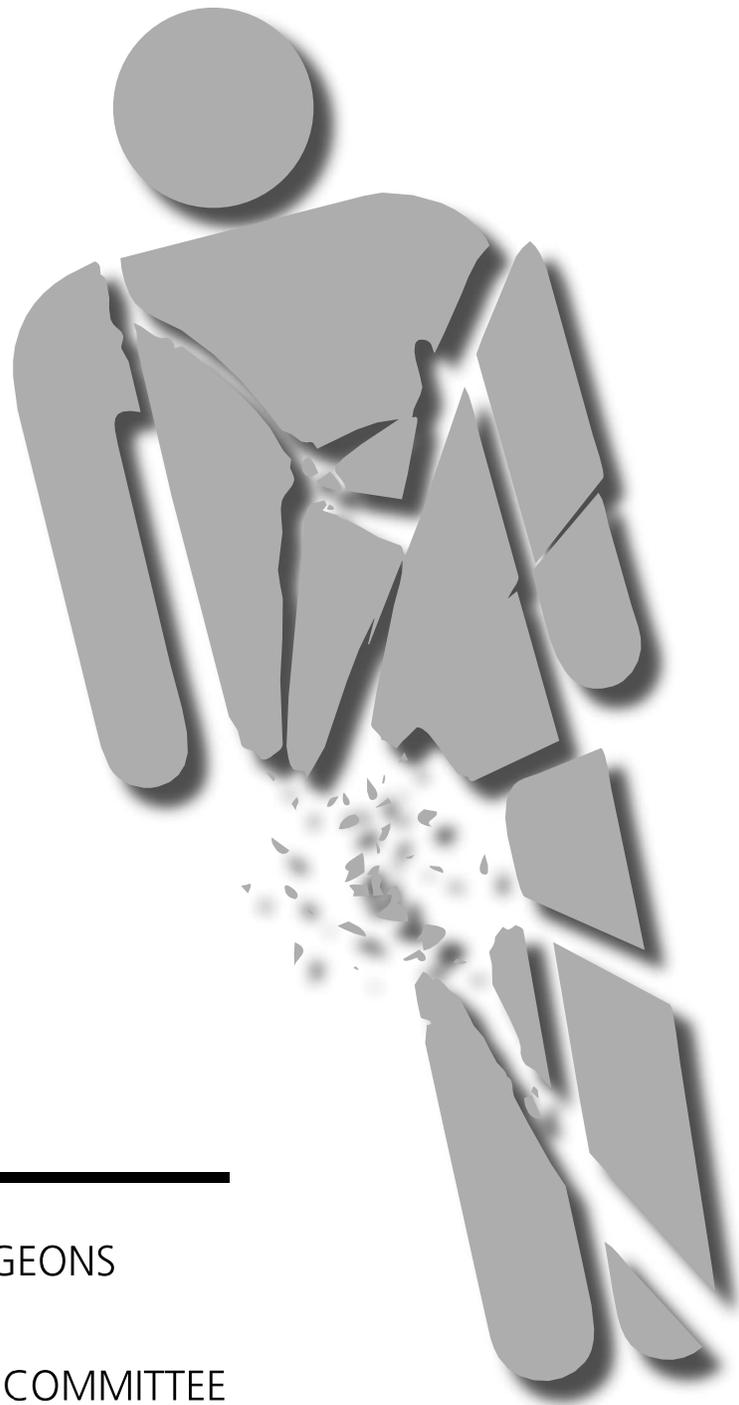


# REGIONAL TRAUMA SYSTEMS: OPTIMAL ELEMENTS, INTEGRATION, AND ASSESSMENT SYSTEMS CONSULTATION GUIDE



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COMMITTEE ON TRAUMA  
AMERICAN COLLEGE OF SURGEONS

TRAUMA SYSTEM  
EVALUATION AND PLANNING COMMITTEE

*Regional Trauma Systems: Optimal Elements, Integration, and Assessment, American College of Surgeons Committee on Trauma: Systems Consultation Guide* is intended as an instructive and evaluation tool to assist surgeons, health care institutions, and public health agencies in improving trauma systems and the care of injured patients. It is not intended to replace the professional judgment of the surgeon or health care administrator in individual circumstances. The American College of Surgeons and its Committee on Trauma cannot accept, and expressly disclaim, liability for claims arising from the use of this work.

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# PREAMBLE

The earliest organized systems of trauma care had 2 components: (1) a concentration of care at centers dedicated to the care of injured patients; and (2) prehospital bypass such that severely injured patients were transported not to the closest facility, but to trauma centers. The focus on transport and definitive care facilities, although relatively simple, was associated with a significant reduction in preventable deaths and injury-related mortality within the region served. These systems typically served population-dense urban centers such that the designation of relatively few Level I or II centers was sufficient to address local needs. With an increasing recognition of the burden of injury associated with trauma outside of major metropolitan areas, including suburban and rural environments, it became evident that this exclusive approach to trauma center designation was inadequate. To better serve the needs of the entire population, systems with an inclusive configuration were implemented. These systems, in which all acute care facilities participate to the extent that their resources allow, served 2 purposes: (1) They provided all centers with a means to assess and stabilize the conditions of patients before transport to Level I or II centers if indicated. (2) They allowed for less severely injured patients to be cared for within their community. Recent evidence suggests that inclusive systems of trauma care are associated with a reduction in injury-related mortality within a region compared with exclusive systems.

Organized systems of trauma care are more than definitive care facilities and a means to transport patients. The system must be grounded in legislation, with policies and procedures to ensure that the system continues to meet regional needs. Thus, there must be a means to ensure adequate funds and personnel to support systems operations, continuing quality improvement, and injury surveillance to identify emergent new threats. As the trauma system's role in reducing mortality and reintegrating the injured back into society was increasingly understood, the trauma system's expanded role in post-acute care and rehabilitation was recognized.

## **History of the American College of Surgeons Trauma System Consultation Process**

Historically, in the United States, care of injured patients focused on trauma centers, not trauma systems. This focus stemmed from the existence of large county hospitals, which became de facto trauma centers. Dedicated trauma centers, beyond these county hospitals, were developed beginning in 1966. There was also the sporadic development of trauma systems beginning with the state of Illinois designating trauma centers (a "system") in 1971 and Maryland creating the statewide Shock Trauma System in Baltimore. Other regions followed, such as Orange County, California, and San Diego, California, in the early 1980s.

The first document to establish resource and process standards for trauma centers was published in the *Bulletin of the American College of Surgeons* in 1976 and titled "Optimal Hospital Resources for Care of the Seriously Injured." This document formed the basis for the American College of Surgeons (ACS)-Committee on Trauma (COT) Trauma Center Verification Program. It was during trauma center verification site visits that it became evident there was also great interest in having assistance in developing trauma systems. However, at that time, the ACS-COT did not have the necessary tools or processes to provide this service.

In 1992, under the auspices of the Health Resources and Services Administration (HRSA), the Model Trauma Care System Plan was developed for the United States. The HRSA Model Trauma plan was used as the basis for the development of the ACS-COT Trauma Systems Consultation Program in 1996, to meet this national need. The ACS-COT multidisciplinary committee established the following fundamental principles for the Trauma Systems Consultation Program:

- Trauma systems should be inclusive.
- This program would be a consultation program as opposed to a "verification" program. It was thought that the program should be designed to assist any

region desirous of developing or improving an already existing a trauma system.

- The process and consultation team would be multidisciplinary, reflecting the multidisciplinary nature of a trauma system.
- Regions requesting a consultation visit would be able to customize the consultation process. Customization was accomplished by allowing the requesting lead agency to submit specific questions and issues the region wanted to be addressed. The site visit team could thereby include people with the requisite expertise to serve the needs of the requesting agency and participants.
- All site visit work sessions would be inclusive and, thereby, include all participants who represented the various components of the system (such as surgeons, nurses, hospital administrators, emergency medical services agency, fire chiefs, and paramedics and emergency medical technicians). Therefore, all discussions regarding the trauma system would take place with input from all key participants.

The first consultation visit was conducted in Montana in 1999. During this initial consultation, the process was tested and modified, including the use of an electronic format for creating the consultation report. Numerous consultation site visits have been conducted and enabled refinements to the consultation process.

A Client Manual was developed to assist states and regions in preparing for the site visit. This document was followed by the development of a Reviewer Manual to assist review team participants to assess the level of trauma system maturity and to recommend operational processes to move the system forward.

The need for a more scientifically based assessment tool grounded in the principles of public health was identified in 2002 by HRSA in cooperation with the ACS-COT Trauma Systems Committee. The public health framework of assessment, policy development, and assurance, the guiding principles and core functions of public health, were also recognized as the basis for developing trauma systems including injury control and prevention programs. This need led to the development of the *Model Trauma System Planning and Evaluation* (MTSPE) document, released by HRSA in 2006.

Based on this document and the recommendation for regionalization by the 2006 Institute of Medicine report (*The Future of Emergency Care in the US Health Care System*) and its experience in conducting trauma system assessments, the ACS-COT concluded that a major update of the *Trauma Systems Consultation*

*Guide* was in order. The Institute of Medicine report specifically acknowledged the ACS-COT Trauma System Evaluation and Planning Committee efforts to promote regionalized, coordinated, and accountable systems of care as a model for other emergency health care responses.

## Public Health Model

The events of September 11, 2001, led to a review of the emergency medical services and the public health infrastructure. What resulted was a broader understanding of the need for emergency care and public health systems to work in a more collaborative and cooperative environment. There came an awareness of the need for prepared and fully interoperable emergency medical, trauma care, and all-hazards response systems and the recognition of the importance of the public health infrastructure in responding to all hazards, including terrorist activities. Add to this the clear parallels between the epidemiologic behaviors of illness and injuries and the existing public health strategies used for communicable disease eradication, and it becomes evident that an organized system of trauma care should interface very well with public health services. This interface is reflected in HRSA's MTSPE, released in February 2006.

The application of the public health model to trauma systems is based on the concept that injury as a disease can be prevented or its negative impacts decreased, or both, by primary, secondary, and/or tertiary prevention efforts. These actions are similar to actions taken to reduce morbidity and mortality of infectious diseases. It is well recognized that excellent clinical trauma care and effective injury prevention programs are necessary to reduce death and disability due to injury. This goal can be obtained through partnerships among trauma system managers, health care providers, and public health agencies such that all 3 phases of injury prevention are addressed. Key objectives in reducing the burden of injury and in making improvements in the trauma care of persons with serious injury include forging effective collaborations among trauma system agencies, community health care facilities, and public health departments.

The public health system provides a conceptual framework for trauma system development, management, and ongoing performance improvement. The 3 core functions of public health services are assessment, policy development, and assurance.

- **Assessment** is the regular and systematic collection and analysis of data from a variety of sources to

determine the status and cause of a problem and to identify potential opportunities for interventions.

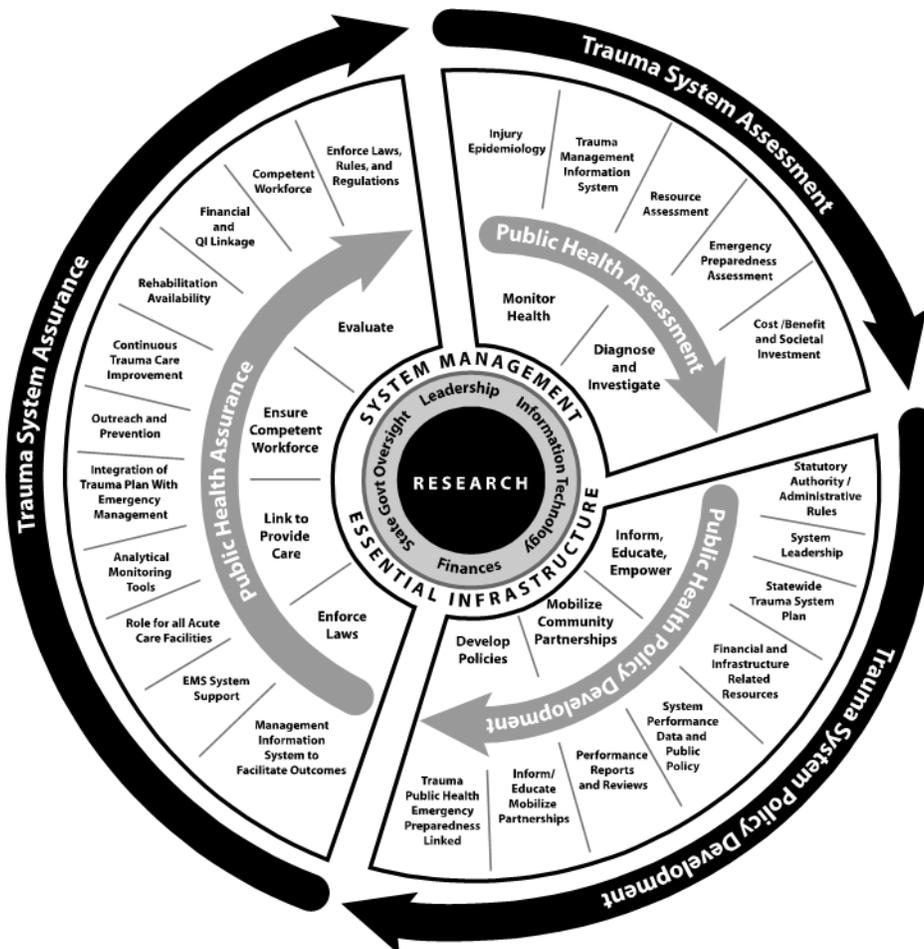
- **Policy development** uses the results of the assessment in an organized manner to establish comprehensive policies intended to improve the public's health.
- **Assurance**, agreed-on goals to improve the public's health, is achieved by providing services directly, by requiring services through regulation, or by encouraging the actions of others (public or private).

The core functions of the public health approach as they relate to trauma systems are demonstrated in Figure 1. The relationship between these core functions and trauma system components as described in HRSA's *Model Trauma Care System Components* document

(1992) is illustrated in Table 1. The public health community moved to make core function concepts more clear by describing 10 essential services that are key to providing public health at a local level. These essential services of public health are as follows:

1. Monitor health status to identify community health problems.
2. Diagnose and investigate health problems and health hazards in the community.
3. Inform, educate, and empower people about health issues.
4. Mobilize community partnerships to identify and solve health problems.

**Figure 1. Core functions and essential services of the trauma system integrated with public health.**



From Health Resources and Services Administration. *Model Trauma System Planning and Evaluation*. Rockville, MD: Health Resources and Services Administration; 2006:18.

\*Note that research, one of the 10 essential services, is key and is placed in the center, as it is research that drives the system.

**Table 1. Comparison of Public Health Core Functions and 1992 Model Trauma Care System Components\***

Public Health Core Functions		Trauma System Components	
Core Function	Essential Service	1992 Core Components	Subcomponents
Assessment	Monitor health Diagnose and investigate	Evaluation	Needs assessment Data collection Research
Policy Development	Inform, educate, and empower Mobilize community partnerships	Public information and education	Injury prevention Trauma advisory committee
	Develop policies	Legislation and regulations	Trauma system planning and operations Regulations and rules
Assurance	Enforce laws		
	Ensure links to or provision of care	Prehospital care	Communications Triage and transport, medical direction, and treatment protocols
		Definitive care	Facilities (designation), interfacility transfer, and rehabilitation
	Ensure competent workforce	Human resources	Workforce resources and educational preparation
	Evaluation	Evaluation	Data collection Research Interdisciplinary review committee
	Research		

\*From Health Resources and Services Administration. *Model Trauma System Planning and Evaluation*. Rockville, MD: Health Resources and Services Administration; 2006:16.

5. Develop policies and plans that support individual and community health efforts.
6. Enforce laws and regulations that protect health and ensure safety.
7. Link people to needed personal health services, and ensure the provision of health care when otherwise unavailable.
8. Ensure a competent public health and personal health care workforce.
9. Evaluate effectiveness, accessibility, and quality of personal and population-based health services.
10. Conduct research to attain new insights and innovative solutions to health problems.

### **Integration of the Trauma Systems Consultation Guide With the HRSA’s MTSPE Document**

The MTSPE document offers a conceptual framework for trauma system design and implementation. This trauma system consultation guide serves the purpose of assisting in the trauma system consultation process, irrespective of its phase of development or scope. This document thus serves to take the MTSPE conceptual framework and convert it into an assessment tool to be used at the time of trauma system consultation. The MTSPE contains a self-assessment tool for trauma system planning, development, and evaluation. This tool, referred to as the BIS (benchmarks, indicators,

and scoring), serves to allow individuals within the system to identify gaps in their system and monitor their progress over time. The components of the BIS are as follows:

*Benchmarks* are global overarching goals, expectations, or outcomes. In the context of the trauma system, a benchmark identifies a broad system attribute.

*Indicators* are tasks or outputs that characterize the benchmark. Indicators identify actions or capacities within the benchmark and are the measurable components of a benchmark.

*Scoring* breaks down the indicator into completion steps. Scoring provides an assessment of the current status and marks progress over time toward reaching a certain milestone.

In development of the *Regional Trauma Systems: Optimal Elements, Integration, and Assessment* document, we strived to maintain consistency with the BIS and sought to identify benchmarks and indicators appropriate to the various trauma system components. Our broad objectives were to provide context and substance to the conceptual framework proposed in the MTSPE. This approach provides for a practical application of the MTSPE at the time of trauma system consultation and allows stakeholders to readily translate assessments and recommendations provided at the time of consultation into the context of the

public health approach. To facilitate this translation, we have identified the benchmarks and indicators by their numbers (using the same numbers as in the HRSA document), preceded by a B (benchmark) or an I (indicator), in parentheses following system elements. In their simplest form, the indicators represent the optimal elements of a system and are described as such in their sections.

We attempted to ensure that the needs of the *general population* and *special populations* would be met. Special populations include children; people who are elderly, disabled, and dispossessed (poor, homeless, and institutionalized); and tribal nations. We additionally tried to achieve a workable balance in the needs of patients, providers, payers, and the public.

This document is consistent with and supports the concepts contained in the following:

- Emergency Medical Services for Children Program performance measures for state partnership grants
- Centers for Disease Control and Prevention Field Triage Guidelines
- National Highway Traffic Safety Administration's *The Trauma System Agenda for the Future*

The introductions to the 4 sections of this document are from the MTSPE.



## SECTION 1

# TRAUMA SYSTEM ASSESSMENT



### ASSESSMENT

*Regular systematic collection, assembly, analysis, and dissemination of information on the health of the community*

## Injury Epidemiology

### Purpose and Rationale

Injury epidemiology is concerned with the evaluation of the frequency, rates, and pattern of injury events in a population. Injury pattern refers to the occurrence of injury-related events by time, place, and personal characteristics (for example, demographic factors such as age, race, and sex) and behavior and environmental exposures, and, thus, it provides a relatively simple form of risk-factor assessment.

The descriptive epidemiology of injury among the whole jurisdictional population (geographic area served) within a trauma system should be studied and reported. Injury epidemiology provides the data for public health action and becomes an important link between injury prevention and control and trauma system design and development. Within the trauma system, injury epidemiology has an integral role in describing the root causes of injury and identifying patterns of injury so that public health policy and programs can be implemented. Knowledge of a region's injury epidemiology enables the identification of priorities for directing better allocation of resources, the nature and distribution of injury prevention activities, financing of the system, and health policy initiatives.

The epidemiology of injury is obtained by analyzing data from multiple sources. These sources might include vital statistics, hospital administrative discharge databases, and data from emergency medical services (EMS), emergency departments (EDs), and trauma registries. Motor-vehicle crash data might also prove useful, as would data from the criminal justice system focusing on interpersonal conflict. It is important to assess the burden of injury across specific population groups (for example, children, elderly people, and

ethnic groups) to ensure that specific needs or risk factors are identified. It is critical to assess rates of injury appropriately and, thus, to identify the appropriate denominator (for example, admissions per 100,000 population). Without such a measure, it becomes difficult to provide valid comparisons across geographic regions and over time.

To establish injury policy and develop an injury prevention and control plan, the trauma system, in conjunction with the state or regional epidemiologist, should complete a risk assessment and gap analysis using all available data. These data allow for an assessment of the "injury health" of the population (community, state, or region) and will allow for the assessment of whether injury prevention programs are available, accessible, effective, and efficient.

An ongoing part of injury epidemiology is public health surveillance. In the case of injury surveillance, the trauma system provides routine and systematic data collection and, along with its partners in public health, uses the data to complete injury analysis, interpretation, and dissemination of the injury information. Public health officials and trauma leaders should use injury surveillance data to describe and monitor injury events and emerging injury trends in their jurisdictions; to identify emerging threats that will call for a reassessment of priorities and/or reallocation of resources; and to assist in the planning, implementation, and evaluation of public health interventions and programs.

### Optimal Elements\*

- I. There is a thorough description of the epidemiology of injury in the system jurisdiction using population-based data and clinical databases. (B-101)
  - a. There is a thorough description of the epidemiology of injury mortality in the system

\* This section adapted from Health Resources and Services Administration. *Model Trauma System Planning and Evaluation*. Rockville, MD: Health Resources and Services Administration; 2006.

jurisdiction using population-based data. (I-101.1)

- b. There is a description of injuries within the trauma system jurisdiction, including the distribution by geographic area, high-risk populations (pediatric, elderly, distinct cultural/ethnic, rural, and others), incidence, prevalence, mechanism, manner, intent, mortality, contributing factors, determinants, morbidity, injury severity (including death), and patient distribution using any or all the following: vital statistics, ED data, EMS data, hospital discharge data, state police data (data from law enforcement agencies), medical examiner data, trauma registry, and other data sources. The description is updated at regular intervals. (I-101.2)
  - c. There is comparison of injury mortality using local, regional, statewide, and national data. (I-101.3)
  - d. Collaboration exists among EMS, public health officials, and trauma system leaders to complete injury risk assessments. (I-101.4)
  - e. The trauma system works with EMS and public health agencies to identify special at-risk populations. (I-101.7)
- II. Collected data are used to evaluate system performance and to develop public policy. (B-205)
- a. Injury prevention programs use trauma management information system data to develop intervention strategies. (I-205.4)
- III. The trauma, public health, and emergency preparedness systems are closely linked. (B-208)
- a. The trauma system and the public health system have established linkages, including programs with an emphasis on population-based public health surveillance and evaluation for acute and chronic traumatic injury and injury prevention. (I-208.1)
- IV. The jurisdictional lead agency, in cooperation with the other agencies and organizations, uses analytic tools to monitor the performance of population-based prevention and trauma care services. (B-304)
- a. The lead agency, along with partner organizations, prepares annual reports on the status on injury prevention and trauma care in the state, regional, or local areas. (I-304.1)
  - b. The trauma system management information system database is available for routine public

health surveillance. There is concurrent access to the databases (ED, trauma, prehospital, medical examiner, and public health epidemiology) for the purpose of routine surveillance and monitoring of health status that occurs regularly and is a shared responsibility. (I-304.2)

### Prereview Questionnaire

1. Describe the epidemiology of injury in your region and unique features of:
  - a. Children
  - b. Adolescents
  - c. Elderly people
  - d. Other special populations
2. Describe the databases that are used to formulate the injury epidemiology profile (for example, population-based and clinical).
3. Have system epidemiology profile results (for example, mortality rates, distribution of mechanism, or intent) been compared with benchmark values? If so, please provide comparisons and origins of the benchmarks.
4. Describe how emerging injury control patterns (for example, from trend or surveillance data) were identified and acted on.
5. Describe how ongoing and routine injury surveillance is completed and how results are shared with constituent groups.

### Documentation Required

Before the site visit:

- ✓ No additional documentation required

On-site:

- ✓ A copy of the most recent State and Territorial Injury Prevention Directors Association assessment report
- ✓ Copy of the injury epidemiology report or profile

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## Indicators as a Tool for System Assessment

### Purpose and Rationale

In the absence of validated national benchmarks, or norms, the benchmarks, indicators and scoring (BIS) process included in the Health Resources and Services Administration's *Model Trauma System Planning and*

*Evaluation* document provides a tool for each trauma system to define its system-specific health status benchmarks and performance indicators and to use a variety of community health and public health interventions to improve the community's health status. The tool also addresses reducing the burden of injury as a community-wide public health problem, not strictly as a trauma patient care issue.

This BIS tool provides the instrument and process for a relatively objective state and substate (regional) trauma system self-assessment. The BIS process allows for the use of state, regional, and local data and assets to drive consensus responses to the BIS. It is essential that the BIS process be completed by a multidisciplinary stakeholder group, most often the equivalent of a state trauma advisory committee. The BIS process can help focus the discussion on various system strengths and weaknesses, can be used to set goals or benchmarks, and provides the opportunity to target often limited resources and energies to the areas identified as most critical during the consensus process. The BIS process is useful to develop a snapshot of any given system at a moment in time. However, its true usefulness is in repeated assessments that reveal progress toward achieving various benchmarks identified in the previous application of the BIS. This process further permits the trauma system to refine goals to be attained before future reassessments using the tool.

### **Optimal Element\***

- I. Assurance to constituents that services necessary to achieve agreed-on goals are provided by encouraging actions of others (public or private), requiring action through regulation, or providing services directly. (B-300)

### **Prereview Questionnaire**

1. Has a multidisciplinary stakeholder group participated in the scoring and consensus process associated with the BIS tool? If not, are there plans to do so?
2. If the process has been completed, how were the findings used?
3. Is there a date (year/month) set for a reassessment using the BIS tool to mark progress toward agreed-on goals or benchmarks?

### **Documentation Required**

Before the site visit:

- ✓ No additional documentation required

On-site:

- ✓ Copies of recommendations or actions emanating from the BIS process
- ✓ Notes or minutes from any multidisciplinary stakeholder group that applied the BIS

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\* This section adapted from Health Resources and Services Administration. *Model Trauma System Planning and Evaluation*. Rockville, MD: Health Resources and Services Administration; 2006.



## SECTION 2

# TRAUMA SYSTEM POLICY DEVELOPMENT



### POLICY DEVELOPMENT

*Promoting the use of scientific knowledge in decision making, which includes:*

- *building constituencies,*
- *identifying needs and setting priorities,*
- *using legislative authority and funding to develop plans and policies to address needs, and*
- *ensuring the public's health and safety.*

### Statutory Authority and Administrative Rules

#### Purpose and Rationale

Reducing morbidity and mortality due to injury is the measure of success of a trauma system. A key element to this success is having the legal authority necessary to improve and enhance care of injured people through comprehensive legislation and through implementing regulations and administrative code, including the ability to regularly update laws, policies, procedures, and protocols. In the context of the trauma system, comprehensive legislation means the statutes, regulations, or administrative codes necessary to meet or exceed a prescribed set of standards of care. It also refers to the operating procedures necessary to continually improve the care of injured patients from injury prevention and control programs through postinjury rehabilitation. The ability to enforce laws and rules guides the care and treatment of injured patients throughout the continuum of care.

There must be sufficient legal authority to establish a lead trauma agency and to plan, develop, maintain, and evaluate the trauma system during all phases of care. In addition, it is essential that as the development of the trauma system progresses, included in the legislative mandate are provisions for collaboration, coordination, and integration with other entities also engaged in providing care, treatment, or surveillance activities related to injured people. A broad approach

to policy development should include the building of system infrastructure that can ensure system oversight and future development, enforcement, and routine monitoring of system performance; the updating of laws, regulations or rules, and policies and procedures; and the establishment of best practices across all phases of intervention. The success of the system in reducing morbidity and mortality due to traumatic injury improves when all service providers and system participants consistently comply with the rules, have the ability to evaluate performance in a confidential manner, and work together to improve and enhance the trauma system through defined policies.

#### Optimal Elements\*

- I. Comprehensive state statutory authority and administrative rules support trauma system leaders and maintain trauma system infrastructure, planning, oversight, and future development. (B-201)
  - a. The legislative authority states that all the trauma system components, emergency medical services (EMS), injury control, incident management, and planning documents work together for the effective implementation of the trauma system (infrastructure is in place). (I-201.2)
  - b. Administrative rules and regulations direct the development of operational policies and procedures at the state, regional, and local levels. (I-201.3)
- II. The lead agency acts to protect the public welfare by enforcing various laws, rules, and regulations as they pertain to the trauma system. (B-311)
  - a. Laws, rules, and regulations are routinely reviewed and revised to continually strengthen and improve the trauma system. (I-311.4)

\* This section adapted from Health Resources and Services Administration. *Model Trauma System Planning and Evaluation*. Rockville, MD: Health Resources and Services Administration; 2006.

## Prereview Questionnaire

1. Describe how the current statutes and regulations allow the state or region to:
  - a. develop, plan, and implement the trauma system,
  - b. monitor and enforce rules,
  - c. designate the lead agency,
  - d. collect and protect confidential data, and
  - e. protect confidentiality of the quality improvement process.
2. Describe the process by which trauma system policies and procedures are developed or updated to manage the system including:
  - a. the adoption of standards of care,
  - b. designation or verification of trauma centers,
  - c. direct patient flow on the basis of designation,
  - d. data collection, and
  - e. system evaluation.
3. Within the context of statutes and regulation, describe how injury prevention, EMS, public health, the needs of special populations, and emergency management are integrated or coordinated within the trauma system.

## Documentation Required

Before site visit:

- ✓ Trauma system statutes and regulations
- ✓ EMS statutes and regulations

On-site:

- ✓ Trauma system policies, procedures, standards, or other regulatory guidelines

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## System Leadership

### Purpose and Rationale

In addition to lead agency staff and consultants (for example, trauma system medical director), there are other significant leadership roles essential to developing mature trauma systems. A broad constituency of trauma leaders includes trauma center medical directors and nurse coordinators, prehospital personnel, injury prevention advocates, and others. This broad group of trauma leaders works with the lead agency to inform and educate others about the trauma system, implements trauma prevention programs, and assists in

trauma system evaluation and research to ensure that the right patient, right hospital, and right time goals are met. There is a strong role for the trauma system leadership in conveying trauma system messages, building communication pathways, building coalitions, and collaborating with relevant individuals and groups. The marketing communication component of trauma system development and maintenance begins with a consensus-built public information and education plan. The plan should emphasize the need for close collaboration between coalitions and constituency groups and increased public awareness of trauma as a disease. The plan should be part of the ongoing and regular assessment of the trauma system and be updated as frequently as necessary to meet the changing environment of the trauma system.

When there are challenges to providing the optimal care to trauma patients within the system, the leadership needs to effect change to produce the desired results. Broad system improvements require the ability to identify challenges and the resources and authority to make changes to improve system performance. However, system evaluation is a shared responsibility. Although the leadership will have a key role in the acquisition and analysis of system performance data, the multidisciplinary trauma oversight committee will share the responsibility of interpreting those data from a broad systems perspective to help determine the efficiency and effectiveness of the system in meeting its stated performance goals and benchmarks. All stakeholders have the responsibility of identifying opportunities for system improvement and bringing them to the attention of the multidisciplinary committee or the lead agency. Often, subtle changes in system performance are noticed by clinical care providers long before they become apparent through more formal evaluation processes.

Perhaps the biggest challenge facing the lead agency is to synergize the diversity, complexity, and uniqueness of individuals and organizations into a finely tuned system for prevention of injury and for the provision of quality care for injured patients. To meet this challenge, leaders in all phases of trauma care must demonstrate a strong desire to work together to improve care provided to injured victims.

### Optimal Elements\*

- I. Trauma system leaders (lead agency, trauma center personnel, and other stakeholders) use a process to establish, maintain, and constantly

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\* This section adapted from Health Resources and Services Administration. *Model Trauma System Planning and Evaluation*. Rockville, MD: Health Resources and Services Administration; 2006.

evaluate and improve a comprehensive trauma system in cooperation with medical, professional, governmental, and other citizen organizations. (B-202)

- II. Collected data are used to evaluate system performance and to develop public policy. (B-205)
- III. Trauma system leaders, including a trauma-specific statewide multidisciplinary, multiagency advisory committee, regularly review system performance reports. (B-206)
- IV. The lead agency informs and educates state, regional, and local constituencies and policy makers to foster collaboration and cooperation for system enhancement and injury control. (B-207)

### Prereview Questionnaire

1. How does the lead agency bring constituency groups together to review and monitor the trauma system throughout each phase of care?
2. Describe the composition, responsibilities, and activities of the multidisciplinary trauma system advisory committee(s) and the working relationship(s) with the trauma lead agency and the EMS lead agency, if they are different.
  - a. Identify pediatric representatives on the multidisciplinary trauma system advisory committee and any pediatric advisory groups that provide input into trauma system development.
  - b. Describe the process of involving experts in, and advocates for, special populations and how they help drive regional trauma system policy.
  - c. Describe how the multidisciplinary advisory committee is involved in trauma system performance evaluation (for example, review of system performance reports).
3. Provide examples of how the lead agency and trauma system leadership (for example, trauma centers, trauma medical director, nurse coordinator, trauma administrator, and other stakeholders) inform and educate policy makers, elected officials, community groups, and others about the trauma system, its strengths, and its improvement opportunities.
4. Describe the process to build or expand effective trauma leadership within the trauma system (for example, succession planning, leadership courses, and workshops), including the lead agency and trauma centers.
5. Describe the process by which lead agency staff would identify changes in system performance.
6. Describe how the multidisciplinary advisory committee is involved in trauma system performance evaluation.

### Documentation Required

Before site visit:

- ✓ A comprehensive organizational chart that identifies the lead agency staff (including contract employees) assigned to the trauma program (full- or part-time)
- ✓ A copy of the most recent trauma system aggregated performance improvement report generated by the lead agency
- ✓ Organizational chart that illustrates the system oversight committee, its subcommittee, and its relationship to the lead agency

On-site:

- ✓ Copies of curriculum vitae for the trauma system leadership: state EMS director, trauma system manager, state medical director, and state trauma director
- ✓ A copy of minutes or meeting notes pertaining to the identification, discussion, and resolution of a trauma system (rather than a trauma center) issue

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## Coalition Building and Community Support

### Purpose and Rationale

Coalition building is a continuous process of cultivating and maintaining relationships with constituents (interested citizens) in a state or region who agree to collaborate on injury control and trauma system development. Key constituents include health professionals, trauma center administrators, prehospital care providers, health insurers and payers, data experts, consumers and advocates, policy makers, and media representatives. The coalition of key constituents comprises the trauma system's stakeholders. The involvement of these key constituents is important for the following:

- Trauma system plan development
- Regionalization: promoting collaboration rather than competition between trauma centers
- System integration

- State policy development: authorizing legislation and regulations
- Financing initiatives
- Disaster preparedness

The coalition should be effectively organized through the formation of multidisciplinary state and regional advisory groups to coordinate trauma system planning and implementation efforts. Constituents also communicate with elected officials and policy leaders regarding the development and sustainability of the trauma system. Information and education are needed by constituents to be effective partners in policy development for trauma system planning. Regular communication about the status of the trauma system helps these key partners to recognize needs and progress made with trauma system implementation.

One of the most effective ways to educate elected officials and the public is through an organized public information and education effort that may involve a media campaign about the burden of injury in the state and the need for trauma system development. Information and education are important to reduce the incidence of injury in all age groups and to demonstrate the value of an effective trauma system when a serious injury occurs.

### Optimal Element\*

- I. The lead agency informs and educates state, regional, and local constituencies and policy makers to foster collaboration and cooperation for system enhancement and injury control. (B-207)

### Prereview Questionnaire

1. What is the status of the trauma system's coalition (for example, What is the status of recruiting members and building a coalition? Is the coalition strong and active? Does the coalition need new energy? Who is not currently involved but should be a part of your coalition?)?
  - a. What is the role of the coalition members (constituents and stakeholders) in promoting trauma system development?
  - b. What is the method and frequency for communicating with coalition members?
2. Describe how the trauma system leadership mobilizes community partners to improve the trauma system through effective communication and collaboration.

\* This section adapted from Health Resources and Services Administration. *Model Trauma System Planning and Evaluation*. Rockville, MD: Health Resources and Services Administration; 2006.

- a. How has the community been approached to identify injury control concerns?
- b. What key problems has the community identified?
- c. How do stakeholders bring system challenges or deficiencies to the attention of the lead agency?

### Documentation Required

Before site visit:

- ✓ A list of organizations represented for trauma system planning or injury control (for example, multidisciplinary state advisory committee, subcommittees, and other groups supporting trauma system development)

On-site:

- ✓ A list of all coalition members, and identify organizations representing special populations (for example, children and people who are elderly, need rehabilitation, or are disabled)
- ✓ Two or three different types of communication to constituencies or the trauma system coalition (for example, notice of planning meetings, newsletter, activity report, coalition updates, or media message)

## Lead Agency and Human Resources Within the Lead Agency

### Purpose and Rationale

Each trauma system (state, regional, local, as defined in state statute) should have a lead agency with a strong program manager who is responsible for leading the trauma system. The lead agency, usually a government agency, should have the authority, responsibility, and resources to lead the planning, development, operations, and evaluation of the trauma system throughout the continuum of care. The lead agency, empowered through legislation, ensures system integrity and provides for program integration with other health care and community-based entities, namely, public health, EMS, disaster preparedness, emergency management, law enforcement, social services, and other community-based organizations.

The lead agency works through a variety of groups to accomplish the goals of trauma system planning, implementation, and evaluation. The ability to bring multidisciplinary, multiagency advisory groups together to accomplish trauma system goals is essential in

developing and maintaining the trauma system and is part of providing leadership to evolving and mature systems.

The lead agency's trauma system program manager coordinates trauma system design, the adoption of minimum standards (prehospital and in-hospital), and provides for overall system evaluation through performance indicator assessment and assurance. In addition to a trauma program manager, the lead agency must be sufficiently staffed to actively participate in each phase of development and in maintaining the system through a clearly defined structure for decision making (policies and procedures) and through proactive surveillance and evaluation. *Minimum* staffing usually consists of a trauma system program manager, data entry and analysis personnel, and monitoring and compliance personnel. Additional staff resources include administrative support and a part-time commitment from the public health epidemiology service to provide system evaluation and research support.

Within the leadership and governance structure of the trauma system, there is a role for strong physician leadership. This role is usually fulfilled by a full- or part-time trauma medical director within the lead agency.

### Optimal Elements\*

- I. Comprehensive state statutory authority and administrative rules support trauma system leaders and maintain trauma system infrastructure, planning, oversight, and future development. (B-201)
  - a. The legislative authority (statutes and regulations) plans, develops, implements, manages, and evaluates the trauma system and its component parts, including the identification of the lead agency and the designation of trauma facilities. (I-201.1)
  - b. The lead agency has adopted clearly defined trauma system standards (for example, facility standards, triage and transfer guidelines, and data collection standards) and has sufficient legal authority to ensure and enforce compliance. (I-201.4)
- II. Sufficient resources, including financial and infrastructure-related, support system planning, implementation, and maintenance. (B-204)

\* This section adapted from Health Resources and Services Administration. *Model Trauma System Planning and Evaluation*. Rockville, MD: Health Resources and Services Administration; 2006.

### Prereview Questionnaire

1. Describe the number, position titles, and percentage of full-time equivalency of all personnel within the lead agency or contract personnel who have roles or responsibilities to the trauma program.
2. Identify other personnel resources that support the trauma program activities of the lead agency (for example, epidemiology support from other units within the health department, public health interns)
3. Describe the adequacy of personnel resources available to the lead agency to sustain trauma program assessment, policy development, and assurance activities.
  - a. Identify impediments or barriers that hinder system development.

### Documentation Required

Before site visit:

- ✓ A comprehensive organizational chart that identifies the position of the lead agency within the broader governmental authority (for example, health department)
- ✓ A job description for the trauma program manager and the trauma medical director

On-site:

- ✓ No additional documentation required

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## Trauma System Plan

### Purpose and Rationale

Each trauma system, as defined in statute, should have a clearly articulated trauma system planning process resulting in a written trauma system plan. The plan should be built on a completed inventory of trauma system resources identifying gaps in services or resources and the location of assets. It should also include an assessment of population demographics, topography, or other access enhancements (location of hospital and prehospital resources) or barriers to access. It is important that the plan identify special populations (for example, pediatric, elderly, in need of burn care, ethnic groups, rural) within the geographic area served and address the needs of those populations within the planning process. A needs assessment (or other method of identifying injury patterns, patient care review/preventable death study) should also be completed for initial trauma system planning and

updated periodically as needed to assess system changes over time.

The trauma system plan is developed by the lead trauma agency based on the results of a needs assessment and other data resources available for review. It describes the system design, integrated and inclusive, with adopted standards of care for prehospital and hospital personnel and a process to regularly review the plan over time. The plan is built on input from trauma advisory committees (or stakeholder groups) that assist in analyzing data, identifying resources, and developing system standards of care, including system policies and procedures and overall system design. Ideally, although every stakeholder group may not be satisfied with the plan or system design, the plan, to the extent possible, should be based on consensus of the advisory committees and stakeholder groups. These advisory groups should be able to review the plan before final adoption and approve the plan before it is submitted to the lead agency with authority for plan approval.

The trauma system plan is used to guide system development, implementation, and management. Each component of the trauma system (for example, prehospital, hospital, communications, and transportation) is clearly defined and an established service level identified (baseline) with goals for enhancement (benchmark). Within the plan are incorporated other planning documents used to ensure integration of similar services and build collaboration and cooperation with those services. Service plans for emergency preparedness, EMS, injury prevention and control, public health, social services, and mental health are examples of services for which the trauma system plan should include an interface between agencies and services.

### **Optimal Element\***

- I. The state lead agency has a comprehensive written trauma system plan based on national guidelines. The plan integrates the trauma system with EMS, public health, emergency preparedness, and incident management. The written trauma system plan is developed in collaboration with community partners and stakeholders. (B-203)
  - a. The trauma system plan clearly describes the system design (including the components necessary to have an integrated and inclusive trauma system) and is used to guide system implementation and management. For

\* This section adapted from Health Resources and Services Administration. *Model Trauma System Planning and Evaluation*. Rockville, MD: Health Resources and Services Administration; 2006.

example, the plan includes references to regulatory standards and documents and includes methods of data collection and analysis. (I-203.4)

### **Prereview Questionnaire**

1. Describe the process for the development or revision of the trauma system plan.
  - a. Include the role of advisory and stakeholder groups in the process.
2. Is there ongoing assessment of trauma resources and asset allocation within the system?
3. Describe the process used to determine trauma system standards and trauma system policies.
  - a. How are they reviewed and evaluated?
  - b. What standards and policies exist for special populations, including rural and frontier regions?
  - c. How are specialized needs addressed, including burns, spinal cord injury, traumatic brain injury, and reimplantation?

### **Documentation Required**

Before site visit:

- ✓ Copy of the written trauma system plan

On-site:

- ✓ No additional documentation required

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## **System Integration**

### **Purpose and Rationale**

Trauma system integration is essential for the daily care of injured people and includes such services as mental health, social services, child protective services, and public safety. The trauma system should use the public health approach to injury prevention to contribute to reducing the entire burden of injury in a state or region. This approach enables the trauma system to address primary, secondary, and tertiary injury prevention through closer integration with community health programs and mobilizing community partnerships. The partnerships also include mental health, social services, child protection, and public safety services. Collaboration with the public health community also provides access to health data that can be used for system assessment, development of public policy, and informing and educating the community.

Integration with EMS is essential because this system is linked with the emergency response and communication infrastructure and transports severely injured patients to trauma centers. Triage protocols should exist for treatment and patient delivery decisions. Regulations and procedures should exist for online and off-line medical direction. In the event of a disaster affecting local trauma centers, EMS would have a major role in evacuating patients from trauma centers to safety or to other facilities or to make beds available for patients in greater need.

The trauma system is a significant state and regional resource for the response to mass casualty incidents (MCIs). The trauma system and its trauma centers are essential for the rapid mobilization of resources during MCIs. Preplanning and integration of the trauma system with related systems (public health, EMS, and emergency preparedness) are critical for rapid mobilization when a disaster or MCI occurs. The extensive impact of disasters and MCIs on the functioning of trauma centers and the EMS and public health systems within the affected region or state must be considered, and joint planning for optimal use of all resources must occur to enable a coordinated response to an MCI. Trauma system leaders need to be actively involved in emergency management planning to ensure that trauma centers are integrated into the local, regional, and state disaster response plans.

### Optimal Elements\*

- I. The state lead agency has a comprehensive written trauma system plan based on national guidelines. The plan integrates the trauma system with EMS, public health, emergency preparedness, and incident management. The written trauma system plan is developed in collaboration with community partners and stakeholders. (B-203)
  - a. The trauma system plan has established clearly defined methods of integrating the trauma system plan with the EMS, emergency, and public health preparedness plans. (I-203.7)
- II. The trauma, public health, and emergency preparedness systems are closely linked. (B-208)

### Prereview Questionnaire

1. What is the trauma system's collaboration and integration with EMS, public health, and emergency management and programs such as:
  - a. prevention programs,

\* This section adapted from Health Resources and Services Administration. *Model Trauma System Planning and Evaluation*. Rockville, MD: Health Resources and Services Administration; 2006.

- b. mental health,
- c. social services,
- d. law enforcement,
- e. child protective services, and
- f. public safety (such as fire, lifeguard, mountain rescue, and ski patrol)?

### Documentation Required

Before site visit:

- ✓ No additional documentation required

On-site:

- ✓ No additional documentation required

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## Financing

### Purpose and Rationale

Trauma systems need sufficient funding to plan, implement, and evaluate a statewide or regional system of care. All components of the trauma system need funding, including prehospital, acute care facilities, rehabilitation, and prevention programs. Lead agency trauma system management requires adequate funding for daily operations and other important activities such as advisory committee meetings, development of regulations, data collection, performance improvement, and public awareness and education. Adequate funding to support the operation of trauma centers and their state of readiness to care for seriously injured patients within the state or region is essential. The financial health of the trauma system is essential for ensuring its integrity and its improvement over time.

The trauma system lead agency needs a process for assessing its own financial health, as well as that of the trauma system. A trauma system budget should be prepared, and costs should be reported by each component, if possible. Routine collection of financial data from all participating health care facilities is encouraged to fully identify the costs and revenues of the trauma system, including costs and revenues pertaining to patient care, administrative, and trauma center operations. When possible, the lead agency financial planning should integrate with the budgets and costs of the EMS system and disaster, rehabilitation, and prevention programs to enable development of a comprehensive financial health report.

Trauma system financial planning should be related to the trauma plan outcome measures (for example, patient outcome measures such as mortality rates,

length of stay, and quality-of-life indicators). Such information may demonstrate the value added by having a trauma system in place.

### Optimal Elements\*

- I. Sufficient resources, including financial and infrastructure-related, support system planning, implementation, and maintenance. (B-204)
  - a. Financial resources exist that support the planning, implementation, and ongoing management of the administrative and clinical care components of the trauma system. (I-204.2)
  - b. Designated funding for trauma system infrastructure support (lead agency) is legislatively appropriated. (I-204.3)
  - c. Operational budgets (system administration and operations, facilities administration and operations, and EMS administration and operations) are aligned with the trauma system plan and priorities. (I-204.4)
- II. The financial aspects of the trauma systems are integrated into the overall performance improvement system to ensure ongoing fine-tuning and cost-effectiveness. (B-309)
  - a. Collection and reimbursement data are submitted by each agency or institution on at least an annual basis. Common definitions exist for collection and reimbursement data and are submitted by each agency. (I-309.2)

### Prereview Questionnaire

1. How does the lead agency track and analyze internal trauma system finances?

- a. How does the advisory committee participate in the financial review process?
  - b. How frequently are trauma system financial reports published?
  - c. Which financial data are reported (lead agency data, health facility data, or both)?
2. What is the lead agency's budget for the trauma system?
  3. What is the source of funding available to support the development, operations, and management of the trauma system (for example, general funds, dedicated funds)?
  4. What financial incentives and disincentives exist for trauma center participation in the trauma system?
    - a. Specifically include arrangements for uncompensated and undercompensated care.

### Documentation Required

Before site visit:

- ✓ A copy of the lead agency's budgets, identifying line items directly related to goals and objectives of the trauma plan
- ✓ A recent trauma system financial report

On-site:

- ✓ Letters and/or legislation that document financial or in-kind commitment
- ✓ Notice of awards and abstracts (active grants)

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\* This section adapted from Health Resources and Services Administration. *Model Trauma System Planning and Evaluation*. Rockville, MD: Health Resources and Services Administration; 2006.

## SECTION 3

# TRAUMA SYSTEM ASSURANCE



### ASSURANCE

*Ensuring constituents that services necessary to achieve agreed-on goals are provided by:*

- *encouraging the actions of others (public and private),*
- *requiring action through regulation, or*
- *providing services directly.*

### Prevention and Outreach

#### Purpose and Rationale

Trauma systems must develop prevention strategies that help control injury as part of an integrated, coordinated, and inclusive trauma system. The lead agency and providers throughout the system should be working with business organizations, community groups, and the public to enact prevention programs and prevention strategies that are based on epidemiologic data gleaned from the system.

Efforts at prevention must be targeted for the intended audience, well defined, and structured, so that the impact of prevention efforts is system-wide. The implementation of injury control and prevention requires the same priority as other aspects of the trauma system, including adequate staffing, partnering with the community, and taking advantage of outreach opportunities. Many systems focus information, education, and prevention efforts directly to the general public (for example, restraint use, driving while intoxicated). However, a portion of these efforts should be directed toward emergency medical services (EMS) and trauma care personnel safety (for example, securing the scene, infection control). Collaboration with public service agencies, such as the department of health is essential to successful prevention program implementation. Such partnerships can serve to synergize and increase the efficiency of individual efforts. Alliances with multiple agencies within the system, hospitals, and professional associations, working toward the formation of an injury control network, are beneficial.

Activities that are essential to the development and implementation of injury control and prevention programs include the following:

- A needs assessment focusing on the public information needed for media relations, public officials, general public, and third-party payers, thus ensuring a better understanding of injury control and prevention
- Needs assessment for the general medical community, including physicians, nurses, prehospital care providers, and others concerning trauma system and injury control information
- Preparation of annual reports on the status of injury prevention and trauma care in the system
- Trauma system databases that are available and usable for routine public health surveillance

#### Optimal Elements\*

- I. The lead agency informs and educates state, regional, and local constituencies and policy makers to foster collaboration and cooperation for system enhancement and injury control. (B-207)
  - a. The trauma system leaders (lead agency, advisory committees, and others) inform and educate constituencies and policy makers through community development activities, targeted media messaging, and active collaborations aimed at injury prevention and trauma system development. (I-207.2)
- II. The jurisdictional lead agency, in cooperation with other agencies and organizations, uses analytic tools to monitor the performance of population-based prevention and trauma care services. (B-304)
  - a. The lead agency, along with partner organizations, prepares annual reports on the status of injury prevention and trauma care in state, regional, or local areas (I-304.1)

\* This section adapted from Health Resources and Services Administration. *Model Trauma System Planning and Evaluation*. Rockville, MD: Health Resources and Services Administration; 2006.

- III. The lead agency ensures that the trauma system demonstrates prevention and medical outreach activities within its defined service area. (B-306)
- The trauma system is active within its jurisdiction in the evaluation of community-based activities and injury prevention and response programs. (I-306.2)
  - The effect or impact of outreach programs (medical and community training and support and prevention activities) is evaluated as part of a system performance improvement process. (I-306.3)

### Prereview Questionnaire

- List organizations dedicated to injury prevention within the region and the issues they address (for example, MADD, SADD, SafeKids Worldwide, Injury Free Coalition for Kids, American Trauma Society, university-based injury control programs).
- Describe how the trauma lead agency has funded and coordinated system-wide injury prevention or outreach activities.
  - Which injuries (including pediatric injuries) have been identified and prioritized for intervention strategies?
  - Identify any dedicated lead agency or other agency staff member (full- or part-time) responsible for injury prevention outreach and coordination for the trauma system.
  - What is the source of funding?
- Explain the evaluation process for injury prevention projects that are conducted by the lead agency, trauma facilities, or other community-based organizations.
  - Identify any gaps in injury prevention efforts for population groups in the state.

### Documentation Required

Before site visit:

- ✓ A list of the number and nature of injury prevention activities conducted throughout the trauma system in the past year (for example, activities directed at which mechanism or type of injury or which patient population, such as children and elderly people)

On-site:

- ✓ A copy of the state injury control and prevention plan

- ✓ A representative sample of brochures, pamphlets, fliers, and curricula for educational programs on injury prevention

## Emergency Medical Services

### Purpose and Rationale

The trauma system includes, and/or interacts with, many different agencies, institutions, and systems. The EMS system is one of the most important of these relationships. EMS is often the critical link between the injury-producing event and definitive care at a trauma center. Even though at its inception the EMS system was a very broad system concept, over time, EMS has come to be recognized as the prehospital care component of the larger emergency health care system. It is a complex system that not only transports patients, but also includes public access, communications, personnel, triage, data collection, and quality improvement activities.

The EMS system medical director must have statutory authority to develop protocols, oversee practice, and establish a means of ongoing quality assessment to ensure the optimal provision of prehospital care. If not the same individual, the EMS system medical director must work closely with the trauma system medical director to ensure that protocols and goals are mutually aligned. The EMS system medical director must also have ongoing interaction with EMS agency medical directors at local levels, as well as the state EMS for Children program, to ensure that there is understanding of and compliance with trauma triage and destination protocols.

Ideally, a system should have some means of ensuring whether resources meet the needs of the population. To achieve this end, a resource and needs assessment evaluating the availability and geographic distribution of EMS personnel and physical resources is important to ensure a rapid and appropriate response. This assessment includes a detailed description of the distribution of ground ambulance and aeromedical locations across the region. Resource allocations must be assessed on a periodic basis as needs dictate a redistribution of resources. In communities with full-time paid EMS agencies, ambulances should be positioned according to predictable geographic or temporal demands to optimize response efficiencies. Such positioning schemes require strong prehospital data collection systems that can track the location of occurrences over time. Periodic assessment of dispatch and transport times will also provide insight into whether resources are consistent with needs.

Each region should have objective criteria dictating the level of response (advanced life support [ALS], basic life support [BLS]), the mode of transport, and the disposition of the patient based on the location of the incident and the severity of injury. A mechanism for case-based review of trauma patients that involves prehospital and hospital providers allows bidirectional information sharing and continuing education, ensuring that expectations are met at both ends. Ongoing review of triage and treatment decisions allows for continuing quality improvement of the triage and prehospital care protocols. A more detailed discussion of in-field (primary) triage criteria is provided in the section titled: System Coordination and Patient Flow (p 20).

### **Human Resources**

Periodic workforce assessments of EMS should be conducted to ensure adequate numbers and distribution of personnel. EMS, not unlike other health care professions, experiences shortages and maldistribution of personnel. Some means of addressing recruitment, retention, and engagement of qualified personnel should be a priority. It is critical that trauma system leaders work to ensure that prehospital care providers at all levels attain and maintain competence in trauma care. Maintenance of competence should be ensured by requiring standards for credentialing and certification and specifying continuing educational requirements for all prehospital personnel involved in trauma care. The core curricula for First Responder, Emergency Medical Technician (EMT)-Basic, EMT-Intermediate, EMT-Paramedic, and other levels of prehospital personnel have an essential orientation to trauma care for all ages. However, trauma care knowledge and skills need to be continuously updated, refined, and expanded through targeted trauma care training such as Prehospital Trauma Life Support®, Basic Trauma Life Support®, and age-specific courses. Mechanisms for the periodic assessment of competence, educational needs, and education availability within the system should be incorporated into the trauma system plan.

Systems of excellence also encourage EMS providers to go beyond meeting state standards for agency licensure and to seek national accreditation. National accreditation standards exist for ground-based and air medical agencies, as well as for EMS educational programs. In some states, agency licensure requirements are waived or substantially simplified if the EMS agency maintains national accreditation.

EMS is the only component of the emergency health care and trauma system that depends on a large cadre of volunteers. In some states, substantially more than half of all EMS agencies are staffed by volunteers. These

agencies typically serve rural areas and are essential to the provision of immediate care to trauma patients, in addition to provision of efficient transportation to the appropriate facility. In some smaller facilities, EMS personnel also become part of the emergency resuscitation team, augmenting hospital personnel. The trauma care system program should reach out to these volunteer agencies to help them achieve their vital role in the outcome of care of trauma patients. However, it must be noted that there is a delicate balance between expecting quality performance in these agencies and placing unrealistic demands on their response capacity. In many cases, it is better to ensure that there is an optimal BLS response available at all times rather than a sporadic or less timely response involving ALS personnel. Support to volunteer EMS systems may be in the form of quality improvement activities, training, clinical opportunities, and support to the system medical director.

Owing to the multidisciplinary nature of trauma system response to injury, conferences that include all levels of providers (for example, prehospital personnel, nurses, and physicians) need to occur regularly with each level of personnel respected for its role in the care and outcome of trauma patients. Communication with and respect for prehospital providers is particularly important, especially in rural areas where exposure to major trauma patients might be relatively rare.

### **Integration of EMS Within the Trauma System**

In addition to its critical role in the prehospital treatment and transportation of injured patients, EMS must also be engaged in assessment and integration functions that include the trauma system and also public health and other public safety agencies. EMS agencies should have a critical role in ensuring that communication systems are available and have sufficient redundancy so that trauma system stakeholders will be able to assess and act to limit death and disability at the single patient level and at the population level in the case of mass casualty incidents (MCIs). Enhanced 911 services and a central communication system for the EMS/trauma system to ensure field-to-facility bidirectional communications, interfacility dialogue, and all-hazards response communications among all system participants are important for integrating a system's response. Wireless communications capabilities, including automatic crash notification, hold great promise for quickly identifying trauma-producing events, thereby reducing delays in discovery and decreasing prehospital response intervals.

Further integration might be accomplished through the use of EMS data to help define high-risk geographic and demographic characteristics of injuries within a

response area. EMS should assist with the identification of injury prevention program needs and in the delivery of prevention messages. EMS also serves a critical role in the development of all-hazards response plans and in the implementation of those plans during a crisis. This integration should be provided by the state and regional trauma plan and overseen by the lead agency. EMS should participate through its leadership in all aspects of trauma system design, evaluation, and operation, including policy development, public education, and strategic planning.

### Optimal Elements\*

- I. The trauma system is supported by an EMS system that includes communications, medical oversight, prehospital triage, and transportation; the trauma system, EMS system, and public health agency are well integrated. (B-302)
  - a. There is well-defined trauma system medical oversight integrating the specialty needs of the trauma system with the medical oversight for the overall EMS system. (I-302.1)
  - b. There is a clearly defined, cooperative, and ongoing relationship between the trauma specialty physician leaders (for example, trauma medical director within each trauma center) and the EMS system medical director. (I-302.2)
  - c. There is clear-cut legal authority and responsibility for the EMS system medical director, including the authority to adopt protocols, to implement a performance improvement system, to restrict the practice of prehospital care providers, and to generally ensure medical appropriateness of the EMS system. (I-302.3)
  - d. The trauma system medical director is actively involved with the development, implementation, and ongoing evaluation of system dispatch protocols to ensure they are congruent with the trauma system design. These protocols include, but are not limited to, which resources to dispatch, for example, ALS versus BLS, air-ground coordination, early notification of the trauma care facility, prearrival instructions, and other procedures necessary to ensure that resources dispatched are consistent with the needs of injured patients. (I-302.4)
  - e. The retrospective medical oversight of the EMS system for trauma triage, communications,

treatment, and transport is closely coordinated with the established performance improvement processes of the trauma system. (I-302.5)

- f. There is a universal access number for citizens to access the EMS/trauma system, with dispatch of appropriate medical resources. There is a central communication system for the EMS/trauma system to ensure field-to-facility bidirectional communications, interfacility dialogue, and all-hazards response communications among all system participants. (I-302.7)
  - g. There are sufficient and well-coordinated transportation resources to ensure that EMS providers arrive at the scene promptly and expeditiously transport the patient to the correct hospital by the correct transportation mode. (I-302.8)
- II. The lead trauma authority ensures a competent workforce. (B-310)
    - a. In cooperation with the prehospital certification and licensure authority, set guidelines for prehospital personnel for initial and ongoing trauma training, including trauma-specific courses and courses that are readily available throughout the state. (I-310.1)
    - b. In cooperation with the prehospital certification and licensure authority, ensure that prehospital personnel who routinely provide care to trauma patients have a current trauma training certificate, for example, Prehospital Trauma Life Support or Basic Trauma Life Support and others, or that trauma training needs are driven by the performance improvement process. (I-310.2)
    - c. Conduct at least 1 multidisciplinary trauma conference annually that encourages system and team approaches to trauma care. (I-310.9)
  - III. The lead agency acts to protect the public welfare by enforcing various laws, rules, and regulations as they pertain to the trauma system. (B-311)
    - a. Incentives are provided to individual agencies and institutions to seek state or nationally recognized accreditation in areas that will contribute to overall improvement across the trauma system, for example, Commission on Accreditation of Ambulance Services for prehospital agencies, Council on Allied Health Education Accreditation for training programs, and American College of Surgeons (ACS) verification for trauma facilities. (I-311.6)

\* This section adapted from Health Resources and Services Administration. *Model Trauma System Planning and Evaluation*. Rockville, MD: Health Resources and Services Administration; 2006.

## Prereview Questionnaire

1. Provide information on the last assessment of EMS, including assessor and date.
  - a. Describe the EMS system, including the number and competencies (that is, ALS or BLS) of ground transporting agencies, nontransporting agencies, and air medical resources.
  - b. How are these resources allocated throughout the region to serve the population?
  - c. Describe the availability of enhanced 911 and wireless E-911 access in your region.
  - d. Identify any specialty pediatric transporting agencies and aeromedical resources.
  - e. Describe the availability of pediatric equipment on all ground transporting units.
2. Describe the procedures for online and off-line medical direction, including procedures for the pediatric population.
  - a. Describe how EMS and trauma medical direction and oversight are coordinated and integrated.
3. Describe the prehospital workforce competencies in trauma:
  - a. Initial training and certification/licensure requirements
  - b. Continuing education and recertification/relicensure requirements
  - c. Pediatric trauma training requirements for recertification

## Documentation Required

Before site visit:

- ✓ Guidelines for patient care delivery decisions (primary or in-field triage and destination designation guidelines)
- ✓ Map identifying the location of aeromedical resources in the region

On-site:

- ✓ Protocols dictating level of EMS response (ALS or BLS), mode of transport, and disposition of the patient
- ✓ Requirements for medical oversight of all levels of EMS agencies, ALS and BLS, transporting and nontransporting
- ✓ Prehospital care treatment protocols (ALS and

BLS), including pediatric protocols and geriatric protocols if available

## Definitive Care Facilities

### Purpose and Rationale

Inclusive trauma systems are the systems that include all acute health care facilities, to the extent that their resources and capabilities allow and in which the patient's needs are matched to hospital resources and capabilities. Thus, as the core of a regional trauma system, acute care facilities operating within an inclusive trauma system provide definitive care to the entire spectrum of patients with traumatic injuries. Acute care facilities must be well integrated into the continuum of care, including prevention and rehabilitation, and operate as part of a network of trauma-receiving hospitals within the public health framework. All acute care facilities should participate in the essential activities of a trauma system, including performance improvement, data submission to state or regional registries, representation on regional trauma advisory committees, and mutual operational agreements with other regional hospitals to address interfacility transfer, educational support, and outreach. The roles of all definitive care facilities, including specialty hospitals (for example, pediatric, burn, severe traumatic brain injury [TBI], spinal cord injury [SCI]) within the system should be clearly outlined in the regional trauma plan and monitored by the lead agency. Facilities providing the highest level of trauma care are expected to provide leadership in education, outreach, patient care, and research and to participate in the design, development, evaluation, and operation of the regional trauma system.

In an inclusive system, patients should be triaged to the appropriate facility based on their needs and facility resources. Patients with the least severe injuries might be cared for at appropriately designated facilities within their community, whereas the most severe should be triaged to a Level I or II trauma center. In rural and frontier systems, smaller facilities must be ready to resuscitate and initiate treatment of the major injuries and have a system in place that will allow for the fastest, safest transfer to a higher level of care.

Trauma receiving facilities providing definitive care to patients with other than minor injuries must be specifically designated by the state or regional lead agency and equipped and qualified to do so at a level commensurate with injury severity. To assess and ensure that injury type and severity are matched to the qualifications of the facilities and personnel providing

definitive care, the lead agency should have a process in place that reviews and verifies the qualifications of a particular facility according to a specific set of resource and quality standards. This criteria-based process for review and verification should be consistent with national standards and be conducted on a periodic cycle as determined by the lead agency. When centers do not meet set standards, there should be a process for suspension, probation, revocation, or dedesignation.

Designation by the lead agency should be restricted to facilities meeting criteria or statewide resource and quality standards and based on patient care needs of the regional trauma system. There should be a well-defined regulatory relationship between the lead agency and designated trauma facilities in the form of a contract, guidelines, or memorandum of understanding. This legally binding document should define the relationships, roles, and responsibilities between the lead agency and the medical leadership from each designated trauma facility.

The number of trauma centers by level of designation and location of acute care facilities must be periodically assessed by the lead agency with respect to patient care needs and timely access to definitive trauma care. There should be a process in place for augmenting and restricting, if necessary, the number and/or level of acute care facilities based on these periodic assessments. The trauma system plan should address means for improving acute care facility participation in the trauma system, particularly in systems in which there has been difficulty addressing needs.

### **Human Resources**

The ability to deliver high-quality trauma care is highly dependent on the availability of skilled human resources. Therefore, it is critical to assess the availability and educational needs of providers on a periodic basis. Because availability, particularly of subspecialty resources, is often limited, some means of addressing recruitment, retention, and engagement of qualified personnel should be a priority. Periodic workforce assessments should be conducted. Maintenance of competence should be ensured by requiring standards for credentialing and certification and specifying continuing educational requirements for physicians and nurses providing care to trauma patients. Mechanisms for the periodic assessment of ancillary and subspecialty competence, educational needs, and availability within the system for all designated facilities should be incorporated into the trauma system plan. The lead trauma centers in rural areas will need to consider teleconferencing and telemedicine to assist smaller facilities in providing education on regionally identified needs. In addition,

lead trauma centers within the region should assist in meeting educational needs while fostering a team approach to care through annual educational multidisciplinary trauma conferences. These activities will do much to foster a sense of teamwork and a functionally inclusive system.

### **Integration of Designated Trauma Facilities Within the Trauma System**

Designated trauma facilities must be well integrated into all other facets of an organized system of trauma care, including public health systems and injury surveillance, prevention, EMS and prehospital care, disaster preparedness, rehabilitation, and system performance improvement. This integration should be provided by the state and/or regional trauma plan and overseen by the lead agency.

Each designated acute care facility should participate, through its trauma program leadership, in all aspects of trauma system design, evaluation, and operation. This participation should include policy and legislative development, legislative and public education, and strategic planning. In addition, the trauma program and subspecialty leaders should provide direction and oversight to the development, implementation, and monitoring of integrated protocols for patient care used throughout the system (for example, TBI guidelines used by prehospital providers and nondesignated transferring centers), including region-specific primary (field) and secondary (early transfer) triage protocols. The highest level trauma facilities should provide leadership of the regional trauma committees through their trauma program medical leadership. These medical leaders, through their activities on these committees, can assist the lead agency and help ensure that deficiencies in the quality of care within the system, relative to national standards, are recognized and corrected. Educational outreach by these higher levels centers should be used when appropriate to help achieve this goal.

### **Optimal Elements\***

- I. Acute care facilities are integrated into a resource-efficient, inclusive network that meets required standards and that provides optimal care for all injured patients. (B-303)
  - a. The trauma system plan has clearly defined the roles and responsibilities of all acute care facilities treating trauma and of facilities that provide care to specialty populations (for

\* This section adapted from Health Resources and Services Administration. *Model Trauma System Planning and Evaluation*. Rockville, MD: Health Resources and Services Administration; 2006.

example, burn, pediatric, SCI, and others).  
(I-303.1)

II. To maintain its state, regional, or local designation, each hospital will continually work to improve the trauma care as measured by patient outcomes.  
(B-307)

a. The trauma system engages in regular evaluation of all licensed acute care facilities that provide trauma care to trauma patients and of designated trauma hospitals. Such evaluation involves independent external reviews. (I-307.1)

III. The lead trauma authority ensures a competent workforce. (B-310)

a. As part of the established standards, set appropriate levels of trauma training for nursing personnel who routinely care for trauma patients in acute care facilities. (I-310.3)

b. Ensure that appropriate, approved trauma training courses are provided for nursing personnel on a regular basis. (I-310.4)

c. In cooperation with the nursing licensure authority, ensure that all nursing personnel who routinely provide care to trauma patients have a trauma training certificate (for example, Advanced Trauma Care for Nurses, Trauma Nursing Core Course, or any national or state trauma nurse verification course). As an alternative after initial trauma course completion, training can be driven by the performance improvement process. (I-310.5)

d. In cooperation with the physician licensure authority, ensure that physicians who routinely provide care to trauma patients have a current trauma training certificate of completion, for example, Advanced Trauma Life Support® (ATLS®) and others. As an alternative, physicians may maintain trauma competence through continuing medical education programs after initial ATLS completion. (I-310.8)

e. Conduct at least 1 multidisciplinary trauma conference annually that encourages system and team approaches to trauma care. (I-310.9)

f. As new protocols and treatment approaches are instituted within the system, structured mechanisms are in place to inform all personnel about the changes in a timely manner. (I-310-10)

### Prereview Questionnaire

1. Describe the extent to which all acute care facilities participate in the trauma system.

a. Describe the availability and roles of specialty centers within the system (pediatric, burn, TBI, SCI).

2. Describe the roles of the nondesignated acute care facilities in the trauma system.

a. Address their representation on the regional trauma committee.

b. Do they submit registry and/or financial data?

c. What is their degree of engagement in the system-wide performance improvement process?

3. Describe the process for verification and designation. Briefly outline the extent of authority granted to the lead agency to receive applications and to verify, designate, and dedesignate regional trauma centers.

4. Describe your standards for trauma center verification (including pediatric standards) and the extent to which they are aligned with national standards.

a. Describe any waivers or program flexibility granted for centers not meeting verification requirements.

b. Describe the process and frequency of use of dedesignation of trauma centers.

5. Outline how the geographic distribution and number of designated acute care facilities is aligned with patient care needs.

a. Describe the process by which additional trauma centers are brought into the system.

b. Describe the system response to the voluntary withdrawal of designation by acute care facilities.

c. Describe the mechanism for tracking and monitoring patient volume and flow between centers and how this influences the overall configuration of designated facilities.

6. Describe your system for assessing the adequacy of the workforce resources available within participating centers.

a. Address nursing and subspecialty needs (trauma or general surgery, intensivists, neurosurgeons, orthopedic surgeons, anesthesiologists, pediatric surgeons, and others, as required).

b. What human resource deficiencies have been identified, and what corrective actions have been taken?

7. Describe the educational standards and credentialing for emergency physicians and nursing staff, general surgeons, specialty surgeons, and critical care nurses caring for trauma patients in designated facilities.
  - a. What regional educational multidisciplinary conferences are provided to care providers? Who is responsible for organizing these events?

### Documentation Required

Before site visit:

- ✓ Copy of the document outlining the process for designation, redesignation, and dedesignation (if necessary) of trauma centers
- ✓ Copy of the standards (if other than ACS) used for trauma center verification
- ✓ A list of acute care facilities with the following data for each:
  - Level of designation/verification
  - A geographic map showing the location, catchment areas, and designation for all acute care facilities
  - Patient volume (total and with Injury Severity Score [ISS] >15, if available)
    - Emergency department (ED) visits
    - Admissions
  - A list of trauma facilities with their level of designation and trauma patient volume (total and with ISS >15)

On-site:

- ✓ A copy of the sample contract or memorandum of understanding between the lead agency and a trauma center if such exists
- ✓ Flyer for the most recent multidisciplinary educational trauma conference

## System Coordination and Patient Flow

### Purpose and Rationale

To achieve the best possible outcomes, the system must be designed so that the right patient is transported to the right facility at the right time. Although on the surface this objective seems relatively straightforward, patients, geography, and transportation systems often conspire to present significant challenges. The

most critically injured trauma patient is often easy to identify at the scene by virtue of the presence of coma or hypotension. However, in some circumstances, the patients requiring the resources of a Level I or II center may not be immediately apparent to prehospital providers. Primary or field triage criteria aid providers in identifying which patients have the greatest likelihood of adverse outcomes and might benefit from the resources of a designated trauma center. Even if the need is identified, regional geography or limited air medical (or land) transport services might not allow for direct transport to an appropriate facility.

Primary triage of a patient from the field to a center capable of providing definitive care is the goal of the trauma system. However, there are circumstances (for example, airway management, rural environments, inclement weather) when triaging a patient to a closer facility for stabilization and transfer is the best option for accessing definitive care. Patients sustaining severe injuries in rural environments might need immediate assessment and stabilization before a long-distance transport to a trauma center. In addition, evaluation of the patient might bring to light severe injuries for which needed care exceeds the resources of the initial receiving facility. Some patients might have specific needs that can be addressed at relatively few centers within a region (for example, pediatric trauma, burns, severe TBI, SCI, and reimplantation). Finally, temporary resource limitations might necessitate the transfer of patients between acute care facilities.

Secondary triage at the initial receiving facility has several advantages in systems with a large rural or suburban component. The ability to assess patients at nondesignated or Level III to V centers provides an opportunity to limit the transfer of only the most severely injured patients to Level I or II facilities, thus preserving a limited resource for patients most in need. It also provides patients with lesser injuries the possibility of being cared for within their community.

The decision to transfer a trauma patient should be based on objective, prospectively agreed-on criteria. Established transfer criteria and transfer agreements will minimize discussions about individual patient transfers, expedite the process, and ensure optimal patient care. Delays in transfer might increase mortality, complications, and length of stay. A system with an excess of transferred patients might tax the resources of the regional trauma facility. Conversely, inappropriate retention of patients at centers without adequate facilities or expertise might increase the risk of adverse outcomes. Given the importance of timely, appropriate interfacility transfers, the time to transfer, as well as the rates of primary and secondary overtriage

and undertriage, should be evaluated on a regular basis, and corrective actions should be instituted when problems are identified. Data derived from tracking and monitoring the timeliness of access to a level of trauma care commensurate with injury type and severity should be used to help define optimal system configuration.

A central communications center with real-time access to information on system resources greatly facilitates the transfer process. Ideally, this center identifies a receiving facility, facilitates dialogue between the transferring and receiving centers, and coordinates interfacility transport.

To ensure that the system operates at the greatest efficiency, it is important that patients are repatriated back to community hospitals once the acute phase of trauma care is complete. The process of repatriation opens up the limited resources available to care for severely injured patients. In addition, it provides an opportunity to bring patients back into their local environment where their social network might help reintegrate patients into their community.

### **Optimal Elements\***

- I. The trauma system is supported by an EMS system that includes communications, medical oversight, prehospital triage, and transportation; the trauma system, EMS system, and public health agency are well integrated. (B-302)
  - a. There are mandatory system-wide prehospital triage criteria to ensure that trauma patients are transported to an appropriate facility based on their injuries. These triage criteria are regularly evaluated and updated to ensure acceptable and system-defined rates of sensitivity and specificity for appropriately identifying a major trauma patient. (I-302.6)
  - b. There is a universal access number for citizens to access the EMS/trauma system, with dispatch of appropriate medical resources. There is a central communications system for the EMS/trauma system to ensure field-to-facility bidirectional communications, interfacility dialogue, and all-hazards response communications among all system participants. (I-302.7)
  - c. There is a procedure for communications among medical facilities when arranging for interfacility transfers, including contingencies for radio or telephone system failure. (I-302.9)

\* This section adapted from Health Resources and Services Administration. *Model Trauma System Planning and Evaluation*. Rockville, MD: Health Resources and Services Administration; 2006.

II. Acute care facilities are integrated into a resource-efficient, inclusive network that meets required standards and that provides optimal care for all injured patients. (B-303)

- a. When injured patients arrive at a medical facility that cannot provide the appropriate level of definitive care, there is an organized and regularly monitored system to ensure that the patients are expeditiously transferred to the appropriate system-defined trauma facility. (I-303.4)

### **Prereview Questionnaire**

1. Describe the source of prehospital trauma triage protocols, and specify whether they are consistent with national guidelines.
  - a. Describe how children and patients with severe TBI and SCI are triaged from the field to appropriate facilities.
2. Within the system, what criteria are used to guide the decision to transfer patients to an appropriate resource facility and are these criteria uniform across all centers?
3. Specify whether there are interfacility transfer agreements to address the needs of each of the following:
  - a. Transfer to an appropriate resource facility
  - b. TBI
  - c. SCI
  - d. Reimplantation
  - e. Burns
  - f. Children
  - g. Repatriation
4. Describe the system-wide policies addressing the mode of transport and the type and qualifications of transport personnel used for interfacility transfers.
5. Specify whether there is a central communications system to coordinate interfacility transfers. Describe how this system has access to information regarding resource availability within the region.

### **Documentation Required**

Before site visit:

- ✓ EMS triage criteria for trauma team activation
- ✓ Interfacility transfer criteria

On-site:

- ✓ Sample copy of an interfacility transfer agreement
- ✓ Policy addressing the mode of transport and type and qualifications of transport personnel used for field transport and interfacility transfers
- ✓ Minutes of any meeting documenting ongoing quality improvement of transfer criteria
- ✓ Any policies or procedures related to repatriation

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## Rehabilitation

### Purpose and Rationale

As an integral component of the trauma system, rehabilitation services in acute care and rehabilitation centers provide coordinated care for trauma patients who have sustained severe or catastrophic injuries, resulting in long-standing or permanent impairments. Patients with less severe injuries may also benefit from rehabilitative programs that enhance recovery and speed return to function and productivity. The goal of rehabilitative interventions is to allow the patient to return to the highest level of function, reducing disability and avoiding handicap whenever possible. The rehabilitation process should begin in the acute care facility as soon as possible, ideally within the first 24 hours. Inpatient and outpatient rehabilitation services should be available. Rehabilitation centers should have CARF (Commission of Accreditation of Rehabilitation Facilities) accreditation for comprehensive inpatient rehabilitation programs, and accreditation of specialty centers (SCI and TBI) should be strongly encouraged.

The trauma system should conduct a rehabilitation needs assessment (including specialized programs in SCI, TBI, and for children) to identify the number of beds needed and available for rehabilitation in the geographic region. Rehabilitation specialists should be integrated into the multidisciplinary advisory committee to ensure that rehabilitation issues are integrated into the trauma system plan.

The trauma system should demonstrate strong linkages and transfer agreements between designated trauma centers and rehabilitation facilities located in its geographic region (in or out of state). Plans for repatriation of patients, especially when rehabilitation centers across state lines are used, should be part of rehabilitation system planning. Feedback on functional outcomes after rehabilitation should be made available to the trauma centers.

### Optimal Elements\*

- I. The lead agency ensures that adequate rehabilitation facilities have been integrated into the trauma system and that these resources are made available to all populations requiring them. (B-308)
  - a. The lead agency has incorporated, within the trauma system plan and the trauma center standards, requirements for rehabilitation services, including interfacility transfer of trauma patients to rehabilitation centers. (I-308.1)
  - b. Rehabilitation centers and outpatient rehabilitation services provide data on trauma patients to the central trauma system registry that include final disposition, functional outcome, and rehabilitation costs and also participate in performance improvement processes. (I-308.2)
- II. A resource assessment for the trauma system has been completed and is regularly updated. (B-103)
  - a. The trauma system has completed a comprehensive system status inventory that identifies the availability and distribution of current capabilities and resources. (I-103.1)

### Prereview Questionnaire

1. Provide data about the number of rehabilitation beds and specialty rehabilitation services (SCI, TBI, and pediatric) available within the trauma system's geographic region. On average, how long do patients need to wait for these rehabilitation beds? Does the average wait vary by type of rehabilitation needed?
2. Describe how existing trauma system policies and procedures appropriately address treatment guidelines for rehabilitation in acute and rehabilitation facilities.
3. Identify the minimum requirements and qualifications that rehabilitation centers have established for physician leaders (for example, medical director of SCI program, medical director of TBI program, and medical director of rehabilitation program).
4. Describe how rehabilitation specialists are integrated into trauma system planning and advisory groups.

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\* This section adapted from Health Resources and Services Administration. *Model Trauma System Planning and Evaluation*. Rockville, MD: Health Resources and Services Administration; 2006.

## Documentation Required

Before site visit:

- ✓ A report that specifies the proportion of patients with SCI, TBI (Abbreviated Injury Score for the head  $\geq 3$ ), major trauma (ISS  $>15$ ), and pediatric patients (age  $\leq 12$  years, ISS  $>15$ ) with a discharge disposition listed as an inpatient rehabilitation center
- ✓ A list of the rehabilitation centers and their CARF accreditation status

On-site:

- ✓ A list of rehabilitation specialists participating in trauma system planning
- ✓ Data pertaining to the number of inpatient beds designated for rehabilitation and staff-to-patient ratio
- ✓ A list of the rehabilitation data elements that are transferred to the trauma management information system
- ✓ A list of the number of new major trauma, pediatric, SCI, and TBI admissions to rehabilitation centers in the region

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## Disaster Preparedness

### Purpose and Rationale

As critically important resources for state, regional, and local responses to MCIs, the trauma system and its trauma centers are central to disaster preparedness. Trauma system leaders need to be actively involved in public health preparedness planning to ensure that trauma system resources are integrated into the state, regional, and local disaster response plans. Acute care facilities (sometimes including one or more trauma centers) within an affected community are the first line of response to an MCI. However, an MCI may result in more casualties than the local acute care facilities can handle, requiring the activation of a larger emergency response plan with support provided by state and regional assets.

For this reason, the trauma system and its trauma centers must conduct a resource assessment of its surge capacity to respond to MCIs. The resource assessment should build on and be coupled to a hazard vulnerability analysis. An assessment of the trauma system's response to simulated incident or tabletop drills must be conducted to determine the trauma system's ability to respond to MCIs. Following these assessments, a gap analysis should be conducted to

develop statewide MCI response resource standards. This information is essential for the development of an emergency management plan that includes the trauma system.

Planning and integration of the trauma system with plans of related systems (public health, EMS, and emergency management) are important because of the extensive impact disasters have on the trauma system and the value of the trauma system in providing care. Relationships and working cooperation between the trauma system and public health, EMS, and emergency management agencies support the provision of assets that enable a more rapid and organized disaster response when an event occurs. For example, the EMS emergency preparedness plan needs to include the distribution of severely injured patients to trauma centers, when possible, to make optimal use of trauma center resources. This plan could optimize triage through directing less severely injured patients to lower level trauma centers or nondesignated facilities, thus allowing resources in trauma centers to be spared for patients with the most severe injuries. In addition, the trauma system and its trauma centers will be targeted to receive additional resources (personnel, equipment, and supplies) during major MCIs.

Mass casualty events and disasters are chaotic, and only with planning and drills will a more organized response be possible. Simulation or tabletop drills provide an opportunity to test the emergency preparedness response plans for the trauma system and other systems and to train the teams that will respond. Exercises must be jointly conducted with other agencies to ensure that all aspects of the response plan have the trauma system integrated.

### Optimal Elements\*

- I. An assessment of the trauma system's emergency preparedness has been completed, including coordination with the public health agency, EMS system, and the emergency management agency. (B-104)
  - a. There is a resource assessment of the trauma system's ability to expand its capacity to respond to MCIs in an all-hazards approach. (I-104.1)
  - b. There has been a consultation by external experts to assist in identifying current status and needs of the trauma system to be able to respond to MCIs. (I-104.2)

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\* This section adapted from Health Resources and Services Administration. *Model Trauma System Planning and Evaluation*. Rockville, MD: Health Resources and Services Administration; 2006.

c. The trauma system has completed a gap analysis based on the resource assessment for trauma emergency preparedness. (I-104.3)

II. The lead agency ensures that its trauma system plan is integrated with, and complementary to, the comprehensive mass casualty plan for natural and manmade incidents, including an all-hazards approach to planning and operations. (B-305)

a. The EMS, the trauma system, and the all-hazards medical response system have operational trauma and all-hazards response plans and have established an ongoing cooperative working relationship to ensure trauma system readiness for all-hazards events. (I-305.1)

b. All-hazards events routinely include situations involving natural (for example, earthquake), unintentional (for example, school bus crash), and intentional (for example, terrorist explosion) trauma-producing events that test the expanded response capabilities and surge capacity of the trauma system. (I-305-2)

c. The trauma system, through the lead agency, has access to additional equipment, materials, and personnel for large-scale traumatic events. (I-305.3)

### Prereview Questionnaire

1. When was the last assessment of trauma system preparedness resources conducted, and what were the significant findings of the assessment as they relate to emergency preparedness?
2. What actions were taken to remediate or mitigate the gaps identified through tabletop or simulated responses in disaster drills among the acute care facilities participating in the system?
3. What is the trauma system plan to accommodate a need for a surge in personnel, equipment, and supplies?
4. How is the trauma system integrated into the state's incident command system and the communications center?
5. What strategies and mechanisms are in place to ensure adequate interhospital communication during an MCI?

### Documentation Required

Before site visit:

- ✓ An organizational chart identifying the relationships among key emergency management

agencies (trauma system, EMS, public health, emergency management)

On-site:

- ✓ A sample of minutes from joint agency emergency management planning meetings from the past year
- ✓ After-action report of jointly conducted (multiple emergency management agencies) simulated or tabletop drills that include the trauma system's capability to respond to MCIs

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## System-wide Evaluation and Quality Assurance

### Purpose and Rationale

The trauma lead agency has responsibility for instituting processes to evaluate the performance of all aspects of the trauma system. Key aspects of system-wide effectiveness include the outcomes of population-based injury prevention initiatives, access to care, as well as the availability of services, the quality of services provided within the trauma care continuum from prehospital and acute care management phases through rehabilitation and community reintegration, and financial impact or cost. Intrinsic to this function is the delineation of valid, objective metrics for the ongoing quality audit of system performance and patient outcomes based on sound benchmarks and available clinical evidence. Trauma management information systems (MISs) must be available to support data collection and analysis.

The lead agency should establish forums that promote inclusive multidisciplinary and multiagency review of cases, events, concerns, regulatory issues, policies, procedures, and standards that pertain to the trauma system. The evaluation of system effectiveness must take into account the integration of these various components of the trauma care continuum and review how well personnel, agencies, and facilities perform together to achieve the desired goals and objectives. Results of customer satisfaction (patient, provider, and facility) appraisals and data indicative of community and population needs should be considered in strategic planning for system development. System improvements derived through evaluation and quality assurance activities may encompass enhancements in technology, legislative or regulatory infrastructure, clinical care, and critical resource availability.

To promote participation and sustainability, the lead agency should associate accountability for achieving defined goals and trauma system performance

indicators with meaningful incentives that will act to cement the support of key constituents in the health care community and general population. For example, the costs and benefits of the trauma system as they relate to reducing mortality or decreasing years of productive life lost may make the value of promoting trauma system development more tangible. A facility that achieves trauma center verification/designation may be rewarded with monetary compensation (for example, ability to bill for trauma activation fees) and the ability to serve as a receiving center for trauma patients. The trauma lead agency should promote ongoing dialog with key stakeholders to ensure that incentives remain aligned with system needs.

### Optimal Elements\*

- I. The trauma MIS is used to facilitate ongoing assessment and assurance of system performance and outcomes and provides a basis for continuously improving the trauma system, including a cost-benefit analysis. (B-301)
  - a. The lead trauma authority ensures that each member hospital of the trauma system collects and uses patient data, as well as provider data, to assess system performance and to improve quality of care. Assessment data are routinely submitted to the lead trauma authority. (I-301.1)
- II. The jurisdictional lead agency, in cooperation with other agencies and organizations, uses analytic tools to monitor the performance of population-based prevention and trauma care services. (B-304)
- III. The financial aspects of the trauma system are integrated into the overall performance improvement system to ensure ongoing fine-tuning and cost-effectiveness. (B-309)
  - a. Financial data are combined with other cost, outcome, or surrogate measures, for example, years of potential life lost, quality-adjusted life years, and disability-adjusted life years; length of stay; length of intensive care unit stay; number of ventilator days; and others, to estimate and track true system costs and cost-benefits. (I-309.4)

### Prereview Questionnaire

1. What is the membership of the committee charged with ongoing monitoring and evaluating of the trauma system?
  - a. To whom does it report its findings?

\* This section adapted from Health Resources and Services Administration. *Model Trauma System Planning and Evaluation*. Rockville, MD: Health Resources and Services Administration; 2006.

- b. How does it decide what parameters to monitor?
  - c. What action is it empowered to take to improve trauma care?
2. Describe the trauma system performance improvement efforts as they pertain to the system for the following groups of providers in the context of system integration:
  - a. Dispatch centers
  - b. Prehospital provider agencies
  - c. Trauma centers
  - d. Other acute care and specialty facilities
  - e. Rehabilitation centers
3. List the process and patient outcome measures that are tracked at the trauma system level, including measures for special populations.
4. As part of your system-wide performance improvement, specify whether each of the following is assessed on a regular basis:
  - a. Time from arrival to a center and ultimate discharge to a facility capable of providing definitive care. If yes, specify the mean time to transfer.
  - b. Proportion of patients with injury more severe than a predefined injury severity threshold (for example, ISS >15, or other criteria) who receive definitive care at a facility other than a Level I or II trauma center (undertriage)
  - c. Proportion of patients with injury less severe than a predefined injury severity threshold (for example, ISS <9) who are transferred from any facility to a Level I or II trauma center (overtriage)
5. Describe how your system addresses problems related to significant overtriage or undertriage, both primary and secondary.

### Documentation Required

Before site visit:

- ✓ List of the agencies represented on the committee responsible for trauma system quality assurance

On-site:

- ✓ Trauma system annual reports and fact sheets for the past 2 years
- ✓ A copy of minutes or meeting notes pertaining to the identification, discussion, and resolution of a trauma system (rather than a trauma center) issue.

## Trauma Management Information Systems

### Purpose and Rationale

Hospital-based trauma registries developed from the idea that aggregating data from similar cases may reveal variations in care and ultimately result in a better understanding of the underlying injury and its treatment. Hospital-based registries have proven very effective in improving trauma care within an institution but provide limited information regarding how interactions with other phases of health care influence the outcome of an injured patient. To address this limitation, data from hospital-based registries should be collated into a regional registry and linked such that data from all phases of care (prehospital, hospital, and rehabilitation) are accessible in 1 data set. When possible, these data should be further linked to law enforcement, crash incident reports, ED records, administrative discharge data, medical examiner records, vital statistics data (death certificates), and financial data. The information system should be designed to provide system-wide data that allow and facilitate evaluation of the structure, process, and outcomes of the entire system; all phases of care; and their interactions. This information should be used to develop, implement, and influence public policy.

The lead agency should maintain oversight of the information system. In doing so, it must define the roles and responsibilities for agencies and institutions regarding data collection and outline processes to evaluate the quality, timeliness, and completeness of data. There must be some means to ensure patient and provider confidentiality is in keeping with federal regulations. The agency must also develop policies and procedures to facilitate and encourage injury surveillance and trauma care research using data derived from the trauma MIS.

There are key features of regional trauma MISs that enhance their usefulness as a means to evaluate the quality of care provided within a system. Patient information collected within the management system must be standardized to ensure that noted variations in care can be characterized in a similar manner across differing geographic regions, facilities, and EMS agencies. The composition of patients and injuries included in local registries (inclusion criteria) should be consistent across centers, allowing for the evaluation of processes and outcomes among similar patient groups. Many regions limit their information systems to trauma centers. However, the optimal approach is to collect data from all acute care facilities within the region. Limiting required data submission to hospitals

designated as trauma centers allows one to evaluate systems issues only among patients transported to appropriate facilities. It is also important to have protocols in place to ensure a uniform approach to data abstraction and collection. Research suggests that if the process of case abstraction is not routinely calibrated, practices used by abstractors begin to drift.

Finally, every effort should be made to conform to national standards defining processes for case acquisition, case definition (that is, inclusion criteria), and registry coding conventions. Two such national standards include the National Highway Traffic Safety Administration's National Emergency Medical Services Information System (NEMSIS), which standardizes EMS data collection, and the American College of Surgeons National Trauma Data Standard, which addresses the standardization of hospital registry data collection. Strictly adhering to national standards markedly increases the value of state trauma MISs by providing national benchmarks and allowing for the use of software solutions that link data sets to enable a review of the entire injury and health care event for an injured patient.

To derive value from the tremendous amount of effort that goes into data collection, it is important that a similar focus address the process of data reporting. Dedicated staff and resources should be available to ensure rapid and consistent reporting of information to vested parties with the authority and vision to prevent injuries and improve the care of patients with injuries. An optimal information reporting process will include standardized reporting tools that allow for the assessment of temporal and/or system changes and a dynamic reporting tool, permitting anyone to tailor specific "views" of the information.

### Optimal Elements\*

- I. There is an established trauma MIS for ongoing injury surveillance and system performance assessment. (B-102)
  - a. There is an established injury surveillance process that can, in part, be used as an MIS performance measure. (I-102.1)
  - b. Injury surveillance is coordinated with statewide and local community health surveillance. (I-102.2)
  - c. There is a process to evaluate the quality, timeliness, completeness, and confidentiality of data. (I-102.4)

\* This section adapted from Health Resources and Services Administration. *Model Trauma System Planning and Evaluation*. Rockville, MD: Health Resources and Services Administration; 2006.

- d. There is an established method of collecting trauma financial data from all health care facilities and trauma agencies, including patient charges and administrative and system costs. (I-102.5)

II. The trauma MIS is used to facilitate ongoing assessment and assurance of system performance and outcomes and provides a basis for continuously improving the trauma system, including a cost-benefit analysis. (B-301)

- a. The lead trauma authority ensures that each member hospital of the trauma system collects and uses patient data, as well as provider data, to assess system performance and to improve quality of care. Assessment data are routinely submitted to the lead trauma authority. (I-301.1)
- b. Prehospital care providers collect patient care and administrative data for each episode of care and not only provide these data to the hospital, but also have a mechanism to evaluate the data within their own agency, including monitoring trends and identifying outliers. (I-301.2)
- c. Trauma registry, ED, prehospital, rehabilitation, and other databases are linked or combined to create a trauma system registry. (I-301.3)
- d. The lead agency has available for use the latest in computer/technology advances and analytic tools for monitoring injury prevention and control components of the trauma system. There is reporting on the outcome of implemented strategies for injury prevention and control programs within the trauma system. (I-301.4)

### Prereview Questionnaire

1. Which agency has oversight of the trauma MIS?
  - a. Describe the role and responsibilities of the lead agency in collecting and maintaining the data.
  - b. How are the completeness, timeliness, and quality of the data monitored?
2. Specify which of the following data sources are linked to the information system. Describe the method of linkage (for example, probabilistic or deterministic).
  - a. Motor-vehicle crash or incident data
  - b. Law enforcement records
  - c. EMS or other transporting agency records
  - d. ED records

- e. Hospital records (hospital trauma registries)
- f. Hospital administrative discharge data
- g. Rehabilitation data
- h. Coroner and medical examiner records
- i. Financial or payer data
- j. Dispatch

3. What are the regional trauma registry inclusion criteria?
4. Which stakeholders had a role in selecting the data elements for inclusion into the regional registry?
  - a. From what source(s) were the data field definitions derived?
  - b. What pediatric data elements are captured?
5. What local or system-wide reports are routinely generated and at what frequency?
6. Are data contributed to the National Trauma Data Bank (NTDB) or other outside agencies? If so, please specify which agencies.

### Documentation Required

Before site visit:

- ✓ Policies and procedures related to release of data

On-site:

- ✓ Data dictionary for the trauma registry
- ✓ A typical regional registry report, redacted to maintain confidentiality

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## Research

### Purpose and Rationale

#### Overview of Research Activity

Trauma systems are remarkably diverse. This diversity is simply a reflection of authorities tailoring the system to meet the needs of the region based on the unique combination of geographic, economic, and population characteristics within their jurisdiction. In addition, trauma systems are not fixed in their organization or operation. The system evolves over years in response to lessons learned, critical review, and changes in population demographics. Given the diversity of organization and the dynamic nature of any particular system, it is valuable when research can be conducted that evaluates the effectiveness of the regional or statewide system. Research drives the system and will provide the foundation for system development and

performance improvement. Research findings provide value in defining best practices and might alter system development. Thus, the system should facilitate and encourage trauma-related research through processes designed to make data available to investigators. Competitive grants or contracts made available through lead authorities or constituencies should provide funds to support research activities. All system components should contribute to the research agenda. The extent to which research activities are required should be clearly outlined in the trauma system plan and/or the criteria for trauma center designation.

The sources of data used for research might be institutional and regional trauma registries. As an alternative, population-based research might provide a broader view of trauma care within the region. Primary data collection, although desirable, is expensive but might provide insights into system performance that might not be otherwise available.

#### ***Trauma Registry-based Research***

Investigators examining trauma systems can use the information recorded in trauma registries to great advantage to determine the prevalence and annual incidence rate of injuries, patterns of care that occur to injured patients in the system's region, and outcomes for the patients. These data can be compared with standards available from other trauma registries, such as the NTDB. Such comparisons can then enable investigators to determine if care within their region is within standards and can allow for benchmarking.

Initiating and sustaining injury prevention initiatives is a vital goal in mature trauma systems. Investigators can take a leadership role in performing research using trauma registry data that identify emerging threats and instituting public health measures to mitigate the threats. For example, a recent surge in death and disability related to off-road vehicles can be identified and the scope of the problem defined in terms of who, where, and how riders are injured, and then, through presentations and publications, the public can be informed of a new threat.

Trauma system administrators have a responsibility to control investigators' access to the registry. The integrity and reliability of data in a trauma systems registry are essential if accurate research and valid conclusions are to be reached using the data. Trauma system administrators should have a process that screens data entered into the system's composite registry from individual institutions. There should be a mechanism that ensures that the information is stored in a secure manner. Investigators who seek access to the trauma registry must follow a written policy and procedure

that includes approval by an authorized institutional review board. Trauma registry data may include unique identifiers, and system administrators must ensure that patient confidentiality is respected, consistent with state and federal regulations.

#### ***Population-based Trauma System Research***

A major disadvantage of using only trauma registry data to conduct research that evaluates injured patients in a region is the bias resulting from missing data on patients not treated at trauma centers. Specifically, most registry data are restricted to information from hospitals that participate in the trauma system. Although ideally all facilities participate in the form of an inclusive system, many systems do not attain this goal. Thus, a population-based data set provides investigators with the full spectrum of patients, irrespective of whether they have been treated in trauma centers or nondesignated centers or were never admitted to the hospital owing to death at the scene of incident or because their injuries were insufficiently severe to require admission. The state and national hospital discharge databases are examples of population-based data. These discharge databases contain information that was abstracted from medical records for billing purposes by hospital employees who enter these data into an electronic database. For investigators seeking a wider perspective on the care of injured patients in their region, these more inclusive data sets, compared with registries, are essential tools. Other population-based data that may be of help include mortality vital statistics data recorded in death certificates. Selected regions might have outpatient data to capture patients who are assessed in the ED and then released.

Investigators can use these population-based data to study the influence of a regional trauma system on the entire spectrum of patients within its catchment area.

#### ***Participation in Research Projects and Primary Data Collection***

Multi-institutional research projects are important mechanisms for learning new knowledge that can guide the care of injured patients. Investigators within trauma systems can participate as coinvestigators in these projects. Investigators can participate by recruiting patients into prospective studies, being leaders in the design and administration of grants, and preparing manuscripts and reports. Evidence of this collaboration is that investigators within a trauma system are recognized in announcements of grants or awards. Lead agency personnel should identify and reach out to resources within the system with research expertise. These include academic centers and public health agencies.

### **Measures of Research Activity**

Research can be broadly defined as hypothesis-driven data analysis. This analysis leads the investigators to a conclusion, which might become a recommendation for system change. Full manuscripts published in peer-reviewed research journals are an exemplary form of research activity. Research reported in annual reviews or in public information formats intended to inform the trauma system's constituency can also be considered legitimate research activity.

### **Optimal Elements\***

- I. The trauma MIS is used to facilitate ongoing assessment and assurance of system performance and outcomes and provides a basis for continuously improving the trauma system, including a cost-benefit analysis. (B-301)
  - a. The lead agency has available for use the latest in computer/technology advances and analytic tools for monitoring injury prevention and control components of the trauma system. There is reporting on the outcome of implemented strategies for injury prevention and control programs within the trauma system. (I-301.4)
- II. The lead agency ensures that the trauma system demonstrates prevention and medical outreach activities within its defined service area. (B-306)
  - a. The trauma system has developed mechanisms to engage the general medical community and other system participants in their research findings and performance improvement efforts. (I-306.1)
  - b. The effect or impact of outreach programs (medical community training/support and prevention activities) is evaluated as part of a system performance improvement process.
- III. To maintain its state, regional, or local designation, each hospital will continually work to improve the

trauma care as measured by patient outcomes. (B-307)

- a. The trauma system implements and regularly reviews a standardized report on patient care outcomes as measured against national norms.

### **Prereview Questionnaire**

1. Describe the current procedures and processes investigators must follow to request access to the trauma system registry.
2. What are the mechanisms used to ensure patient confidentiality when regional trauma registry data are used by investigators?
3. Provide examples of where research was conducted for the purpose of providing evidence that the processes of care and outcome of injured patients in the system's region are within acceptable standards.
4. How has research been used to modify policy or practice within the system?
5. What resources (for example, personnel and fiscal) are available to the lead agency to assist in conducting system research?

### **Documentation Required**

Before site visit:

- ✓ No additional documentation required

On-site:

- ✓ Policies and procedures pertaining to data access for research purposes
- ✓ A bibliography of research publications published by investigators in the system
- ✓ A list of data requests for the regional trauma registry for the past year

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\* This section adapted from Health Resources and Services Administration. *Model Trauma System Planning and Evaluation*. Rockville, MD: Health Resources and Services Administration; 2006.



## SECTION 4

# POSTCONSULTATION MEASURES



### POSTCONSULTATION MEASURES

*Postconsultation follow-up involves 2 aspects. The first is the degree to which the state or region has done the following:*

- *Prioritized the recommendations contained in the final report from the trauma systems consultation process*
- *Developed an action plan using a logic model or other framework that identifies the outputs and outcome measures of achieving the prioritized recommendations*
- *Made progress in achieving the steps in the action plan*

*The second is an ongoing repeated measures process using the benchmarks, indicators, and scoring process identified in the Model Trauma System Planning and Evaluation document. The following indicators are seen as representative measures of assessment, policy development, and assurance issues. Repeated measures of these indicators, over time, will serve as 1 mark of progress in strengthening the trauma system.*

### Indicators of Trauma System Development Status

#### Assessment

**101.2** There is a description of injuries within the trauma system jurisdiction including the distribution by geographic area, high-risk populations (pediatric, elderly, distinct cultural/ethnic, rural, and others), incidence, prevalence, mechanism, manner, intent, mortality, contributing factors, determinants, morbidity, injury severity (including death), and patient distribution using any or all of the following: vital statistics, emergency department (ED) data, emergency medical services (EMS) data, hospital discharge data, state police data (data from law enforcement agencies), medical examiner data, and trauma registry and other data sources. The description is updated at regular intervals.

*Note: Injury severity should be determined through the consistent and system-wide application of one of the existing injury scoring methods, for example, Injury Severity Score (ISS).*

- 0 Not known
- 1 There is no written description of injuries within the trauma system jurisdiction.
- 2 One or more population-based data sources (for example, vital statistics and medical examiner data) describe injury within the jurisdiction, but clinical data sources are not used.
- 3 One or more population-based data sources and one or more clinical data sources are used to describe injury within the jurisdiction.
- 4 Multiple population-based and clinical data sources are used to describe injury within the jurisdiction, and the description is systematically updated at regular intervals.
- 5 Multiple population-based and clinical data sources (for example, trauma registry, ED data, and others) are electronically linked and used to describe injury within the jurisdiction.

**102.2** Injury surveillance is coordinated with statewide and local community health surveillance.

- 0 Not known
- 1 Injury surveillance, as described in 102.1, does not occur within the system.
- 2 Injury surveillance occurs in isolation from other health risk surveillance and is reported separately.
- 3 Injury surveillance occurs in isolation but is combined and reported with other health risk surveillance processes.
- 4 Injury surveillance occurs as part of broader health risk assessments.
- 5 Processes of sharing and linkage of data exist among EMS systems, public health systems, and trauma systems, and the data are used to monitor, investigate, and diagnose community health risks.

**102.3** Trauma data are electronically linked from a variety of sources.

*Note: Deterministically means with such patient identifiers as name and date of birth. Probabilistically means computer software is used to match likely records through less certain identifiers such as date of incident, patient age, gender, and others.*

- 0 Not known
- 1 Trauma registry data exist but are not deterministically or probabilistically linked to other databases.
- 2 Trauma registry data exist and can be deterministically linked through hand-sorting processes.
- 3 Trauma registry data exist and can be deterministically linked through computer-matching processes.
- 4 Trauma registry data exist and can be deterministically and probabilistically linked to at least one other injury database including: EMS data systems (that is, patient care records, dispatch data, and others), ED data systems, hospital discharge data, and others.
- 5 All data stakeholders (insurance carriers, FARS, and rehabilitation, in addition to typical trauma system resources) have been identified, data access agreements executed, hardware and software resources secured, and the “manpower” designated to deterministically and probabilistically link, analyze, and report a variety of data sources in a timely manner.

**Policy Development**

**201.4** The lead agency has adopted clearly defined trauma system standards (for example, facility standards, triage and transfer guidelines, and data collection standards) and has sufficient legal authority to ensure and enforce compliance.

- 0 Not known
- 1 The lead agency does not have sufficient legal authority and has not adopted or defined trauma system performance and operating standards, nor is there sufficient legal authority to do so.
- 2 Sufficient authority exists to define and adopt standards for trauma system performance and operations, but the lead agency has not yet completed this process.
- 3 There is sufficient legal authority to adopt and implement operation and performance standards including enforcement. Draft process procedures have been developed.

- 4 The authority exists to fully develop all operational guidelines and standards; the stakeholders are reviewing draft policies and procedures; and adoption by the lead agency, including implementation and enforcement, is pending.
- 5 The authority exists; operational policies and procedures and trauma system performance standards are in place; and compliance is being actively monitored.

**203.1** The lead agency, in concert with a trauma-specific multidisciplinary, multiagency advisory committee, has adopted a trauma system plan.

- 0 Not known
- 1 There is no trauma system plan, and one is not in progress.
- 2 There is no trauma system plan, although some groups have begun meeting to discuss the development of a trauma system plan.
- 3 A trauma system plan was developed and adopted by the lead agency. The plan, however, has not been endorsed by trauma stakeholders.
- 4 A trauma system plan has been adopted, developed with multiagency groups, and endorsed by those agencies.
- 5 A comprehensive trauma system plan has been developed, adopted in conjunction with trauma stakeholders, and includes the integration of other systems (for example, EMS, public health, and emergency preparedness).

**203.4** The trauma system plan clearly describes the system design (including the components necessary to have an integrated and inclusive trauma system) and is used to guide system implementation and management. For example, the plan includes references to regulatory standards and documents and includes methods of data collection and analysis.

- 0 Not known
- 1 There is no trauma system plan.
- 2 The trauma system plan does not address or incorporate the trauma system components (prehospital, communication, transportation, acute care, rehabilitation, and others), nor is it inclusive of all-hazards preparedness, EMS, or public health integration.
- 3 The trauma system plan provides general information about all the components including all-hazards preparedness, EMS, and public health

integration; however, it is difficult to determine who is responsible and accountable for system performance and implementation.

- 4 The trauma system plan addresses every component of a well-organized and functioning trauma system including all-hazards preparedness and public health integration. Specific information on each component is provided, and trauma system design is inclusive of providing for specific goals and objectives for system performance.
- 5 The trauma system plan is used to guide system implementation and management. Stakeholders and policy leaders are familiar with the plan and its components and use the plan to monitor system progress and to measure results.

**204.2** Financial resources exist that support the planning, implementation, and ongoing management of the administrative and clinical care components of the trauma system.

- 0 Not known
- 1 There is no funding to support the trauma system planning, implementation, or ongoing management and operations for either trauma system administration or trauma clinical care.
- 2 Some funding for trauma care within the third-party reimbursement structure has been identified, but ongoing support for administration and clinical care outside the third-party reimbursement structure is not available.
- 3 There is current funding for the development of the trauma system within the lead agency organization consistent with the trauma system plan, but costs to support clinical care support services have not been identified (transportation, communication, uncompensated care, standby fees, and others). No ongoing commitment of funding has been secured.
- 4 There is funding available for both administrative and clinical components of the trauma system plan. A mechanism to assess needs among various providers has begun. Implementation costs and ongoing support costs of the lead agency have been addressed within the plan.
- 5 A stable (consistent) source of reliable funding for the development, operations, and management of the trauma program (clinical care and lead agency administration) has been identified and is being used to support trauma planning, implementation, maintenance, and ongoing program enhancements.

**204.3** Designated funding for trauma system infrastructure support (lead agency) is legislatively appropriated.

*Note: Although nomenclature concerning designated, appropriated, and general funds varies between jurisdictions, the intent of this indicator is to demonstrate long-term, stable funding for trauma system development, management, evaluation, and improvement.*

- 0 Not known
- 1 There is no designated funding to support the trauma system infrastructure.
- 2 One-time funding has been designated for trauma system infrastructure support, and appropriations have been made to the lead agency budget.
- 3 Limited funds for trauma system development have been identified, but the funds have not been appropriated for trauma system infrastructure support.
- 4 Consistent, though limited, infrastructure funding has been designated and appropriated to the lead agency budget.
- 5 The legislature has identified, designated, and appropriated sufficient infrastructure funding for the lead agency consistent with the trauma system plan and priorities for funding administration and operations.

**208.1** The trauma system and the public health system have established linkages including programs with an emphasis on population-based public health surveillance and evaluation for acute and chronic traumatic injury and injury prevention.

- 0 Not known
- 1 There is no evidence that demonstrates program linkages, a working relationship, or the sharing of data between the public health system and the trauma system. Population-based public health surveillance and evaluation for acute or chronic traumatic injury and injury prevention have not been integrated with the trauma system.
- 2 There is little population-based public health surveillance shared with the trauma system, and program linkages are rare. Routine public health status reports are available for review by the trauma system lead agency and constituents.
- 3 The trauma system and the public health system have begun sharing public health surveillance data for acute and chronic traumatic injury. Program linkages are in the discussion stage.

- 4 The trauma system has begun to link with the public health system, and the process of sharing public health surveillance data is evolving. Routine dialogue is occurring between programs.
- 5 The trauma system and the public health system are integrated. Routine reporting, program participation, and system plans are fully vested. Operational integration is routine, and measurable progress can be demonstrated. (Demonstrated integration and linkage could include such activities as rapid response to and notification of incidents, integrated data systems, communication cross-operability, and regular epidemiology report generation.)

**Assurance**

**301.1** The lead trauma authority ensures that each member hospital of the trauma system collects and uses patient data as well as provider data to assess system performance and to improve quality of care. Assessment data are routinely submitted to the lead trauma authority.

- 0 Not known
- 1 There is no system-wide management information data collection system that the trauma centers and other community hospitals regularly contribute to or use to evaluate the system.
- 2 There is a trauma registry system in place in the trauma centers, but it is used by neither all facilities within the system nor the lead trauma authority to assess system performance.
- 3 The trauma management information system contains information from all facilities within a geographic area.
- 4 The trauma management information system is used by the trauma centers to assess provider and system performance issues.
- 5 Hospital trauma registry data are routinely submitted to the lead trauma authority, are aggregated, and are used to evaluate overall system performance.

**302.1** There is well-defined trauma system medical oversight integrating the specialty needs of the trauma system with the medical oversight for the overall EMS system.

*Note: The EMS System medical director and the trauma medical director may, in fact, be the same person.*

- 0 Not known
- 1 There is no medical oversight for EMS providers within the trauma system.
- 2 EMS medical oversight for all levels of prehospital providers caring for the trauma patient is provided, but such oversight is provided outside of the purview of the trauma system.
- 3 The EMS and trauma medical directors have integrated prehospital medical oversight for prehospital personnel caring for trauma patients.
- 4 Medical oversight is routinely given to EMS providers caring for trauma patients. The trauma system has integrated medical oversight for prehospital providers and routinely evaluates the effectiveness of both online and off-line medical oversight.
- 5 The EMS and trauma system fully integrate the most up-to-date medical oversight and regularly evaluate program effectiveness. System providers are included in the development of medical oversight policies.

**302.6** There are mandatory system-wide prehospital triage criteria to ensure that trauma patients are transported to an appropriate facility based on their injuries. These triage criteria are regularly evaluated and updated to ensure acceptable and system-defined rates of sensitivity and specificity for appropriately identifying major trauma patients.

- 0 Not known
- 1 There are no mandatory universal triage criteria to ensure trauma patients are transported to the most appropriate hospital.
- 2 There are differing triage criteria guidelines used by different providers. Appropriateness of triage criteria and subsequent transportation are not evaluated for sensitivity or specificity.
- 3 Universal triage criteria are in the process of being linked to the management information system for future evaluation.
- 4 The triage criteria are used by all prehospital providers. There is system-wide evaluation of the effectiveness of the triage tools in identifying trauma patients and in ensuring that they are transported to the appropriate facility.
- 5 System participants routinely evaluate the triage criteria for effectiveness. There is linkage with the trauma system, and sensitivity and specificity

(over- and under-triage rates) of the tools used are regularly reported through the trauma lead authority. Updates to the triage criteria are made as necessary to improve system performance.

**303.1** The trauma system plan has clearly defined the roles and responsibilities of all acute care facilities treating trauma and of facilities that provide care to specialty populations (for example, burn, pediatric, spinal cord injury, and others).

0 Not known

1 There is no trauma system plan that outlines roles and responsibilities of all acute care facilities treating trauma and of facilities that provide care to special populations.

2 There is a trauma system plan, but it does not address the roles and responsibilities of licensed acute care and specialty care facilities.

3 The trauma system plan addresses the roles and responsibilities of licensed acute care facilities or specialty care facilities, but not both.

4 The trauma system plan addresses the roles and responsibilities of licensed acute care facilities and specialty care facilities.

5 The trauma system plan clearly defines the roles and responsibilities of all acute care facilities treating trauma within the system jurisdiction. Specialty care services are addressed within the plan, and appropriate policies and procedures are implemented and tracked.

**307.1** The trauma system engages in regular evaluation of all licensed acute care facilities that provide trauma care to trauma patients and of designated trauma hospitals. Such evaluation involves independent external reviews.

0 Not known

1 There is no ongoing mechanism for the trauma system to assess or evaluate the quality of trauma care delivered by all licensed acute care facilities that provide trauma care to trauma patients and of designated trauma hospitals.

2 There is a mechanism for the trauma system to evaluate trauma care services in designated trauma hospitals through internal performance improvement processes.

3 There is a mechanism to evaluate trauma care services across the entire trauma care system through performance improvement processes.

4 Review of trauma care quality is both internal (through routine monitoring and evaluation) and external (through independent review during redesignation or reverification of trauma centers).

5 Quality of trauma care is ensured through both internal and external methods. Internal review is regular, and participation is routine for trauma stakeholders. External independent review teams provide further assurance of quality trauma care within all licensed acute care and trauma facilities treating trauma patients.

**308.1** The lead agency has incorporated, within the trauma system plan and the trauma center standards, requirements for rehabilitation services including interfacility transfer of trauma patients to rehabilitation centers.

0 Not known

1 There are no written standards or plans for the integration of rehabilitation services with the trauma system or with trauma centers.

2 The trauma system plan has incorporated the use of rehabilitation services, but the use of those facilities for trauma patients has not been fully realized.

3 The trauma system plan has incorporated requirements for rehabilitation services. The trauma centers routinely use the rehabilitation expertise although written agreements do not exist.

4 The trauma system plan incorporates rehabilitation services throughout the continuum of care. Trauma centers have actively included rehabilitation services and their programs in trauma patient care plans.

5 There is evidence to show a well-integrated program of rehabilitation is available for all trauma patients. Rehabilitation programs are included in the trauma system plan, and the trauma centers work closely with rehabilitation centers and services to ensure quality outcomes for trauma patients.

**311.4** Laws, rules, and regulations are routinely reviewed and revised to continually strengthen and improve the trauma system.

0 Not known

1 There is no process for examining laws, rules, or regulations.

- 2 Laws, rules, and regulations are reviewed and revised only in response to a “crisis” (for example, malpractice insurance costs).
- 3 Laws, rules, and regulations are reviewed and revised on a periodic schedule (for example, every 5 years).
- 4 Laws, rules, and regulations are reviewed by agency personnel on a continuous basis and are revised as needed.

- 5 Laws, rules, and regulations are reviewed as part of the performance improvement process involving representatives of all system components and are revised as they negatively impact system performance.

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# GLOSSARY OF TERMS, ACRONYMS, AND ABBREVIATIONS

## Glossary of Terms

**Agency** A division of government with a specific function offering a particular kind of assistance.

**All-Hazards Care** A standardized, integrated, coordinated, and trained response for the provision of care during all types of incidents.

**Assessment** The regular systematic collection, assembly, analysis, and dissemination of information on the health of the community. These data, from a variety of sources, will assist in determining the status and cause of a problem and will identify potential opportunities for interventions.

**Assurance** Services necessary to achieve agreed-on goals by encouraging actions of others (public or private), requiring action through rules and regulations, or providing services directly.

**Authorization** Legal power or right; sanction.

**Available Resources** The components required to respond to injured patients and provide injury care (for example, workforce, equipment, medications, supplies, and facilities).

**Benchmarks** Global overarching goals, expectations, or outcomes. In the context of the trauma system, a benchmark identifies a broad system attribute.

**Casualty** Any person who is declared dead, missing, injured, or ill as a result of an incident.

**Communications System** An infrastructure that facilitates field-to-facility bidirectional connectivity, interfacility dialogue, and disaster service communications among all parties.

**Compliance** The process of performing acts according to what is expected or required; in the context of trauma systems, for example, meeting expectations required by the state to achieve trauma center status.

**Comprehensive Trauma System** A coordinated inclusive system of care for injured people that encompasses all phases of care, from the prehospital

setting to rehabilitation services and follow-up care. Such systems include data systems for injury surveillance and prevention and for performance measurement and improvement.

**Cost-Benefit Analysis** Procedures implemented for classifying, recording, and allocating current or predicted costs that relate to a certain product, production process, or outcome; in the context of trauma systems, all known costs associated with the system and actual care of injured people compared with actual recovery and the good derived for individuals and the community.

**Data Collection Standards** Clearly defined expectations and rules regulating the collection of data. In the context of trauma systems, such standards would include patient exclusion and inclusion criteria, common elements to be collected, and clear definitions for each element collected to ensure consistency in data collection and analysis.

**Data Source** A collection of information from which one may make conclusions or inferences. In the context of trauma systems, data sources aid in describing the epidemiology of injury, care and outcome data, and cost of system and care and provide a tool for quality measurement in the system jurisdiction using population-based data, clinical databases, and accounting data. Such sources may include vital statistics and these types of data: EMS, ED, trauma center and hospital discharge, state police, medical examiner, trauma registry, rehabilitation, and mental health and social services.

**Dedesignation** The revocation of trauma center designation for noncompliance with preestablished criteria and standards for verification and designation.

**Definitive Care** Actions taken or implemented to ensure the needs of the patient are met.

**Designation (facility)** The identification of capabilities or status based on predetermined criteria; in the context of trauma systems, the identification of trauma centers based on the meeting of specific predetermined criteria.

**Determinant (of injury)** A factor causing or contributing to the occurrence of trauma.

**Deterministic Data Linkage** Data that are linked with patient identifiers such as name and date of birth.

**Disaster (major)** As defined by the Stafford Act, any natural catastrophe (including any hurricane, tornado, storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought) or, regardless of cause, any fire, flood, or explosion, in any part of the United States, which in the determination of the president causes damage of sufficient severity and magnitude to warrant major disaster assistance under this Act to supplement the efforts and available resources of states, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby.

**Dispatch** The central location for incoming emergency calls requesting medical assistance. Based on information received, the coordination level of prehospital providers and a Basic Life Support (BLS) or an Advanced Life Support (ALS) ambulance is determined, and a response team is directed to respond to the emergency.

**Emergency** In the context of trauma systems, the occurrence of critical or life-threatening injury requiring triage and transportation to resuscitation resources found in defined trauma centers.

**Emergency Management** Overseeing the multiagency coordination for mass casualty incident preparedness, communication, mitigation, response, or recovery at a local, state, regional or national level.

**Emergency Preparedness Plan** The specific measures, collaborative relationships, training, and capabilities that jurisdictions and agencies should develop and incorporate into an overall system to enhance operational readiness for incident management.

**Epidemiology** The science that investigates the causes and control of epidemic diseases.

**Essential Services and Core Functions of Public Health** The central responsibilities of public health that contribute to and ensure the health of communities.

**Facility Standards** Rules established as a basis of comparison for measuring or judging capacity, quantity, content, extent, value, and quality of services provided; in the context of trauma systems, rules defining resource availability and determining trauma and burn care capabilities of hospitals.

**First Responder** In the context of trauma systems, personnel who arrive at the scene in early stages to provide the medical care necessary for injured people.

**Frontier** The wilderness of woods, hills, mountains, plains, islands, and desert outside of urban and suburban centers; all communities with a population density of 20 or fewer persons per square mile and located more than 60 miles or 60 minutes, or both, from the nearest market center.

**Gap Analysis** The analysis of the difference between trauma system standards and the compliance of the trauma system with those standards that result in the identification of system needs.

**Health Surveillance** Inspection and assessment of the physical and mental well-being of individuals living in a defined location, that is, city, district, and others.

**Incidence** The degree or range of occurrence or effect.

**Incident** An occurrence or event that requires an emergency response to protect life or property. Incidents may include major disasters, emergencies, terrorist attacks, wild land and urban fires, floods, hazardous material spills, nuclear accidents, aircraft accidents, earthquakes, hurricanes, tornadoes, tropical storms, war-related disasters, public health and medical emergencies, and other occurrences requiring an emergency response.

**Incident Command System (ICS)** A standardized on-scene incident management construct specifically designed to provide for the adoption of an integrated organizational structure that reflects the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries. ICS is the combination of facilities, equipment, personnel, procedures, and communications operating with a common organizational structure, designed to aid in the management of resources during incidents.

**Incident Management** Refers to the totality of activities to be aware of, prevent, prepare for, respond to, and recover from incidents. The term is emphasized in the National Response Plan and replaces the terms emergency management, disaster management, crisis management, and consequence management.

**Inclusive Trauma System** A system that includes all health care facilities to the extent that their resources and capabilities allow and in which the patient's needs are matched to hospital resources and capabilities. See Trauma System.

**Indicator** The tasks or outputs that characterize a benchmark. Indicators identify actions or capacities

within the benchmark. Indicators are the measurable components of a benchmark.

**Infrastructure** In the context of trauma systems, the identified lead agency within the state; state trauma manager; trauma advisory committee; and supporting legislative language, that is, rules and regulations; trauma data system; identified resource care facilities (for example, levels of trauma centers and burn centers); workforce; and other essential components to facilitate the implementation, monitoring, and performance improvement of care provided to severely injured people.

**Injury** Physical harm or damage to the body resulting from the transfer of or exposure to mechanical, thermal, electrical, or chemical energy or from the absence of such essentials as heat or oxygen.

**Injury Risk Assessment** The process used to determine the likelihood that injury will result from an incident, taking into account the identification of the hazard type, population affected, severity of injury, and volume or number affected.

**Interfacility Transfer** Movement of a patient from one care facility to another. In the context of trauma systems, interfacility transfer usually occurs in an effort to move an injured patient to a higher level of care where necessary resources optimize recovery.

**Jurisdiction** A range or sphere of authority. Public agencies have jurisdiction at an incident related to their legal responsibilities and authorities. Jurisdictional authority at an incident can be political, geographic (that is, city, county, tribal, state, or federal boundary lines), or functional (for example, law enforcement or public health).

**Lead Agency** The agency responsible for trauma-EMS systems planning and program coordination within the state.

**Legislative Authority** Statute and regulations. A statutory provision establishing and continuing a government agency, activity, or program for a fixed or indefinite period.

**Mass Casualty Incident (MCI)** A situation in which a large quantity or number of physical injuries or deaths, or both, occur.

**Medical Oversight** The responsibility of supervising something (formal) relating to, involving, or used in medicine or treatment.

**Morbidity** The relative incidence of disease; the condition of being diseased; the ratio of sick to well persons in a community.

**Performance Improvement (PI)** Method for evaluating and improving processes that uses a multidisciplinary approach and that focuses on data, benchmarks, and components of the system being evaluated.

**Policy Development** A core function that uses the results of assessments and scientific knowledge, in an organized manner, to establish comprehensive policies intended to improve public health; a process of decision making that includes building constituencies, identifying needs and setting priorities, exercising legislative authority and providing funding to develop plans and policies to address needs, and ensuring the public's health and safety.

**Population-based Data** Analysis of data based on a given population. The US Census Bureau collects and publishes data on populations in the United States according to several definitions. Various systems then use the appropriate population to calculate rates.

**Preparedness** The range of deliberate, critical tasks and activities necessary to build, sustain, and improve the operational capability to prevent, protect against, respond to, and recover from domestic incidents. Preparedness is a continuous process involving efforts at all levels of government and between government and private-sector and nongovernmental organizations to identify threats, determine vulnerabilities, and identify required resources. The term "preparedness" is used interchangeably with "readiness."

**Probabilistic Data Linkage** A method of linking data between 2 or more sources using a computerized judgment process. Linkage occurs through less certain identifiers such as date of incident, patient age, sex, and others.

**Protocol** Detailed plans for the triage, transport, resuscitation, and eventual definitive care of trauma patients. Protocols provide guidance for the care of trauma patients.

**Public Health** What we as a society do collectively to ensure the conditions in which people can be healthy; a societal effort that addresses the health of the population as a whole rather than medical health care, which focuses on treatment of the individual ailment. Public health programs address the physical, mental, and environmental health concerns of communities and populations at risk for disease and injury.

**Public Health Approach** A proven, systematic method for identifying and solving problems. Improvements in the public health system, in partnership with the health care system, can be accomplished through informed, strategic, and deliberate efforts to positively affect health.

**Public Health Surveillance** To watch or monitor public occurrences of disease or injury or both.

**Public Health System** A system to ensure a safe and healthy environment for all citizens in their homes, schools, workplaces, and such public spaces as medical care facilities, transportation systems, commercial locations, and recreational sites.

**Regional** In the context of trauma system development, this term refers to intrastate-designated trauma areas (regions).

**Rehabilitation** Services that seek to return a trauma patient to the fullest physical, psychological, social, vocational, and cognitive levels of functioning of which he or she is capable, consistent with physiologic or anatomic impairments and environmental limitations.

**Resource Standards** Components of the trauma system defined and identified by the state as being essential state trauma system operations (for example, ALS EMS, trauma centers, data repository, and others).

**Response** Activities that address the short-term, direct effects of an incident. Response includes immediate actions to save lives, protect property, and meet basic human needs. Response also includes the execution of emergency operation plans and of incident mitigation activities designed to limit the loss of life, personal injury, property damage, and other unfavorable outcomes.

**Risk Assessments** Risk priorities determined by collecting and evaluating data and comparing the level of risk against predetermined standards, target risk levels, or other criteria (that is, injury risk assessments).

**Regulation** A rule or an order having force of law issued by the executive authority of the government. The term “regulation” is often used interchangeably with “rule.”

**Rule** A principle or regulation set up by an authority, prescribing or directing action or forbearance. The term “rule” is often used interchangeably with “regulation.”

**Scoring** Provides an assessment of the current status and marks progress over time to reach a certain milestone. Scoring breaks down an indicator into completion steps.

**Special Population** Children, elderly, burns, ethnic groups, disabled, and other populations who have chronic physical, developmental, behavioral, or emotional health conditions; populations living in rural or frontier areas.

**Specialty Care Facility** An acute care facility that provides specialized services and specially trained personnel to care for a specific portion of the injured

population, such as pediatric, burn injury, or spinal cord injury patients.

**Stakeholder** A person or group of individuals with direct interest, involvement, or investment in a matter; in the context of trauma, an individual with interest in trauma care or trauma system development (for example, trauma surgeon, epidemiologist, EMS, ED director, or hospital administrator).

**Surge Capacity** The accommodation of the health system to a transient sudden rise in demand for health care after an incident with real or perceived adverse health effects.

**System** The scheme of ideas, components, or principles by which something is organized; in the context of trauma systems, designation, for example, of trauma centers, state trauma system plans, triage protocols, and aeromedical and other transport procedures.

**Trauma (traumatic injury)** Tissue or organ injury, or both, sustained by the transfer of environmental energy.

**Trauma Center** A specialized hospital or facility with the immediate availability of specially trained health care personnel who provide emergency care on a 24-hour–7-day/week basis for injured people. These specially trained personnel are immediately available to treat patients with ready operating rooms, special equipment, and necessary supplies. The American College of Surgeons defines certain standards for each of the 4 levels of trauma centers that it identifies.

**Trauma System Plan** A document in which the lead agency’s guiding members envision the future, identify system needs, and develop necessary procedures and operations to achieve that expectation. The plan will provide direction and function as a communication tool so that all within the system are functioning with the same mind-set; following the same guidelines, policies, and protocols; and striving for the same goals and objectives.

**Trauma System** An organized, inclusive approach to facilitating and coordinating a multidisciplinary system response to severely injured patients. A trauma system encompasses a continuum of care provision and is inclusive of injury prevention and control, public health, EMS field intervention, ED care, surgical interventions, intensive and general surgical in-hospital care, and rehabilitative services, along with the social services and the support groups that assist injured people and their significant others with their return to society at the most productive level possible.

**Trauma System Manager** The individual within the lead agency for trauma care who is responsible for the

management, coordination, facilitation, and evaluation of the trauma system.

**Trauma System Standards** The measures by which a trauma system can be determined or evaluated (for example, facility standards, transfer protocols, triage protocols, and data collection standards).

**Triage** Sorting and determining priority; in the context of trauma systems, a process for sorting patients by types and severity of injury to determine transport to facilities where appropriate resources will exist to ensure optimal outcome.

**Triage Protocols** Established, written plans for sorting and setting priorities; in the context of this document, having written plans, often backed by rules and regulations that use severity of injury as a criterion for the determination of patient movement and transfer to appropriate facilities.

**Verification** A process by which trauma care capability and performance of an institution are evaluated by experienced on-site reviewers.

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## List of Acronyms and Abbreviations

**ABA** American Burn Association

**ACS** American College of Surgeons

**ACS-COT** American College of Surgeons Committee on Trauma

**ALS** Advanced Life Support

**ATCN** Advanced Trauma Care for Nurses

**ATLS** Advanced Trauma Life Support

**ATS** American Trauma Society

**BIS** Benchmarks, indicators, and scoring

**BLS** Basic Life Support

**CAAS** Commission on Accreditation of Ambulance Services

**CAHEA** Council on Allied Health Education Accreditation

**CARF** Commission on Accreditation of Rehabilitation Facilities

**CV** Curriculum vita

**DALY** Disability-adjusted life years

**ED** Emergency department

**EMS** Emergency medical services

**EMSC** Emergency medical services for children

**EMT** Emergency medical technician

**HRSA** Health Resources and Services Administration

**IC** Incident command

**ICS** Incident command system

**ICU** Intensive care unit

**IOM** Institute of Medicine

**ISS** Injury Severity Score

**MADD** Mothers Against Drunk Driving

**MCI** Mass casualty incident

**MIS** Management information system

**MOU** Memorandum of understanding

**MTSPE** Model Trauma System Planning and Evaluation (2006)

**NEMSIS** National EMS Information System

**NHTSA** National Highway Traffic Safety Administration

**NTDB** National Trauma Data Bank

**PI** Performance improvement

**PRQ** Prereview Questionnaire

**QA** Quality assurance

**QALY** Quality-adjusted life years

**SADD** Students Against Destructive Decisions

**SCI** Spinal cord injury

**STIPDA** State and Territorial Injury Prevention Directors Association

**TBI** Traumatic brain injury

**TNCC** Trauma Nursing Core Course

**YPLL** Years of productive life lost



# PREREVIEW QUESTIONNAIRE (PRQ)



## Section 1: Assessment

### Injury Epidemiology

1. Describe the epidemiology of injury in your region and unique features of:
  - a. Children
  - b. Adolescents
  - c. Elders
  - d. Other special populations
2. Describe the databases that are used to formulate the injury epidemiology profile (for example, population-based and clinical).
3. Have system epidemiology profile results (for example, mortality rates, distribution of mechanism, or intent) been compared with benchmark values? If so, please provide comparisons and origins of the benchmarks.
4. Describe how emerging injury control patterns (for example, from trend or surveillance data) were identified and acted on.
5. Describe how ongoing and routine injury surveillance is completed and how results are shared with constituent groups.

### Indicators As a Tool for System Assessment

1. Has a multidisciplinary stakeholder group participated in the scoring and consensus process associated with the BIS tool? If not, are there plans to do so?
2. If the process has been completed, how were the findings used?
3. Is there a date (year/month) set for a reassessment using the BIS to mark progress toward agreed-on goals or benchmarks?

## Section 2: Policy Development

### Statutory Authority and Administrative Rules

1. Describe how the current statutes and regulations allow the state or region to:
  - a. develop, plan, and implement the trauma system,
  - b. monitor and enforce rules,
  - c. designate the lead agency,
  - d. collect and protect confidential data, and
  - e. protect confidentiality of the quality improvement process.
2. Describe the process by which trauma system policies and procedures are developed or updated to manage the system including:
  - a. the adoption of standards of care,
  - b. designation or verification of trauma centers,
  - c. direct patient flow on the basis of designation,
  - d. data collection, and
  - e. system evaluation.
3. Within the context of statutes and regulations, describe how injury prevention, EMS, public health, the needs of special populations, and emergency management are integrated or coordinated within the trauma system.

### System Leadership

1. How does the lead agency bring constituency groups together to review and monitor the trauma system throughout each phase of care?
2. Describe the composition, responsibilities, and activities of the multidisciplinary trauma system advisory committee(s) and the working relationship(s) with the trauma lead agency and the EMS lead agency, if they are different.

- a. Identify pediatric representatives on the multidisciplinary trauma system advisory committee and any pediatric advisory groups that provide input into trauma system development.
  - b. Describe the process of involving experts in, and advocates for, special populations and how they help drive regional trauma system policy.
  - c. Describe how the multidisciplinary advisory committee is involved in trauma system performance evaluation (for example, review of system performance reports).
3. Provide examples of how the lead agency and trauma system leadership (for example, trauma centers, trauma medical director, nurse coordinator, trauma administrator, and other stakeholders) inform and educate policy makers, elected officials, community groups, and others about the trauma system, its strengths, and its improvement opportunities.
  4. Describe the process to build or expand effective trauma leadership within the trauma system (for example, succession planning, leadership courses, workshops), including the lead agency and trauma centers.

### **Coalition Building and Community Support**

1. What is the status of the trauma system's coalition (for example, What is the status of recruiting members and building a coalition? Is the coalition strong and active coalition? Does the coalition need new energy? Who is not currently involved but should be a part of your coalition?)?
  - a. What is the role of the coalition members (constituents and stakeholders) in promoting trauma system development?
  - b. What is the method and frequency for communicating with coalition members?
2. Describe how the trauma system leadership mobilizes community partners to improve the trauma system through effective communication and collaboration.
  - a. How has the community been approached to identify injury control concerns?
  - b. What key problems has the community identified?
  - c. How do stakeholders bring system challenges or deficiencies to the attention of the lead agency?

### **Lead Agency and Human Resources Within the Lead Agency**

1. Describe the number, position titles, and percentage of full-time equivalency of all personnel within the lead agency or contract personnel who have roles or responsibilities to the trauma program.
2. Identify other personnel resources that support the trauma program activities of the lead agency (for example, epidemiology support from other units within the health department, public health interns)
3. Describe the adequacy of personnel resources available to the lead agency to sustain trauma program assessment, policy development, and assurance activities.
  - a. Identify impediments or barriers that hinder system development.

### **Trauma System Plan**

1. Describe the process for the development or revision of the trauma system plan.
  - a. Include the role of advisory and stakeholder groups in the process.
2. Is there ongoing assessment of trauma resources and asset allocation within the system?
3. Describe the process used to determine trauma system standards and trauma system policies.
  - a. How are they reviewed and evaluated?
  - b. What standards and policies exist for special populations, including rural and frontier regions?
  - c. How are specialized needs addressed, including burns, spinal cord injury, traumatic brain injury, and reimplantation?

### **System Integration**

1. What is the trauma system's collaboration and integration with EMS, public health, and emergency management and programs such as:
  - a. prevention programs,
  - b. mental health,
  - c. social services,
  - d. law enforcement,
  - e. child protective services, and
  - f. public safety (for example, fire, lifeguard, mountain rescue, and ski patrol)?

## Financing

1. How does the lead agency track and analyze internal trauma system finances?
  - a. How does the advisory committee participate in the financial review process?
  - b. How frequently are trauma system financial reports published?
  - c. Which financial data are reported (lead agency data, health facility data, or both)?
2. What is the lead agency's budget for the trauma system?
3. What is the source of funding available to support the development, operations, and management of the trauma system (for example, general funds, dedicated funds)?
4. What financial incentives and disincentives exist to encourage trauma center participation in the trauma system?
  - a. Specifically include arrangements for uncompensated and undercompensated care.

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## Section 3: Assurance

### Prevention and Outreach

1. List organizations dedicated to injury prevention within the region and the issues they address (for example, MADD, SADD, SafeKids Worldwide, Injury Free Coalition for Kids, American Trauma Society, university-based injury control programs).
2. Describe how the trauma lead agency has funded and coordinated system-wide injury prevention or outreach activities.
  - a. Which injuries (including pediatric injuries) have been identified and prioritized for intervention strategies?
  - b. Identify any dedicated lead agency or other agency staff member (full- or part-time) responsible for injury prevention outreach and coordination for the trauma system.
  - c. What is the source of funding?
3. Explain the evaluation process for injury prevention projects that are conducted by the lead agency, trauma facilities, or other community-based organizations.
  - a. Identify any gaps in injury prevention efforts for population groups in the state.

## Emergency Medical Services

1. Provide information on the last assessment of EMS, including assessor and date.
  - a. Describe the EMS system, including the number and competencies (that is, ALS or BLS) of ground transporting agencies, nontransporting agencies, and aeromedical resources.
  - b. How are these resources allocated throughout the region to service the population?
  - c. Describe the availability of enhanced 911 and wireless E-911 access in your region.
  - d. Identify any specialty pediatric transporting agencies and aeromedical resources.
  - e. Describe the availability of pediatric equipment on all ground transporting units.
2. Describe the procedures for online and off-line medical direction, including procedures for the pediatric population.
  - a. Describe how EMS and trauma medical direction and oversight are coordinated and integrated.
3. Describe the prehospital workforce competencies in trauma:
  - a. Initial training and certification/licensure requirements
  - b. Continuing education and recertification/relicensure requirements
  - c. Pediatric trauma training requirements for recertification

### Definitive Care Facilities

1. Describe the extent to which all acute care facilities participate in the trauma system.
  - a. Describe the availability and roles of specialty centers within the system (pediatric, burn, traumatic brain injury, spinal cord injury)
2. Describe the roles of the nondesignated acute care facilities in the trauma system.
  - a. Address their representation on the regional trauma committee.
  - b. Do they submit registry and/or financial data?
  - c. What is their degree of engagement in the system-wide performance improvement process?
3. Describe the process for verification and designation. Briefly outline the extent of authority

granted to the lead agency to receive applications and to verify, designate, and dedesignate regional trauma centers.

4. Describe your standards for trauma center verification (including pediatric standards) and the extent to which they are aligned with national standards.
  - a. Describe any waivers or program flexibility granted for centers not meeting verification requirements.
  - b. Describe the process and frequency of use for dedesignation of trauma centers.
5. Outline how the geographic distribution and number of designated acute care facilities is aligned with patient care needs.
  - a. Describe the process by which additional trauma centers are brought into the system.
  - b. Describe the system response to the voluntary withdrawal of designation by acute care facilities.
  - c. Describe the mechanism for tracking and monitoring patient volume and flow between centers and how this influences the overall configuration of designated facilities.
6. Describe your system for assessing the adequacy of the workforce resources available within participating centers.
  - a. Address nursing and subspecialty needs (trauma or general surgery, intensivists, neurosurgeons, orthopedic surgeons, anesthesiologists, pediatric surgeons, and others, as required).
  - b. What human resource deficiencies have been identified and what corrective actions have been taken?
7. Describe the educational standards and credentialing for emergency physicians and nursing staff, general surgeons, specialty surgeons, and critical care nurses caring for trauma patients in designated facilities.
  - a. What regional educational multidisciplinary conferences are provided to care providers? Who is responsible for organizing these events?

### **System Coordination and Patient Flow**

1. Describe the source of prehospital trauma triage protocols, and specify whether they are consistent with national guidelines.
  - a. Describe how children and patients with severe traumatic brain injury and spinal cord

injury are triaged from the field to appropriate facilities.

2. Within the system, what criteria are used to guide the decision to transfer patients to an appropriate resource facility and are these criteria uniform across all centers?
3. Specify whether there are interfacility transfer agreements to address the needs of each of the following:
  - a. Transfer to an appropriate resource facility
  - b. Traumatic brain injury
  - c. Spinal cord injury
  - d. Reimplantation
  - e. Burns
  - f. Children
  - g. Repatriation
4. Describe the system-wide policies addressing the mode of transport and the type and qualifications of transport personnel used for interfacility transfers.
5. Specify whether there is a central communications system to coordinate interfacility transfers. Describe how this system has access to information regarding resource availability within the region.

### **Rehabilitation**

1. Provide data about the number of rehabilitation beds and specialty rehabilitation services (spinal cord injury, traumatic brain injury, and pediatric) available within the trauma system's geographic region. On average, how long do patients need to wait for these rehabilitation beds? Does the average wait vary by type of rehabilitation needed?
2. Describe how existing trauma system policies and procedures appropriately address treatment guidelines for rehabilitation in acute and rehabilitation facilities.
3. Identify the minimum requirements and qualifications that rehabilitation centers have established for the physician leaders (for example, medical director of spinal cord injury program, medical director of traumatic brain injury program, and medical director of rehabilitation program).
4. Describe how rehabilitation specialists are integrated into trauma system planning and advisory groups.

### **Disaster Preparedness**

1. When was the last assessment of trauma system preparedness resources conducted, and what were the significant findings of the assessment as they relate to emergency preparedness?
2. What actions were taken to remediate or mitigate the gaps identified through tabletop or simulated responses in disaster drills among the acute care facilities participating in the system?
3. What is the trauma system plan to accommodate a need for a surge in personnel, equipment, and supplies?
4. How is the trauma system integrated into the state's incident command system and the communications center?
5. What strategies and mechanisms are in place to ensure adequate interhospital communication during a mass casualty incident?

### **System-wide Evaluation and Quality Assurance**

1. What is the membership of the committee charged with ongoing monitoring and evaluating of the trauma system?
  - a. To whom does it report its findings?
  - b. How does it decide what parameters to monitor?
  - c. What action is it empowered to take to improve trauma care?
2. Describe the trauma system performance improvement efforts as they pertain to the system for the following groups of providers in the context of system integration:
  - a. Dispatch centers
  - b. Prehospital provider agencies
  - c. Trauma centers
  - d. Other acute care and specialty facilities
  - e. Rehabilitation centers
3. List the process and patient outcome measures that are tracked at the trauma system level, including measures for special populations.
4. As part of your system-wide performance improvement, specify whether each of the following is assessed on a regular basis:
  - a. Time from arrival to a center and ultimate discharge to a facility capable of providing

definitive care. If yes, specify the mean time to transfer.

- b. Proportion of patients with injury more severe than a predefined injury severity threshold (for example, ISS >15, or other criteria) who receive definitive care at a facility other than a Level I or II trauma center (undertriage)
  - c. Proportion of patients with injury less severe than a predefined injury severity threshold (for example, ISS <9) who are transferred from any facility to a Level I or II trauma center (overtriage).
5. Describe how your system addresses problems related to significant overtriage or undertriage, both primary and secondary.

### **Trauma Management Information Systems**

1. Which agency has oversight of the trauma management information system?
  - a. Describe the role and responsibilities of this agency in collecting and maintaining the data.
  - b. How are the completeness, timeliness, and quality of the data monitored?
2. Specify which of the following data sources are linked to the information system. Describe the method of linkage (for example, probabilistic or deterministic).
  - a. Motor-vehicle crash or incident data
  - b. Law enforcement records
  - c. EMS or other transporting agency records
  - d. Emergency department records
  - e. Hospital records (hospital trauma registries)
  - f. Hospital administrative discharge data
  - g. Rehabilitation data
  - h. Coroner and medical examiner records
  - i. Financial or payer data
  - j. Dispatch
3. What are the regional trauma registry inclusion criteria?
4. Which stakeholders had a role in selecting the data elements for inclusion into the regional registry?
  - a. From what source(s) were the data field definitions derived?
  - b. What pediatric data elements are captured?

5. What local or system-wide reports are routinely generated and at what frequency?
6. Are data contributed to the National Trauma Data Bank (NTDB) or other outside agencies? If so, please specify which agencies.

**Research**

1. Describe the current procedures and processes investigators must follow to request access to the trauma system registry.
2. What are the mechanisms used to ensure patient confidentiality when regional trauma registry data are used by investigators?

3. Provide examples of where research was conducted for the purpose of providing evidence that the processes of care and outcome of injured patients in the system's region are within acceptable standards.
4. How has research been used to modify policy or practice within the system?
5. What resources (for example, personnel and fiscal) are available to the lead agency to assist in conducting system research?