of first response and transport components.</p>	<p>conditions and rapidly dispatching appropriate responders.</p> <ul style="list-style-type: none"><li>● EMS dispatch systems should make sure that effective bystander-initiated patient care can be achieved via phone directives. Critical interventions such as cardiopulmonary resuscitation (CPR), choking relief, and hemorrhage control can be instituted prior to EMS arrival. Evidence-based pre-arrival instructions constitute the foundation for rapidly initiating this care.</li><li>● Emergency response (“lights and sirens” mode) proves an inherent risk to the public and EMS professionals. While perceived critical medical conditions warrant this risk, many calls for EMS assistance do not. Evidence-based medical interrogations constitute the foundation for differentiating emergency, urgent (“non lights and sirens” mode), and non-emergent responses. First response provides time-sensitive care in higher priority medical conditions. Rapid availability of first response can become compromised when first response resources are dispatched to all requests for EMS service. That is why EMS systems should establish evidence-based medical interrogation protocols which constitute the foundation for rapidly identifying medical conditions substantially improved by first response care.</li><li>● Each EMS system should provide for appropriate and timely first response care. Timely first response care depends equally upon the efficient identification of higher priority medical conditions AND efficient methods of first response notification/dispatch. In some instances, first response self-dispatch based upon direct observation or monitored radio communications proves the quickest means for first response utilization.</li><li>● Each EMS system should provide appropriate dispatch triage methods. EMS dispatch must be capable of discerning if medical conditions are markedly worsening while EMS professionals are responding to the initial call for help. As conditions warrant, EMS dispatch must be capable of assigning higher priorities to these incidents, notifying currently responding EMS professionals of change(s) in patient condition, and activating appropriate additional responders to these patients.</li><li>● Each EMS system should regularly evaluate and provide for community-appropriate response times. While response time “standards” may seem well supported, most have been derived without significant evidence-based medicine. As better EMS science emerges, response time standards must be periodically re-evaluated and potentially expanded to include other factors. Response time standards for first response and transport components should factor medical benefit, operational</li></ul>
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	<p>safety, and fiscal responsibility concerns.</p> <ul style="list-style-type: none"> <li>● Each EMS system should carefully evaluate resource utilization. Sending a first response and/or ambulance to every EMS request for service may constitute an over-utilization of these resources. Evidence-based programs exist for alternative response (example: EMS professional(s) in car/truck/SUV), alternative disposition (examples: medical advice line, social service referral), and/or alternative destination (examples: walk-in clinics). Over or inappropriate use of resources means that those critical resources are unavailable for emergent events.</li> <li>● EMS systems should regularly evaluate medical dispatch. EMS dispatch constitutes an important part of the EMS system’s practice of medicine. Appropriate re-evaluations of EMS dispatch should utilize evidence-based medicine and medical oversight. Where gaps in evidence exist, industry “best practices”—medical, operational, and financial—should serve as leading points of discussion among decision-makers. Dispatch CQI constitutes an integral part of the total EMS system’s improvement efforts.</li> </ul>
<p><b>5. Appropriate Resource allocation.</b> EMS communications optimizes the EMS system’s patient care abilities when utilizing integrated EMS resource capabilities to identify and dispatch the closest appropriate responder(s).</p>	<ul style="list-style-type: none"> <li>● Each EMS system should ensure that an integrated dispatch system exists to provide clear, consistent, and efficient notification to EMS responders that will eliminate confusion and insure the delivery of quality patient care.</li> <li>● A consolidated dispatch center provides more consistent delivery of information to the EMS provider and allows compatible staff training and cost utilization.</li> <li>● Each EMS system should ensure that the technology (CADS, GPS, etc) is available to enhance the dispatch center’s ability to send the appropriately equipped and staffed unit to handle the requirements of the EMS emergency at hand and to ensure the safety of responders.</li> <li>● A dispatch center with the capability of connectivity with medical direction and other responding units (fire, police, rescue, HAZMAT) also enhances the response of other resources that may be needed to mitigate the incident and protect the patient and responders.</li> <li>● A dispatch center should have the means of determining the availability of local and regional resources when local resources are actually or potentially depleted.</li> </ul>

	<ul style="list-style-type: none"> <li>● The EMS system should ensure that the receiving facilities have the ability to report their receiving status to the dispatch agency. This will allow responders to transport patients to the appropriate facilities the first time.</li> </ul>
<p><b>6. Coordinated Competency Assurance.</b>          Effective, coordinated continuing education (CE) enables advances in excellent patient care. Relevant, engaging CE is based upon EMS CQI findings, updated guidelines supported by evidence based medicine, patient care capabilities, and treatment protocols.</p>	<ul style="list-style-type: none"> <li>● EMS systems should ensure that effective continuing education (CE) drives progressive clinical ability, decision-making, psychomotor skills, competency, and performance.</li> <li>● EMS systems should base the appropriate number of providers at each level of EMT on the number of medical responses. Because both critical decision-making and motor skills degrade as patient contacts decrease, a critical component in ensuring competency is determining the appropriate number of paramedics, EMTs, and other responders in the system.</li> <li>● EMS systems should provide effective post-certification continuing education (CE). CE must effectively teach EMS professionals needed clinical improvements identified by CQI and evidence-based research, often incorporating new medical equipment and/or new medical treatment protocols.</li> <li>● EMS systems should align CE methods with the desired effect. Types of training, including simulation training, should be structured to provide appropriate competency outcomes.</li> <li>● Expertise from regional resources (e.g. stroke, cardiac and pediatric care centers) should be accessed to optimize the provider’s education, training and experience.</li> <li>● Systems should provide CE in ways that reflect the way that services are provided in the field. EMS professionals respond most effectively and efficiently when they train together.</li> <li>● EMS systems should ensure that eligibility for clinical credentialing by the EMS medical director is aligned with and depends upon the individual attaining and maintaining appropriate certification credentials from the state or local credentialing authority.</li> <li>● System CE should afford every credentialed individual the educational content necessary to fulfill the baseline requirements for ongoing certification.</li> </ul>

<p><b>7. Integrated Protocols.</b> Medical treatment and other protocols are derived utilizing prevailing EMS standards of care, evidence-based medicine, and system design considerations. Medical treatment protocols are formatted to recognize the essential contributions from communications, first response, transport, healthcare facilities and promote seamless care delivery. Clinical staffing must afford the safe implementation of these protocols.</p>	<ul style="list-style-type: none"> <li>● The system should ensure that medical treatment protocols are developed utilizing evidence-based medicine, acceptable EMS standards of care, and CQI outcomes, and that they consider system-specific characteristics. These protocols are patient-centric, incorporating the essential contributions from communications, first response, transport, and healthcare facilities in seamless treatment plans.</li> <li>● Medical treatment protocols highlight critical interventions for time-sensitive conditions and reflect desirable timeliness of care. Each EMS system should establish methods for consistent measuring and contributing time-related data from first response, transport, and healthcare facility components that reflect their respective patient contact spans of time.</li> <li>● The system should develop integrated administrative and operating protocols, such as incident command system, destination decisions, communications and mode of transport.</li> <li>● The EMS system’s medical oversight team, led by the medical director(s) should develop medical treatment protocols supported either by existing evidence based medicine guidelines or standardized practice and consensus within the specialty. Protocols should focus not only on meeting patient care needs, but should also include complementary support in continuing education, equipment and medication specifications, and professional development.</li> </ul>
<p><b>8. Cost Effectiveness.</b> The EMS system recognizes and respects each community’s desire for high-quality emergency medical services delivered through an affordable, cost effective</p>	<ul style="list-style-type: none"> <li>● Each EMS system in each community has a moral and ethical responsibility to ensure that all citizens have access to high quality EMS medical care.</li> <li>● Each system must ensure fiscal accountability, particularly when multiple agencies are involved.</li> <li>● EMS system design, clinical care, and operational decisions should be driven by patient need and evidence-based medicine and operations. The EMS system’s leaders are responsible for making ethically defensible, scientifically sound, clinically appropriate, and fiscally responsible decisions.</li> </ul>

<p>design. Communications, first response, and transport components/resources are integrally linked and depend upon the effectiveness and efficiency of each other. Additional system resources are added only when they support the desired high quality of EMS in our communities and do so with reasonable costs evaluated through system-wide impact analysis.</p>	<ul style="list-style-type: none"> <li>● The system should emphasize the “one-team” approach. Incorporating the “one team” philosophy not only leads to better patient care and a more enjoyable work environment, it also fosters economies of scale. As first response and transport components identify common initial orientation, continuing education, CQI programs, and equipment inventory/maintenance operations, opportunities exist to make these programs more cost effective by reducing duplication of service and/or expanding service without attendant cost.</li> <li>● EMS readiness costs must be recognized, supported, and funded by the entire beneficiary population.</li> <li>● EMS readiness costs should also include meeting public expectations in times of both unpredictable and preplanned disasters involving considerable staffing, training, and equipment costs.</li> </ul>
<p><b>9. Medical Oversight.</b> Medical care provided by the EMS professionals in this system constitutes the practice of medicine. The medical overseers and other physicians must be experienced and specialty board certified as appropriate. These physicians commit to providing objective and independent medical</p>	<ul style="list-style-type: none"> <li>● EMS systems should continually consider that all components of EMS medical care constitute the practice of medicine in the out-of-hospital arena as established under state laws and rules.</li> <li>● EMS systems must ensure appropriate medical oversight. Medical oversight physicians provide counsel, advice, and direction through approval of medical administrative and treatment protocols as well as through evaluating patient care CQI reports. These functions are vital to each patient receiving care in accordance with prevailing professional standards.</li> <li>● The EMS system is comprised of one or more medical directors who provide medical administration and can ensure that skilled personnel have appropriate training, education, clinical experience, and expertise to provide medically appropriate care to patients on a daily basis under the aegis of the medical authority. . Physician and non-physician members of the medical oversight team should be educated, trained, certified (when applicable) and experienced in their respective areas of supervision.</li> </ul>

<p>oversight, without regard to self-interests and political pressures.</p>	<ul style="list-style-type: none"> <li>● Non-physician members of the medical oversight team should be supported and supervised by the EMS system’s medical director/s.</li> <li>● The EMS system’s medical oversight team led by the medical director/s will be responsible for determining provider competence, scope of practice ceiling, credentialing, and level autonomy.</li> <li>● EMS systems should actively pursue and optimize online and/or offline medical direction and/or expertise from willing and able regional resources such as stroke, cardiac and pediatric care centers, and regional or state EMS medical directors.</li> <li>● The EMS system’s medical oversight team led by the medical director/s should be responsible for developing and/or acquiring treatment protocols that meet or exceed the current standard of care by specialty (supported either by existing EBM guidelines or standardized practice and consensus within the specialty). Those protocols should be reviewed and updated annually, at a minimum, and current technology should be optimized to allow for easy access and distribution of those updates to providers.</li> <li>● EMS systems and their medical oversight team should ensure that mechanisms are in place to guarantee awareness of, competence in, and compliance with medical protocols and updates.</li> </ul>
<p><b>10. Electronic Data Capture.</b> Electronic patient records must be utilized by every provider level and integrated into every aspect of prehospital care. Agencies should adopt standardized data points and fields (e.g. Utstein Criteria and National EMS Information System [NEMSIS]) that represent EMS needs and standards.</p>	<ul style="list-style-type: none"> <li>● Electronic patient records enables 100 percent case review, graphical analysis, and statistical analysis; allowing rapid and comprehensive evaluation of clinical and operational patterns. This capability improves medical treatment protocol compliance and design. EMS systems should therefore ensure that the system has the capability to aggregate, capture, and electronically report on critical patient care issues.</li> <li>● Because electronic patient records allow the EMS system to compile a patient care database for needed clinical research, EMS systems should establish electronic database methods to store and evaluate data.</li> <li>● The system should provide seamless integration of dispatch, first response, transport, and selected health care facility data on each patient by using a shared computer platform. This</li> </ul>

	<p>structure ensures that the care provided throughout system is provided at the highest level and allows for evaluation of practices along the entire continuum of patient care from dispatch to hospital admission..</p> <ul style="list-style-type: none"> <li>● Agencies should adopt standardized data points and fields (e.g. Utstein Criteria). National EMS Information System (NEMIS) is the recognized method of ensuring both a standardized data definition and a uniform architecture. The system should make sure that data points and fields represent local EMS system needs and standards.</li> </ul>
<p><b>11. Measuring and Reporting on Key Performance Indicators.</b> Key performance indicators (KPIs), such as response time standards, factor the patient’s perceived condition. Performance indicators in EMS systems are appropriate for first response, transport, and dispatch agencies. Strict compliance within standards is expected.</p>	<ul style="list-style-type: none"> <li>● The system should establish and support a structure that reinforces the development, application, analysis and maintenance of key performance measures EMS systems should make every effort to access and utilize current key performance measures developed by EMS systems and national organizations recognized for industry standards and best practice (supported either by existing EBM guidelines or standardized practice and consensus within the specialty).</li> <li>● System overseers must ensure accountability for key performance indicators, including response time and clinical performance in both first response and transport components of this EMS system.</li> <li>● The system should create methods to measure performance based on the patient-centric view, including outcomes rather than solely response time as performance measures in the EMS system First response and transport organizations must agree on response and clinical data definitions to ensure accurate and aggregated measures of system’s performance.</li> <li>● The system should measure and report response times in fractiles rather than averages, thereby representing a truer picture of the system’s response time reliability. Additionally, response times for specified area(s) in the service area should be reported to ensure appropriate response time performance throughout the entire service area.</li> </ul>
<p><b>12 Structured and Integrated Continuous Quality Improvement (CQI).</b> As the “single patient” paradigm</p>	<ul style="list-style-type: none"> <li>● Each EMS system should ensure that all care provided is subject to review of system access, treatment and operational compliance. Reporting of patient contact and care must be performed in a manner enabling efficient CQI.</li> </ul>



<p>predominates throughout the EMS system’s design of response, medical treatment, and continuing medical education, the EMS system’s continuous quality improvement should be both vertically and horizontally coordinated and integrated.</p>	<ul style="list-style-type: none"> <li>● Each EMS system should have structures in place to optimize system performance and improve patient outcomes—both of which are dependent upon the system’s ability to conduct integrated CQI activities.</li> <li>● Each EMS system should make sure that operational and medical treatment data are collected, analyzed, displayed, and acted upon using statistically valid methods. Data definitions must be clear, consistent, and adopted by all system components. Qualitative and quantitative data should be organized and displayed in ways that ease interpretation for system decision-makers.</li> <li>● Each EMS system should collaborate and maintain effective working relationships and current data-sharing agreements with hospitals, trauma committees, and other related health care entities within their respective region. Expertise from regional tertiary care resources (e.g. stroke, cardiac and pediatric care centers).should be recruited and utilized for system CQI</li> <li>● To be effective in establishing an effective CQI process, each EMS system should establish a Culture of Trust and patient safety. A Culture of Trust helps to ensure that system participants are able to report potential errors without fear of retribution and medical directors can make system wide improvements based on those reported errors.</li> <li>● Each EMS system should use areas for improvement identified through the CQI program to drive continuing education for EMS providers.</li> </ul>
<p><b>13. Disaster Preparedness and Surge Response.</b> Disaster preparedness and surge response constitute essential roles of an EMS system. Effective preparedness for disaster-related emergency medical needs is dependent upon</p>	<ul style="list-style-type: none"> <li>● Each EMS system should design protocols and standards for unusual, high impact events involving all patient populations, including special needs, pediatric and geriatric. Mass casualty incidents (MCI) often require EMS professionals to operate differently than day-to-day responses to medical illness and/or injury. EMS systems should establish simple, clear MCI response plans to help EMS professional to efficiently and effectively contribute to the EMS system’s response to unpredictable disaster events.</li> <li>● EMS professionals can best respond to any given disaster when specifically trained in that type of disaster. Systems should ensure that realistic drills and focused didactic sessions are delivered on a</li> </ul>

<p>concise, task-oriented multiple casualty response procedures, routinely-scheduled realistic multiple casualty training, funding necessary training as well as protective and medical equipment, and achieving region-wide governmental operational support. Surge response, similarly, is the system’s plan and ability to manage varying levels demand surge in the system. EMS systems should also be prepared to rapidly respond to an increase in surge .,</p>	<p>routine basis to best prepare EMS professionals to care for disaster victims while ensuring personal safety.</p> <ul style="list-style-type: none"> <li>● The well being of EMS professionals responding to disasters, both man-made and natural, is dependent upon ready access to and proper utilization of personal protective equipment. Given the possibilities of intentional chemical, biological, radiological, nuclear, and explosive events, the EMS system must protectively train, outfit, and equip its most valuable assets – its EMS professionals.</li> <li>● This EMS system’s Standards of Care may change when facing extreme environmental conditions, excessive numbers of casualties in relation to available resources, or medical dangers posed to patients or providers. The EMS Medical Director(s) must work closely with other system leaders to clearly define acceptable interim standards of care, enabling the greatest possible good to be safely delivered to as many casualties as possible.</li> <li>● EMS systems should establish and implement plans to serve known events with a high likelihood of EMS need. Mass gatherings, sporting events, and other outdoor entertainment venues provide opportunities to implement real time plans to serve predictable medical needs.</li> <li>● No single EMS system can adequately respond alone to all disasters. That Is why regional planning and operational support is the minimum level of planning and response essential to effective disaster readiness. Clearly, state and federal planning and operational support is also appropriate in many circumstances. An integral part of disaster pre-planning is attaining regional government political, financial, and operational support. The Metropolitan Medical Response System (MMRS) is one example of an effective multiple agency/multiple government disaster readiness initiative.</li> <li>● Effective EMS response to disaster is dependent upon effective hospital response to disaster. EMS system’s leaders and its disaster preparedness experts must coordinate efforts with appropriate hospital-based personnel to promote an effective emergency medical response to disaster, specifically including efficient EMS- emergency department transitions of patient care.</li> </ul>
<p><b>14, On-going EMS System Planning.</b> EMS strategic planning best enables optimal</p>	<ul style="list-style-type: none"> <li>● Each EMS system should employ appropriate mechanisms to plan for changes in the practice of medicine. EMS is a practice of medicine and therefore subject to ever-changing standards of medical care. Necessary changes to the practice of EMS are part of a larger process of planning for</li> </ul>

<p>EMS system design and performance when conducted continuously.</p>	<p>system design and function. While medical care specifications are the purview of the EMS medical authority, the delivery of this medical care depends upon EMS systems ensuring appropriate system design and productive professional relationships, both of which are fostered through continuous strategic planning.</p> <ul style="list-style-type: none"> <li>● EMS systems should consider their complex roles and how they interface with other healthcare components. Effectively improving healthcare outcomes for all patient populations, especially given an ever-growing pediatric and geriatric population with complex emergency medical needs, requires multi-agency participation, creative solutions, and increased efficiencies to operate within fiscal constraints. Continuous strategic planning identifies areas of common objectives and the methods to use the talents of EMTs, first response and transport agencies, and administrative personnel. Planning that is supported by institutions such as local EMS regulatory agencies and local hospitals, achieves the best outcomes at reasonable expense.</li> <li>● Current system design and future recommendations should anticipate the community’s EMS needs, factoring present and needed resources, ultimately fulfilling the commitment to provide optimal EMS care.</li> </ul>
<p><b>15. Safety of Responders and Patients.</b> A system-wide focus on safety should be woven in to the system design to ensure that the primary safety interests of patients, citizens, and responders are protected.</p>	<ul style="list-style-type: none"> <li>● EMS systems should ensure a Culture of Safety, because EMS providers are often placed in a position that could imperil the safety of their patients, themselves and others. Creating this culture will help providers to understand the importance of maintaining a safe attitude and environment.</li> <li>● The Culture of Safety should strongly influence the processes, training and equipment for EMS providers in the system, to maximize provider and patient safety.</li> <li>● The EMS system must ensure that providers in the system practice a safe and complete assessment of the scene and the patient. Environmental awareness is paramount to completing a proper assessment and treatment of the patient with consideration for patients, providers, and others at the scene.</li> <li>● The EMS systems goals must make sure that the practice of safety begins at the outset of the response and continues throughout the incident--including every stage of the response, treatment,</li> </ul>

	<p>and transport.</p> <ul style="list-style-type: none"> <li>● The system should establish standards that consider crew fatigue. Scheduling of EMS personnel must promote continuous patient safety, optimal clinical care, and appreciable workforce beneficence. Shift lengths must closely correlate with clinical duty expectations and system demands to minimize provider fatigue.</li> <li>● A culture of safety that protects patients and providers must extend to supporting processes and structures in the system. The culture of safety begins with and includes appropriate selection and maintenance of equipment (including fleet maintenance processes), and includes operational protocols and dispatch standards.</li> </ul>
<p><b>16. Community Engagement.</b> The necessary engagement with the community requires that the EMS system is designed appropriately to meet the community’s needs, while at the same time ensuring that the community has an adequate voice in EMS system strategy.</p>	<ul style="list-style-type: none"> <li>● Each EMS system should engage the community by understanding the local team members and all the stakeholder organizations involved or having an interest in the system, including patient advocates, emergency call takers, emergency responders, mutual aid providers, health care service providers, emergency management, relevant health care specialties, social service agencies, health care facilities, public health, and others.</li> <li>● Each EMS system has a moral and ethical responsibility to ensure that the community and all citizens have access to high-quality EMS medical care.</li> <li>● Each EMS system should educate the community it serves about what the EMS system is, what appropriate uses for it are, what the community can expect from it and ways that the community may be active its own health (e.g. injury prevention and community AED/CPR programs). Continuous communication with the community allows the EMS system managers and the medical community to identify common objectives and methods to achieve the best medical outcomes at reasonable expense.</li> <li>● Each EMS system should engage the community to ensure a community-appropriate balance between EMS readiness costs, EMS service costs, and the quality of care provided to the entire beneficiary population.</li> <li>● EMS systems should engage the community to ensure that the systems have the ability to serve</li> </ul>

	<p>known events with a high likelihood of EMS need. Mass gatherings, sporting events, and other outdoor entertainment venues provide opportunities to implement real-time plans to serve predictable medical needs.</p> <ul style="list-style-type: none"><li>● EMS systems should consider their complex roles and how they interface with the community and other healthcare components. Effectively improving healthcare outcomes, especially given an ever-growing aging population with complex emergency medical needs, requires multi-agency participation, creative solutions, and increased efficiencies to operate within fiscal constraints.</li></ul>
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### **E. Committee conclusion**

The committee supports a patient-centered, evidence-based, systems approach to design of EMS systems. That approach requires that the system stakeholders establish recommendations for guiding principles, core issues, and operational plans for use by agencies of the federal government and by system participants throughout the United States.

### **Recommended Actions/Strategies: National EMS Advisory Council**

1. Develop methods for agencies to create operational plans to help achieve the core issues and the guiding principles.

### **National Highway Traffic Safety Administration**

1. Support a federal effort to expand, enhance, and fund EMS research based on operational, financial, and medical outcomes criteria.
2. Develop and publish key performance indicators (KPIs) for EMS systems to measure and monitor performance. Use NASEMSO Performance Measures document as basis for performance standards.
3. Share committee recommendations with Council on Emergency Medical Care (CEMC), Emergency Care Coordinating Committee (ECCC), Federal Emergency Management Agency (FEMA), and Federal Interagency Council on EMS (FICEMS) so that EMS is not left out of the discussion on health care reform.
4. Provide the Guiding Principles information to federal agencies to assist in funding regionalization demonstration projects.

### **Other Department of Transportation**

1. Support a federal effort to expand EMS grant funding so that EMS agencies can implement NEMSIS compliant recording and reporting.

### **Federal Interagency Committee on Emergency Medical Services**

1. Support a federal effort to expand, enhance, and fund EMS research based on operational, financial, and medical outcomes criteria.

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  2. National Highway Traffic Safety Administration. 1996. *Emergency Medical Services Agenda for the Future*. Washington, DC: U.S. Department of Transportation.

## Guiding Principles and Core Issues in EMS System Design

EMS Systems Committee

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3. National Fire Protection Association. 2002. Guide for EMS System Design. Batterymarch Park
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