AMERICAN COLLEGE OF SURGEONS COMMITTEE ON TRAUMA
Trauma Systems Evaluation and Planning Committee

Trauma System Consultation Report

State of Arizona

Phoenix, AZ
November 26-29, 2012

AMERICAN COLLEGE OF SURGEONS
Inspiring Quality:
Highest Standards, Better Outcomes

A multidisciplinary working group prepared this document based on the consultation visit that took place November 26th-29th, 2012 in the State of Arizona and included the following members:

Team Leader:

Robert J. Winchell, MD, FACS
Chair, Trauma Systems Evaluation and Planning Committee
American College of Surgeons, Committee on Trauma
Associate Professor of Surgery
Tufts University School of Medicine
Chief, Division of Trauma and Burn Surgery
Maine Medical Center
Portland, Maine

Team:

Jane Ball, RN, DrPH
Technical Advisor TSC
American College of Surgeons
Director, National Resource Center (EMS-C & Trauma) – Retired
Washington, DC

Rajan Gupta, MD, FACS, FCCP
Associate Professor of Surgery
Director, Trauma Program
Dartmouth Hitchcock Medical Center
Lebanon, NH

Heidi A. Hotz, RN,
Trauma Program Manager
Cedars-Sinai Medical Center
Los Angeles, CA

Janet Kastl
Washington State EMS Director
Office of Emergency Medical and Trauma Prevention
Tumwater, WA

Nels D. Sanddal, REMT-B, CMO, PhD, MS
Manager, Trauma Systems and Verification Programs
American College of Surgeons
Chicago IL

James D. Upchurch, MD
Billings Area, IHS, EMS Medical Director
PHS Indian Hospital
Crow Agency, MT
ACS Staff

Carol Williams
Administrative Director, Trauma Programs
American College of Surgeons

Table of Contents

Executive Summary

Arizona has made dramatic progress in the development of its trauma system since the Trauma Systems Consultation visit by the American College of Surgeons (ACS) Committee on Trauma (COT) in June of 2007. The leadership within the Bureau of EMS and Trauma Systems (BEMSTS) has remained constant and committed to the advancement of care for the injured, and great energy has been expended in the development of rural trauma resources and the designation of trauma centers outside the major urban areas. In a little over five years, the number of trauma centers has risen from seven to 25, with the addition of 18 new centers, most of which are rural centers designated at Level IV. The location of the new trauma centers has not been specifically guided by a comprehensive plan. However, since the majority of new trauma centers were designated in areas of clear-cut need, there has been broad acceptance and little controversy. Substantial progress has also been made by Arizona in the integration and enhancement of EMS resources, and in the development of the statewide trauma and pre-hospital database systems.

Arizona has a strong tradition of free enterprise and small government, and this philosophy has guided trauma system development. Participation in the trauma system remains voluntary, and statewide directives governing facilities and EMS are considered guidelines rather than rules. In fact, at the time of this trauma system consultation, the state government had declared a broad moratorium on the creation of new regulations unless compelling public need could be demonstrated. In the early development of the Arizona trauma system no real conflict existed between the free enterprise approach and the need to manage expensive and potentially duplicative resources, to optimize the public good rather than business profit. As the trauma system has matured and additional trauma centers have filled obvious voids in urban areas, the issues inherent in blending free enterprise and public good have become more challenging, just as they have in many other state trauma systems. The primary issues driving the request for this trauma system consultation, as expressed by the BEMSTS and participants during the consultation were related to:

- the development and ownership of a guiding vision for future trauma system development, and
- the establishment of rules, authority, and political will to make that vision an operational reality.

The two significant points of the debate focused on:

- the designation of new trauma centers, especially in areas felt to be served by existing trauma centers, and
- the creation and enforcement of rules governing patient flow both from the field to definitive care facilities and between definitive care facilities.

The state trauma plan describes an inclusive system, in which all acute care facilities participate in the care of the injured at an appropriate level. This vision was re-enforced as one of the priority recommendations of the 2007 ACS trauma system consultation team. In practice, especially under the influence of a free enterprise philosophy, this concept has been misapplied. In an inclusive system, all facilities should participate at a level consistent with their own capabilities and more importantly at a level that is consistent with overall trauma system needs. The location and level of all trauma centers, new or established, should be governed by an overall plan that is based upon the needs of the population served. The facilities should be designated at a level to meet those needs, not simply at a level that serves the mission of a particular facility. The trauma enabling legislation has basic provisions authorizing BEMSTS to both designate and de-designate trauma centers, functions that are vital to the administration of an effective system. The processes by which this is accomplished and the criteria governing such choices are not well established and have never been tested. The state has no specific criteria in place to determine whether an application for provisional trauma center designation is consistent with the needs of the system. Currently, all such applications are approved if administratively complete. In order to achieve full designation, a trauma center must meet standards established by the ACS verification process; however, these standards only establish that a trauma center has the capability to function at a certain level, not that it should do so within the context of a given trauma system.

At the time of the 2007 trauma system consultation, the state had only seven designated trauma centers and all but one were located in major population centers (5 in the Phoenix area, 1 in Tucson, and 1 in Flagstaff). The majority of new trauma centers designated since 2007 are located in remote underserved areas. A confluence of forces within the state have now led several urban and suburban facilities to seek trauma center designation, potentially altering the flow of patients and the volume of patients seen at existing centers. Because such changes are the result of economic and business factors, rather than a planned response to population needs, the concern is justified that the overall effects may not be beneficial. The ACS consultation team strongly recommends that the Arizona Trauma System Plan be updated and that it incorporate a regional needs assessment that outlines the optimal location and level of trauma centers within each region based upon anticipated population needs. All new trauma center designations should be consistent with that plan and should serve the needs of the trauma system and the population it serves. The team further suggests a moratorium on additional new trauma center designations until the new plan is in place.

Arizona is fortunate to have significant funding for trauma system infrastructure and operations. In addition to the state budget allocation to BEMSTS, a 2002 voter initiative allocated a portion of Native American gaming income to offset readiness costs and costs of uncompensated care at Level I trauma centers. When the law was passed all trauma centers in the state were Level I, and all of these trauma centers were located in the two major urban areas of Maricopa and

Pima counties. All seven designated trauma centers in 2007 are currently designated by the state as Level I, although not all meet the criteria for that Level I established by the ACS Trauma Center Verification Review Committee, a practice driven by the rules governing distribution of the Native American gaming funds. The distribution model for these funds creates a strong disincentive for any facility to seek Level II designation, and provides no support for facilities designated at Level III or Level IV. Further, the model is based in part on trauma volume, and as such contributes to competition between trauma centers for patients from the field, and especially, in transfer from other institutions. This distribution scheme makes it more difficult for the BEMSTS to designate facilities at an appropriate level, and does not allow the funds to be used to effectively improve the trauma system as a whole. The ACS consultation team recommends that this distribution model be modified to allow for fixed level-specific support to be provided to all designated centers.

The stakeholder advisory structure is essentially unchanged since the 2007 ACS consultation, despite the transformational changes that have occurred in the trauma system. As a result, representation on the State Trauma Advisory Board and its sub-committees is skewed in favor of the original urban centers, while rural centers and providers have insufficient representation. Some perception exists that BEMSTS lacks the authority and political support to provide strong system leadership. The state stakeholder group clearly has a great deal of energy, expertise, and commitment. This larger group should be engaged to help create a guiding vision for the trauma system, a vision that provides the common ground from which to build consensus around the difficult structural and operational challenges. To address these issues, the ACS consultation team recommends that the make-up of the advisory committees be modified to reflect the current status of the trauma system and the present urban/rural composition. The reporting structure of the committees themselves should be modified to provide for more efficient communications and more direct lines of reporting. This newly re-constituted state trauma advisory board should be immediately tasked with updating the State Trauma System Plan.

The State of Arizona represents a study in contrasts between rural and urban, and the needs and resources within the various regions are vastly different. An effective plan must make use of the existing regional structure, providing an over-arching set of standards and some adjustment at the state level to meet the needs of each specific region. This approach should be applied to all levels of trauma system function, including needs assessment, trauma center numbers, levels, and locations, and patient destination, both from the field and from referring facilities.

In the balance, Arizona has a proven commitment to the care of the injured, and has made great strides in the continued improvement of its trauma system. The state has many strengths, including facilities, people, and finances, and it has strong leadership within the lead agency. The challenges with respect to system governance and control of trauma center designation are occurring in other state

trauma systems as well. These issues present significant challenges to the bureaucratic structure in the exercise of its authority, especially under the philosophy of non-regulation. Nevertheless, these challenges must be faced if the trauma system is to be maintained and improved in a way that benefits the population served, rather than specific constituencies within it. This basic principle is universal, though the specific solution will be local. As yet, no single set of criteria to govern system design exists, but examples of approaches used in other areas can serve as a model to guide development.

The report that follows expands on these general observations and provides specific recommendations organized by functional category within the inclusive trauma system model. The following sections of this executive summary will present a broad overview of the primary findings of the team and a list of the priority recommendations.

Strengths

- Long history of strong participation
  - Institutions
  - Trauma leadership
  - People
- Substantial funding
- Commitment by the Arizona Department of Health Services and BEMSTS leadership
- Sufficient number of high level trauma centers
- Rapid increase in rural Level IV trauma centers
- Growth of capacity outside urban areas
- Fewer reported issues with diversion
- Sophisticated and collaborative EMS system
- Strong regulatory oversight of EMS
- Adoption of the Center for Disease Control field triage guidelines
- Good trauma system plan from 2002
- Robust data infrastructure, including Data and Quality Assurance Section
- Collaborative research infrastructure
- Diverse injury prevention programs
- Disaster preparation within facilities

Challenges and Vulnerabilities

- Large remote land area, geographic isolation
- Limited resources in rural areas
- Potential maldistribution of trauma centers
- Lead agency lacks (or perceives itself to lack) clear authority and mandate
- Limited clinical trauma expertise in lead agency
- Historical reliance on guidelines versus rules
- Outdated advisory board structure
- Lack of cohesive stakeholder involvement

- Incomplete acceptance of inclusive system
- Distribution requirements of Proposition 202 funds creates adverse incentives
- Inability to designate trauma centers based on need
- Lack of clear destination protocols
- Limited system-level integration with emergency preparedness efforts
- Immature processes for trauma system monitoring
- Limited utilization of available data
- Lack of clear constituency and legislative support

Themes

- The need for a clear vision and a clear plan for future direction, embraced by all stakeholders and by the BEMSTS
- BEMSTS needs to have clear support from stakeholders to lead, backed up by statutory and regulatory authority
- Advisory committees need to be reconfigured to provide broader stakeholder participation and to establish clear acceptance as a balanced policy development group
- Trauma center designation should be based on need
- Choice of destination from field or transfer should be consistent, and driven only by patient needs
- Proposition 202 funds are not being used to their full potential
    - No support for trauma centers other than Level I
    - Distribution model fosters competition for volume

Priority Recommendations

Statutory Authority and Administrative Rules

- Amend trauma system statutes and rules to:
    - Require a demonstration of need as a requirement for any provisional trauma center designation
    - Establish standards of care relative to specific trauma destination protocols:
        - Establish a state template in rule based on the Centers for Disease Control and Prevention (CDC) field triage criteria
        - Provide authority to the regions and require them to use the state template by rule to develop detailed destination procedures based on the state template.

- Establish a new overarching statewide multidisciplinary emergency care committee to advise the Arizona Department of Health Services (ADHS).
    - Constitute new committees specializing in Emergency Medical Services, trauma, stroke, ST-Elevation Myocardial Infarction (STEMI), and medical direction to provide guidance to the multidisciplinary overarching committee.

- Ensure that the main committee and all subcommittees are broadly representative.

System Leadership

- Encourage broader participation and more frequent turnover of committee membership.

- Regularly convene and empower a trauma program manager group to be a system advocate, contribute to trauma system development, inform the Bureau of EMS and Trauma Services, and support the Trauma and EMS Performance Improvement Standing Committee in performance improvement efforts.

Lead Agency and Human Resources Within the Lead Agency

- Establish a separate trauma medical director position (trauma surgeon) to provide the needed trauma system leadership and vision.

Trauma System Plan

- Assign the revision of the Arizona trauma system plan to a broad-based ad hoc subcommittee of the State Trauma Advisory Board or new multidisciplinary trauma advisory committee including the trauma medical directors, trauma program managers, and representatives from prehospital care, prevention, rehabilitation, disaster, and the public.
  - Ensure balanced rural and urban participation.
  - Adopt the plan formally through a broad trauma stakeholders group, state multidisciplinary trauma advisory committee, and the Arizona Department of Health Services (ADHS).
- Require a regional or statewide needs assessment prior to any new provisional trauma centers that addresses geography, availability and proximity of Level I trauma centers as criteria for designation.

System Integration

- Improve integration efforts between system leadership and Level III and Level IV Trauma Centers.
  - Include Level III and Level IV representation on the State Trauma Advisory Board (STAB).
- Optimize the integration of STAB and the EMS Council until the new overarching multidisciplinary committee is constituted (see Statutory Authority section):
  - Have more frequent meetings of the statutory committees, and stagger the schedule to allow members with dual or multiple appointments to attend all meetings.

- Leverage electronic resources to further facilitate meeting participation.
- Consider additional ad hoc workgroups to facilitate efforts.
- Increase trauma representation on EMS council.

Financing

- Revise the distribution method of the Trauma and Emergency Fund to include funding for all designated trauma centers in the trauma system.
  - Change the rule for the fund to ensure that all designated trauma centers receive level-appropriate support for the “cost of readiness”.
  - Develop a formula for distribution of funds that focuses on specific deliverables by trauma center level rather than volume and acuity.
  - Include a mechanism to support trauma rehabilitation services (establish in rule and/or direct Level I trauma centers to use some of their funds to “buy” beds in rehabilitation centers).
  - Revisit the allocation method/ formula on a regular basis (e.g., every 3 years))
- Distribute funds through a contractual agreement with each trauma center to ensure that each center continuously meets all of the requirements of verification/designation, such as:
  - Outreach
  - Prevention
  - Performance Improvement
  - Data submission
  - Participation and leadership in regional and statewide systems
- Regularly audit or monitor fund distribution and utilization.
  - Require hospitals to demonstrate that funds are used to support trauma center readiness and/or outreach as appropriate by designated level (for example Level I trauma centers should be required to do outreach as a criterion to receive funding).

Definitive Care Facilities

- Impose a moratorium on additional trauma center designations in Maricopa and Pima counties (assuming a positive response from the Attorney General) to allow for appropriate trauma system plan development.
- Establish criteria and standards for designation and de-designation of trauma centers.

- Establish geographic catchment areas for individual high-level trauma centers to balance load, minimize temporal maldistribution, and mitigate adverse effects of competition based upon need and performance.

System Coordination and Patient Flow

- Establish regional trauma destination standards and monitor compliance.
  - Develop a state framework or template that can be adapted regionally. Talk with other state trauma program managers, e.g. Colorado, to identify potential template models.
  - Clearly identify which facilities are appropriate to receive patients identified in each step of the field triage criteria.
- Use the statutory authority of the Bureau of EMS and Trauma System to mandate that EMS services comply with accepted field triage destination standards.

Rehabilitation

- Identify funding sources to facilitate the timely transfer of patients with uncompensated care to rehabilitation facilities.

System-wide Evaluation and Quality Assurance

- Select the first audit filter from the provided list for review as part of the Trauma and EMS Performance Improvement (TEPI) standing committee's trauma system performance improvement (PI) activities. (See Focus Question 3)
  - Schedule a meeting, and then start the review process.
- Encourage the trauma system program manager to contact the National Association of State EMS Officials' Trauma Manager Council for sample state trauma system PI plans.
  - Use these resources to develop a state trauma system PI plan in collaboration with TEPI.

Trauma Management Information Systems

- Identify and convene a work group consisting of a trauma medical director, trauma program manager, prehospital care providers, and system planners (possibly under Trauma and EMS Performance Improvement [TEPI]) to develop a list of reports that will be essential to develop measurable objectives for the new trauma system plan.
  - Include metrics such as distribution of patients, transfer patterns, time to definitive care (field and transfer). See Appendix D.
- Assign TEPI with the development of a list of standardized template reports to be run each quarter that will assist in ongoing monitoring of the trauma system performance.

- Run and have TEPI review the same list of reports for at least one full year before adaptation, deletion or substitution.
- Distribute the reports widely to stakeholders and advisory bodies.

Trauma System Assessment

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 through description of the epidemiology of injury mortality in the system 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)**
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).

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)**

Current Status

Arizona's Department of Health Services (ADHS) has excellent resources to describe the state's injury problem. The Data and Quality Assurance Section (DQA) within the Bureau of Emergency Medical Services and Trauma System (BEMSTS) provided a good description of injuries reported to the statewide trauma registry. The Office of Injury Prevention (OIP) based within the Bureau of Women's and Children's Health (BWCH) has an injury epidemiologist. The description of injuries provided in the draft *2011 Injury Prevention Plan* is very detailed by age, ethnicity, mechanism of injury, mortality by mechanism, and morbidity. Both population-based and clinical databases were used to describe the injury problem in Arizona.

The state has many data resources to study injury, including vital statistics, medical examiner data, motor vehicle crash data, emergency department and hospital discharge data, and the state trauma registry. The state previously had a Crash Outcome Data Evaluation System (CODES) project that enabled data linkage. Interest was expressed by staff in the DQA Section to learn strategies for data linkage between the state trauma registry and the Arizona Prehospital Information and EMS Registry System (AZ-PIERS), as well as several other databases. It may be possible to perform deterministic data linkage because certain patient identifiers are retained in the databases and removed once data are aggregated. Future linkages between databases will be very beneficial for planned trauma system performance improvement efforts. Opportunities exist to build an injury surveillance program within the ADHS.

The DQA Section is encouraged to use the Hospital Discharge dataset in association with the state trauma registry to track trends in trauma system performance improvement. For example, contrasting the patients with injuries contained in the Hospital Discharge dataset with the patients in the trauma

registry can expand knowledge of injury care within the state, such as injury-related admissions and deaths in non-designated facilities, patient transfers, and costs. The OIP epidemiologist may be a good resource to help guide the DQA Section in a more detailed analysis of the trauma registry and population-based databases.

The DQA staff members are encouraged to meet with the OIP epidemiologist to expand their knowledge of injury analysis with population-based datasets. Cross training should be considered since the state's Centers for Disease Control and Prevention (CDC) Injury Core Capacity Grant is in its fourth year of funding. While a report describing injuries is produced annually from the trauma registry, it is not known how frequently the OIP produces a detailed description of injuries for the state. The OIP epidemiologist and DQA Section staff members are encouraged to collaborate and develop a report format that integrates numerous databases that can be produced annually or biennially. Collaborating with the OIP epidemiologist will increase the effectiveness of a more detailed analysis with injury prevention projects through the use of the trauma registry and population based databases.

Recommendations

- Facilitate meetings between the Data Quality Assurance Section (DQA) staff members and the Office of Injury Prevention (OIP) epidemiologist to enable the DQA staff members to gain an increased understanding and skill in injury epidemiology.
- Develop a template for an annual or biennial report describing injuries in Arizona that use both population-based and clinical databases.
    - Produce the report at regular intervals and disseminate it to the public, elected officials, and all trauma system stakeholders.
- Collaborate with the OIP epidemiologist to develop reports from the trauma registry to identify targeted topics that may inform the Trauma and EMS Performance Improvement Standing Committee about potential performance improvement issues.
- Encourage collaboration between the OIP epidemiologist and the DQA staff members to develop an injury surveillance system.

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)**

Current Status

Arizona is to be commended for having conducted a statewide self-assessment using the Health Resources and Services Administration (HRSA) Benchmarks, Indicators, and Scoring (BIS) framework in the past year. More than 60 stakeholders were invited to complete the BIS self-assessment survey, and 47 stakeholders responded. The distribution of respondents included the following:

- Trauma medical directors - 2
- Trauma program managers - 5

- EMS providers - 14
- ADHS or BEMSTS – 13
- Others (non BEMSTS or ADHS) - 13

Of the direct care providers, 4 participants were from Level IV trauma centers and 9 were from Level I trauma centers.

After collecting all survey responses, a consultant calculated the mean scores for each indicator, and then provided a comparison of mean scores for each indicator by region. The analysis of each indicator by region helped to identify that variation in scoring existed between the regions. This variation could be related to regional differences in stages of trauma system development or to differences in knowledge about the state trauma system components.

Two meetings were conducted to review and discuss the BIS self-assessment mean scores. Discussions further clarified the differences in scoring found between regions and different groups of respondents. This process improved the participants' knowledge and understanding about the strengths, challenges, and needs of the state's trauma system.

To date, a consensus building process regarding which indicators should become priorities for future trauma system development has not occurred. When the decision was made to request a trauma system consultation from the American College of Surgeons (ACS), the work associated with consensus building and identification of priorities for future trauma system development was postponed.

Completion of the consensus building process regarding priority focus areas for the trauma system plan revision may be an effective way to encourage stakeholders to communicate, collaborate, and initiate the next stage of trauma system development.

An important element of trauma system development is to step back and assess progress over time. Planning a future BIS self-assessment is an effective way to allow trauma system stakeholders to evaluate overall progress in trauma system development and to identify new priorities for attention.

Recommendations

- Complete the consensus building process regarding the Benchmarks, Indicators, and Scoring (BIS) self-assessment findings by identifying the most important indicators that will become priorities for the new trauma system plan.
- Share findings and interpretations of the BIS self-assessment process with all trauma system stakeholders in a user-friendly format.

- Repeat the BIS self-assessment in 3 to 5 years to evaluate progress in trauma system development and to identify emerging priorities for attention.

Trauma System Policy Development

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 predescribed 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)**

Current Status

The BEMSTS has the statutory authority to provide oversight and evaluation of the statewide EMS and trauma system. However, some legislative limitations do exist regarding its ability to address and define standards and requirements for trauma center designation and system integration. The rules that would enhance the development and implementation of a complete statewide trauma system are not in place. The BEMSTS has chosen to manage the trauma system in a voluntary, non-regulatory manner. Participants expressed concerns that the current state statute and rules "lack the teeth" needed to implement the state trauma system.

A statute that required hospitals and other facilities and health care services to go through a certificate of need (CON) process was repealed by the legislature. The current trauma statutes and regulations do not provide the ADHS or BEMSTS with direct authority to require a demonstration of need for designation as a trauma center. As a result the interpretation of the statute by ADHS and BEMSTS is that the state is required to designate any facility that applies and meets minimal standards.

An inclusive, system-wide approach to trauma care calls for designation of each hospital in the state at an appropriate level based on community need. A lack of clarity seems to exist among stakeholders as to what an inclusive trauma system looks like in practical application. As a result, existing trauma centers are concerned that implementation of an inclusive system represents a threat. An inclusive trauma system does <u>not</u> mean that all hospitals should participate at whatever level they chose. Ideally, statute would provide authority for the state to limit the number and location of designated higher-level trauma centers, and then to identify all other hospitals as trauma system "participating facilities." These designations should then be used to determine the best destination for injured patients. Many effective trauma systems have specific prehospital destination decisions made at the regional or local level. Destination decisions are based on the Centers for Disease Control and Prevention (CDC) field triage criteria and applied to as it relates to local resources, geography, and travel time.

Statute and rule do exist to provide full authority to regulate the EMS components of the state system. A Certificate of Necessity program for EMS agency licensure

does exist, and EMS ambulance service licenses are awarded based on need. The BEMSTS has strong authority to regulate EMS services and providers and to establish standards of care. Training and certification of EMS providers is fully regulated. EMS providers are encouraged to follow patient treatment protocols and to deliver patients to the appropriate facility for their condition. The rules include the authority to establish protocols for selection of Health Care Institution for Emergency Patient Transport (R-25-504), including to a special hospital (defined in R9-10-201 as licensed to provide services within a specific branch of medicine). The ACS TSC team believes that designated trauma centers meet this definition, and that control of patient flow at the EMS level offers the best short-term solution to optimize system function.

Statutes establishing the EMS regions are minimal, but they do require the region (local emergency medical services coordinating system) to develop and submit a regional EMS plan that includes a needs assessment to the BEMSTS Director. These regional plans become a part of the state EMS plan. This statutory authority should provide the mechanism to direct the regions to include the identification of appropriate prehospital destination facilities for trauma patients, as well as other special emergency patient needs.

Given the current lack of authority to include needs-based criteria for the designation of new trauma centers and the potential for the current laissez-faire approach to enable designation of new trauma centers based upon criteria other than optimization of patient outcome, the TSC team recommends a moratorium on new trauma center designation until a state-wide assessment of need is completed. This needs assessment should include a plan for the optimal number, level, and location of trauma centers throughout the state.

Currently, state statute establishes 3 equally important oversight committees to advise the BEMSTS:

- The EMS Committee,
- The State Trauma Advisory Board (STAB), and
- The Medical Directors Committee for EMS (MDC).

The makeup and responsibilities of these committees are defined in statute and rule. The responsibilities of these committees overlap, and the designated membership of each is outdated. The committees are not multidisciplinary and are not inclusive of both urban and rural providers. The state would benefit from a newly formed multidisciplinary oversight committee to replace these three committees. This multidisciplinary oversight committee could provide advice and guidance regarding the emergency care system, inclusive of the EMS, trauma, ST Elevation Myocardial Infarction (STEMI), and stroke programs. Advisory committees for each program could be subcommittees of the larger committee.

Proposition 202

Proposition 202 provides an account from Indian gaming monies with funding dedicated to support Level I trauma centers and hospital emergency departments. This proposition was passed through an initiative process rather than an act of the state legislature. In Arizona, the state legislature may not repeal an initiative. The proposition can be amended only if the amendment "furthers the purposes" of the initiative and is approved by a three-quarters majority vote of the legislature. The law is outdated and does not allow the state to provide funding to any trauma center below Level I, except through the funds that go to each hospital emergency department. An amendment that enhances the fund's ability to support the statewide trauma system by providing funds to trauma centers designated at levels additional to Level I could be an appropriate legislative action.

The administrative rules promulgated by the Arizona Health Care Cost Containment System (AHCCCS), the state Medicaid agency to implement Proposition 202, require that 90% of the fund goes to Level I trauma centers and 10% is distributed to hospital emergency departments. This creates an adverse incentive for hospitals to participate below level I designation, leading to some significant issues:

- The state designation of Level I trauma centers for facilities that include both ACS-verified Level I and Level II trauma centers,
- Lack of participation by some facilities in the system, and
- Initial difficulty in getting Level III and IV trauma centers designated, especially in rural areas of the state.

Fortunately, through extensive efforts over the past 5 years, the state now has a total of 18 Level III and IV trauma centers spread across the state.

Adjustment in the allocation of the funding is needed to provide a mechanism for all trauma designed hospitals to receive reimbursement for the costs of trauma center readiness based on level of designation. Ideally, this would happen through a revised state statute. Alternatively, the rules for funding distribution might be adjusted to change the allocation between Level I trauma centers and emergency departments, and/ or to define the requirements to receive funds as an emergency department plus an additional amount for each trauma center designation level.

Moratorium on Rules

A further complication for the state is the moratorium on rules, which prohibits agencies from adopting any new rules that are not "necessary for public safety". State officials reported that this moratorium may be in place for the next few years. This presents an additional, but not insurmountable, challenge to changing the current regulatory authority over the development, implementation, and management of the state trauma system. Options may include going directly to the legislature to change the laws, or an exception to the moratorium could be

sought. The members of the trauma community could make a strong argument that changes to support full implementation of the state trauma system are necessary for the public safety of citizens of Arizona.

Recommendations

- **Amend trauma system statutes and rules to:**
  - **Require a demonstration of need as a requirement for any provisional trauma center designation**
  - **Establish standards of care relative to specific trauma destination protocols:**
    - **Establish a state template in rule based on the Centers for Disease Control and Prevention (CDC) field triage criteria**
    - **Provide authority to the regions and require them to use the state template by rule to develop detailed destination procedures based on the state template.**
- **Establish a new overarching statewide multidisciplinary emergency care committee to advise the Arizona Department of Health Services (ADHS).**
  - **Constitute new committees specializing in Emergency Medical Services, trauma, stroke, ST-Elevation Myocardial Infarction (STEMI), and medical direction to provide guidance to the multidisciplinary overarching committee.**
  - **Ensure that the main committee and all subcommittees are broadly representative.**
- Seek an Attorney General opinion regarding the establishment of a moratorium on additional trauma center designations in Maricopa and Pima counties.
- Revise the rules for the distribution formula of Proposition 202 funds to support statewide trauma system development.

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 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)**

Current Status

The fundamental leadership structure for the Arizona trauma system has not changed significantly since the previous ACS trauma system consultation in 2007. Overall responsibility for the trauma system lies within the ADHS through the BEMSTS. The three statutory advisory committees are the State Trauma Advisory Board (STAB), the EMS council, and the Medical Direction Committee (MDC). The structure and membership of these committees are also largely unchanged. In practice, the three advisory committees have functioned largely independently of one another, and specific liaison positions have been established to improve inter-committee communication and collaboration. The structure of the standing subcommittees has been modified to enhance focus on system-wide performance improvement. The Trauma and EMS Performance Improvement committee (TEPI) was created, replacing the previous quality assurance subcommittee of the STAB and broadening its scope.

The regional EMS council structure has not changed since that last visit, and 4 such state-funded multi-disciplinary councils exist. Though the charter of these councils gives them responsibility for oversight of trauma system issues in addition to broader EMS issues, the regional EMS councils do not typically have trauma-related representation, and they are minimally involved with trauma system development and operation at a functional level. From the perspective of the trauma system, these regional councils represent an under-utilized resource.

At the time of the previous ACS consultation, only high-level designated trauma centers were located within the state's three major metropolitan areas. The primary focus of trauma system development since that consultation has been in the recruitment and designation of trauma centers (primarily level IV) in rural

areas of the state, an effort that has been highly successful. As a result, a large number of providers from rural facilities are now involved in the trauma system, but the system leadership structure has not been changed to reflect this fundamental shift. The statutory makeup of the STAB does not include specific rural representation, and little turnover in the membership of STAB has occurred. As a result, STAB and trauma leadership within the state, as a whole, is primarily composed of representatives from the original urban trauma centers. The unifying concept over the past 5 years has clearly been the development of resources in the rural areas of the state and the designation of rural centers. With this task well underway, stakeholders from urban and non-urban parts of the state represented differences of opinion regarding the future direction of the trauma system, and what the guiding vision should be. The priorities voiced by urban stakeholders and those from more rural areas were different, and no clear consensus could be ascertained by the TSC team. Revision of the state trauma plan, as well as other formal planning efforts, has been put on hold pending the results of the current ACS consultation.

Stakeholders expressed frustration at the communication between the lead agency and the STAB, and at the inability of the STAB to “make and enforce rules”; however, there was a lack of consensus among stakeholders as to what those rules should be. At the same time, some clear successes have been achieved, for example, the evaluation and utilization of aeromedical resources that demonstrate good collaboration between the STAB and the BEMSTS. The most contentious issues surround the designation of new trauma centers in urban and suburban areas, within the catchment area of the existing high level centers. No clear criteria exist within existing statutes to define criteria for the designation of new trauma centers. The lead agency believes it does not have the authority to deny designation to facilities that meet standards for ACS/COT trauma center verification, regardless of overall trauma system needs. Trauma care was felt to be operating under a “free enterprise” system, a philosophy that is a strong underlying component of the current state government. Under this philosophy of limited government, a moratorium on the creation of new rules for trauma system operation exists, and no clear support within the state legislature or the executive branch was demonstrated for the structured development of the trauma system.

The state has made strong progress in the development of data systems to allow analysis of both hospital-based and pre-hospital trauma care. The TEPI has produced statewide reports looking at overall descriptive statistics and some specific process metrics regarding patient flow and center performance. The TEPI standing committee has great potential to utilize these data to raise public awareness and to direct process improvement. However, TEPI has not yet developed into a committee that is capable of supporting trauma system leadership initiatives or to facilitate the development of a public constituency that could support structured development of the trauma system.

The nature of the Arizona trauma system has changed substantially in the past few years, but the system leadership has not been revised and updated to keep pace with these changes. The fundamental leadership structure is sound, but stakeholder representation needs to be broadened in a way that reflects the current makeup of the trauma system. The frequency and focus of trauma system meetings should be increased to prior levels, and priority should be given to the formulation of a guiding vision for future trauma system development. A key component in the realization of this vision will be the engagement of the regional councils, especially in the areas of needs assessment and functional oversight. Substantial differences are likely to be found between the 4 regions.

Finally, priority should be given to the identification of key members of the legislature who will support and promote the cause of trauma system development. These individuals need to be provided with the information and support to assist them in their advocacy efforts.

Recommendations

- **Encourage broader participation and more frequent turnover of committee membership.**
- **Regularly convene and empower a trauma program manager group to be a system advocate, contribute to trauma system development, inform the Bureau of EMS and Trauma Services, and support the Trauma and EMS Performance Improvement Standing Committee in performance improvement efforts.**
- Expand the base of stakeholder representation on the State Trauma Advisory Board (STAB) and its working subcommittees.
    - Increase the number of working subcommittees to complete specific task work and to broaden participation.
- Strengthen the role, responsibilities, and accountability of the EMS regional councils in policy implementation and trauma system oversight, in collaboration with the trauma stakeholders in their region.
- Identify members of the state legislature who will actively support and promote trauma system development.
    - Inform and educate them about significant trauma system issues.

Coalition 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)**

Current Status

The number of participants attending the ACS TSC and their level of engagement revealed a large number of trauma system stakeholders. This group of participants included individuals beyond the membership of the STAB and its work groups.

Arizona has a well-organized coalition for injury prevention that includes an extensive list of organizations, as well as the trauma centers. The OIP program manager is highly successful in seeking out organizations and individuals to become engaged in the injury prevention efforts. Participants described levels of engagement with the Injury Prevention Advisory Committee (IPAC) and injury prevention programs that revealed how much they value the opportunity to collaborate. The IPAC and trauma system stakeholders demonstrated an ability to mobilize and form a coalition to successfully support efforts to obtain booster seat legislation.

The trauma system appears to have no cohesive coalition to support trauma system development. Surprisingly, the trauma center program managers no longer meet as a group to share information, support each other, assist new trauma center program managers, or enhance trauma system development. It is not apparent that new Level III and IV trauma centers feel well integrated into a coalition to improve trauma care statewide.

Arizona has some factors that challenge coalition building to enhance trauma system development. The lack of term limits for STAB members reduces opportunities for fresh energy and ideas to flow to the system leadership. It is unclear how additional members on work groups associated with the STAB are recruited; however, this is an opportunity to include new individuals into the trauma system coalition. Due to the period of time that the BEMSTS had an unfilled trauma program manager position, no coordinator to support and sustain the trauma system coalition was available. The Arizona Trauma and Acute Care Coalition (AZTrACC), composed of a group of Level I trauma medical directors, is exclusive and has the potential to selectively support or not support trauma system initiatives. This could potentially hinder the trauma system coalition.

The “trauma system road show” was a project undertaken by the BEMSTS to educate the rural areas on the need for Level III and Level IV trauma centers and to encourage them to seek trauma center designation. This was a successful venture. Continuing support for these trauma centers is provided by the BEMSTS designation staff. At the time of the ACS TSC, no plans existed to retool the road show and present the trauma constituents with other information pertinent to the changing trauma environment. Arizona created a model document to inform and educate the public and elected officials about the trauma system for use during the road show. This document was used during the road shows to generate interest in having hospitals become part of the trauma system. This is a model

tool that could be updated and used to educate elected officials when the state initiates efforts to modify the trauma system statutes.

Recommendations

- Identify issues around which stakeholders of the trauma system can mobilize.
  - Consider priorities identified in the Benchmarks, Indicators, and Scoring (BIS) self-assessment as a starting point.
  - Support the efforts of stakeholders to meet and share information.
  - Use electronic communication strategies to foster coalition building efforts.
- Encourage the current trauma system program manager to develop relationships with all trauma center medical directors, trauma program managers, registrars, and other interested stakeholders.
- Invite the trauma system program manager to participate on the Injury Prevention Advisory Committee.
- Encourage the trauma system program manager to meet with the manager of the Office of Injury Prevention to identify potential opportunities for collaboration and to learn strategies for coalition building.
- Revise and update information about the trauma system to share with elected officials.

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)**

Current Status

The Arizona lead agency for EMS and trauma system development and implementation is the BEMSTS within the ADHS. The BEMSTS has the statutory authority to provide oversight and evaluation of the statewide trauma system. However, some statutory limitations do exist regarding the ability to address and define standards and requirements for designation and trauma system integration.

The EMS and trauma system have very strong leadership with direction and participation by the ADHS director and a committed and knowledgeable bureau chief. The BEMSTS staff are committed and dedicated to implementing a strong statewide trauma system.

With 34 full time equivalent (FTE) employees, the BEMSTS is fairly well funded and staffed as an overall program. The BEMSTS is organized with 5 sections: Trauma Development; Data and Quality Assurance; Certification of Need (CON), Certification and Enforcement; Ambulance, Training and Base Hospital; and Business Operations. The majority of BEMSTS staffing is dedicated to EMS activities. EMS functions appear to be primarily regulatory. On the trauma side, only 4 FTEs are dedicated to system implementation and management. In 2007, the trauma system program had 5 FTEs, including the trauma registrar position. Although the 2007 ACS TSC report recommended the addition of 2 FTEs to the trauma program, no additions were made. Additional staffing is still needed for trauma system oversight, designation management, and technical assistance and outreach. The trauma system program would benefit from additional staff with clinical and trauma systems background and experience.

The DQA section has 5 FTEs dedicated to EMS and Trauma system data analysis and quality improvement. The level of staffing appears to be adequate to meet the system evaluation needs and to manage both the AZ-PIERS and the trauma registry. The staff in this DQA section would benefit from clear direction and additional education in developing and using trauma system performance improvement indicators and methodologies.

Support for EMS medical direction is provided. The 2007 ACS TSC report recommended that the BEMSTS add support for a trauma medical director. The agency added 0.25 FTE for trauma and expanded the responsibilities of the EMS medical director. The system would benefit from dedicated medical direction and leadership by a trauma surgeon.

The OIP and Emergency Medical Services for Children (EMSC) programs are located in the BWCH. Other injury specific prevention programs, such as falls prevention, are based in other ADHS units. These programs should be consolidated in one area of the ADHS to facilitate improved injury epidemiology and injury prevention programs. In addition, the emergency preparedness program and BEMSTS have overlapping missions. Better internal coordination between these programs would benefit the state.

Recommendations

- **Establish a separate trauma medical director position (trauma surgeon) to provide the needed trauma system leadership and vision.**
- Provide an additional 1 to 2 full time equivalent positions for designation, re-designation, support and technical assistance to Level III and Level IV trauma centers.
    - Recruit staff with experience in trauma service and/or trauma system management.
    - Preferably require clinical expertise, such as a registered nurse.
- Establish an intra-departmental injury prevention and control task group comprised of representatives from appropriate bureaus and programs, such as trauma, injury prevention, disaster preparedness, Screening Brief Intervention and Referral to Treatment (SBIRT), suicide, and others.
- Consolidate all injury prevention programs and the Emergency Medical Services for Children program under the auspices of the Bureau of Emergency Medical Services and Trauma Systems.

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

Current Status

During the ACS consultation conducted in 2007, the TSC team summarized the historical background relating to Arizona's *Emergency Medical Services and Trauma System Plan*, formally released in January, 2002. Additionally, the TSC team made several recommendations pertaining to the need to "develop a new comprehensive inclusive, state Trauma System Plan that includes a minimum of: goals, measurable objectives, and strategies; timelines for implementing trauma system goals and objectives; and assign responsibilities to advisory committees and staff."

The Pre-Review Questionnaire (PRQ) developed for the 2012 ACS TSC noted that "updating the 2005 trauma plan is underway". However, when participants were asked about the general direction and progress of that effort, responses revealed that a hiatus had been imposed pending the receipt of this TSC report.

Many of the general constructs contained in the 2002 plan are still viable, and the revision should be based on that effort. When updating the plan, the principles contained in the HRSA *Model Trauma System Planning and Evaluation* (MTSPE) document should serve as the framework for the revision. A particular focus should include expanding the definition of an **inclusive** and **integrated** trauma system for Arizona. Future revisions of the plan should continue to define the need for an **inclusive** trauma system to serve the citizens of, and visitors to the state. An inclusive trauma system has the following elements for all designated trauma centers and participating facilities:

- Identification of the role of every acute care facility with an emergency department (ED) in the care of injured patients,
- Data submission to the Arizona State Trauma Registry (ASTR), and
- Participation in regional and statewide performance improvement.

During the revision, an additional focus to include is the description of need for an **integrated** system, meaning

- Facility designation should be based on need and

- Trauma centers should not be verified or designated at a level that is not necessary for the optimal performance of the system.

The completion of the Benchmarks, Indicators, and Scoring criteria (BIS) from the MTSPE document earlier in 2012 should help inform the trauma system plan revision process. Additional commentary about the BIS process can be found in an earlier section of this report.

The STAB has the authority and responsibility to develop and revise the trauma system plan as noted in Arizona Revised Statutes (ARS) § 36-2222, Title 36, Chapter 21.1, Article 1 Trauma advisory board; membership; compensation; duties. Under "duties" it is noted that the board shall: "Make recommendations on the development and implementation of comprehensive regional emergency medical services and trauma system plans". It was unclear to the TSC team that the assigned STAB work group is viewed as representative of all the state's trauma stakeholders. Representatives on this work group should ensure urban and rural participation and be reflective of an inclusive and integrated trauma system to address the needs of the entire state.

Recommendations

- **Assign the revision of the Arizona trauma system plan to a broad-based ad hoc subcommittee of the State Trauma Advisory Board or new multidisciplinary trauma advisory committee including the trauma medical directors, trauma program managers, and representatives from prehospital care, prevention, rehabilitation, disaster, and the public.**
    - **Ensure balanced rural and urban participation.**
    - **Adopt the plan formally through a broad trauma stakeholders group, state multidisciplinary trauma advisory committee, and the Arizona Department of Health Services (ADHS).**
- **Require a regional or statewide needs assessment prior to any new provisional trauma centers that addresses geography, availability and proximity of Level I trauma centers as criteria for designation.**
- Create a strategic or tactical plan to facilitate full implementation of the trauma system plan.
    - Initiate any regulatory and statutory changes immediately to avoid any unnecessary proliferation and commensurate costly duplication of services of high level trauma centers.
- Establish a set schedule and process for the trauma system plan revision.

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)**

Current Status

The BEMSTS has three statutory committees: the State Trauma Advisory Board (STAB), EMS Council, and the Medical Direction Commission. Of the four standing committees, one is the Trauma and EMS Performance Improvement (TEPI) committee. The STAB (by statute) is comprised of 24 members of whom two are trauma center representatives. One trauma representative is a member of the EMS Council. The EMS Council is comprised of 31 members. These two committees meet three times each year. Participants reported that meetings are often held at the same time; and thus, members with appointments on both committees cannot often attend both meetings. Overall, the integration between STAB and the EMS Council does not appear to be very functional. In the past, these committees met more frequently, and also had workgroups that met even more frequently. It was reported by participants that the previous structure was more productive. Statutory committee meetings are staggered to ensure that members are able to attend any meeting they choose. These meetings are accessible electronically via I-Link. Statutory Committee meetings are not limited by funding.

At the regional level, integration between the trauma system and EMS appears to be variable. It is unclear if any integration exists in the Western region. As a result, integration of rural Level III and Level IV trauma centers with either regional EMS services or with the statewide trauma system is minimal. Rural trauma centers are not represented on STAB, and it is unclear if they have been included in the current efforts to revise the trauma system plan. Essentially, two parallel, but dichotomous, trauma systems appear to exist in the state with minimal integration -- the urban trauma system comprised primarily of the Level I centers, and the rural system comprised of the Level III and Level IV trauma centers.

Integration between the trauma system and injury prevention, as well as disaster preparedness, occurs only at the individual facility level. Trauma program managers from several of the Level I trauma centers attend the Injury Prevention Advisory Council (IPAC) meetings; however, injury prevention is not represented on STAB. Although the Office of Injury Prevention (OIP) resides in the BWCH and not BEMSTS, the two bureaus both reside in the ADHS under the same director. Reluctance was expressed by participants to move the OIP into the BEMSTS because BEMSTS is heavily regulated while the BWCH is not. It was also expressed that the OIP and IPAC may be less productive if relocated. The Bureau of Public Health Emergency Preparedness (BPHEP) has coordinated

efforts with individual facilities with regard to disaster and emergency preparedness exercises; however, no formal integration between BPHEP and BEMSTS exists.

The DQA section of the BEMSTS often has interns from the University of Arizona School of Public Health who use state trauma registry data for research efforts. Similarly, public health interns also collaborate with the Level I trauma center at the university.

Recommendations

- **Improve integration efforts between system leadership and Level III and Level IV trauma centers.**
    - **Include Level III and Level IV representation on the State Trauma Advisory Board (STAB).**
- **Optimize the integration of STAB and the EMS Council until the new overarching multidisciplinary committee is constituted (see Statutory Authority section):**
    - **Have more frequent meetings of the statutory committees, and stagger the schedule to allow members with dual or multiple appointments to attend all meetings.**
    - **Leverage electronic resources to further facilitate meeting participation.**
    - **Consider additional ad hoc workgroups to facilitate efforts.**
    - **Increase trauma representation on EMS council.**

- Include an injury prevention representative on the STAB.

- Include a disaster and emergency preparedness representative on the STAB.
    - Focus integration at the system level versus facility level.
- Promote integration between trauma and EMS on the regional committees.
    - Include trauma facilities in future regional needs assessment efforts.

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)**

Current Status

The operations (planning, management and implementation of components of trauma system) are well funded. The BEMSTS is supported by a dedicated account, the Trauma and Emergency Services Fund, which is appropriated from the Emergency Medical Enhancement Fund. The BEMSTS budget from this source is $2.8 million per year, of which $400,000 is allocated to the trauma section. The regions are allocated 8% of this fund (2% per region).

In addition, the BEMSTS has a $250,000 grant from the Arizona Governor's Office of Highway Safety - 408 funds. These funds support the AZ-PIERS. The BEMSTS has strong funding and staffing for the EMS system and the DQA section of the BEMSTS. The funding and staffing resources allocated to the trauma program are limited.

Due to a shortage of revenue, fewer essential advisory committee meetings are supported by BEMSTS. Regular meetings of the STAB have been reduced to three per year. Without administrative support for the advisory committees, their ability to provide input and to build an effective coalition is limited. This negatively impacts the state's ability to develop the trauma system and to integrate the newly designated Level III and Level IV trauma centers.

Arizona enjoys a robust source of funding for designated trauma centers through Proposition 202, providing a dedicated account from Indian gaming monies. This fund is dedicated to support unrecovered readiness costs for trauma centers and hospital emergency departments. Trauma center readiness costs are defined as the difference between costs incurred in providing the service and the amount the hospital has been paid for providing the service. Trauma center readiness costs are defined in statute. The fund is administered through the Arizona Health Care Cost Containment system (AHCCCS), the state Medicaid program. This program is located in the ADHS.

The administrative rules require that 90% of the fund goes to Level I trauma centers, and 10% is distributed to hospital emergency departments. Information from participants revealed that the funds are distributed to Level I trauma centers based upon volume of trauma patients and reported unrecovered costs.

The distribution formula does not provide funding for trauma centers designated below Level I. This creates an adverse incentive for hospitals to participate below Level I designation, and it has resulted in the establishment of a state Level I designation scheme that allows for facilities that might be more appropriately designated at Level II to achieve state designation at Level I.

The BEMSTS is not involved in the administration or oversight of the Proposition 202 fund, and the bureau appears to be uninformed about the formula or methodology for fund distribution beyond the basics identified in rule. It would benefit the state trauma system if the BEMSTS were more involved in identifying a methodology that would support the implementation of the statewide trauma system.

Accountability for how the trauma centers use the Proposition 202 funds is limited or does not exist. The state does not contract with the trauma centers, and no deliverables are required in exchange for these funds. The 2007 ACS TSC report recommended that the funding be tied to deliverables and that the deliverables be tied to the money. Participants reported that they have not been audited for performance or for use of this fund; however, the trauma centers are required to complete a form and provide documentation of costs to the AHCCCS twice a year to receive the funds.

The state was able to acquire federal matching funds using the Trauma and Emergency Fund for a limited (2 year) time frame. This has allowed the state to attract a federal match of approximately $2 federal per $1 state dollar. These funds were distributed through a different formula that directed more of the federal dollars to the emergency departments rather than maintaining the 90% to 10% split in the original state-generated fund. All hospitals with emergency departments, including Level I trauma centers, received enhanced funding through this federal match program.

Although the CDC grant has been beneficial to the ADHS, a stable and predictable funding source should be secured in order to maintain continuity of injury prevention programs and services. At a minimum, funding to maintain the injury epidemiologist is essential. A plan and process to continue seeking grant opportunities for injury prevention activities is appropriate. However, developing a solid infrastructure for the injury prevention program supported by predictable dollars and sustainable financing assures the viability of the program.

Recommendations

- **Revise the distribution method of the Trauma and Emergency Fund to include funding for all designated trauma centers in the trauma system.**
    - **Change the rule for the fund to ensure that all designated trauma centers receive level-appropriate support for the “cost of readiness”.**

    - **Develop a formula for distribution of funds that focuses on specific deliverables by trauma center level rather than volume and acuity.**
    - **Include a mechanism to support trauma rehabilitation services (establish in rule and/or direct Level I trauma centers to use some of their funds to "buy" beds in rehabilitation centers).**
    - **Revisit the allocation method/ formula on a regular basis (e.g., every 3 years)**
- **Distribute funds through a contractual agreement with each trauma center to ensure that each center continuously meets all of the requirements of verification/designation, such as:**
    - **Outreach**
    - **Prevention**
    - **Performance Improvement**
    - **Data submission**
    - **Participation and leadership in regional and statewide systems**
- **Regularly audit or monitor fund distribution and utilization.**
    - **Require hospitals to demonstrate that funds are used to support trauma center readiness and/or outreach as appropriate by designated level (for example Level I trauma centers should be required to do outreach as a criterion to receive funding).**
- Fund an additional position for trauma center designation, re-designation, and trauma center technical assistance.
- Secure permanent funding for an injury epidemiologist.
- Secure a stable funding source that supports a comprehensive injury prevention program (rather than relying on grants).

Trauma System Assurance

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 is 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)**

III. 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 is active within its jurisdiction in the evaluation of community based activities and injury prevention and response programs. **(I-306.2)**

b. 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)**

Current Status

The Office of Injury Prevention (OIP) is located within the BWCH within the ADHS. The injury prevention program is funded through a CDC core capacity grant that is in its fourth year of funding. The Injury Prevention Coordinator position is 1.0 FTE, and the funding and dedicated position have been beneficial for the state's injury prevention efforts. The BWCH is a non-regulatory bureau, and it was reported that this enables the program to implement injury prevention activities more quickly. Since the ACS TSC in 2007, visible progress and expanded collaborative efforts are apparent, but opportunities for improvement still exist.

The Injury Prevention Advisory Committee (IPAC) membership is a multidisciplinary group with representation by various organizations, including the Arizona Hospital and Healthcare Association, Indian Health Services, University of Arizona College of Nursing, Governor's Office of Highway Safety, and three of the trauma centers. Reportedly, all of the Level I trauma centers participate in the IPAC activities, but it is not clear if they are formal committee members. It was

reported that all injury prevention stakeholders are encouraged to attend the IPAC meetings. Participation in the IPAC meetings is voluntary, and everyone is invited to attend. Each participating hospital or organization is responsible for supporting expenses associated with its representative's participation. Even though injury prevention is not a formal requirement for Level III and Level IV trauma center designation, injury prevention activities may still be undertaken by these centers if resources are available. Rural participation from appropriate organizations should continue to be encouraged.

The IPAC has had several joint projects. These joint projects include all-terrain vehicle (ATV) safety, a booster seat project, and the "battle of the belts", a high school seatbelt program. Programs being offered by various state offices as reported in the inventory include, but are not limited to the following: teen driving safety, child healthcare consultation, Child Fatality Review Program, infant and child care seat safety programs, safety fairs, seat belt safety and usage programs, drinking and driving programs, firearm safety, Rural Safe Home Network (a domestic violence program), and sexual violence and prevention programs. Safe Kids Arizona is also based in the BWCH. A traumatic brain and spinal cord injury surveillance program was initiated in1992, but it has been scaled back as of 2005. A Sexual Violence and Prevention Education program and other domestic violence programs exist in the BWCH.

Some potential gaps in program activity reporting, monitoring effectiveness of injury prevention programs, and delivery of prioritized programs based on the 2006-2010 plan seem to exist. The injury prevention and control program inventory provided in the PRQ lists programs offered by the ADHS. Some programs listed are licensing type programs, and provide a high level view or surveillance effort versus a population-based targeted injury prevention program. Many of the programs listed in the inventory do not indicate evaluation of program effectiveness. Some results or outcomes information are dated, e.g., five years old. No consistent monitoring of the programs was apparent from data provided in the PRQ. Current discussion within the OIP and IPAC is occurring about the need to create a comprehensive list of the injury prevention programs that are offered by other organizations and hospitals within Arizona.

Technical assistance for prevention activities is currently provided by the OIP as time and staffing permits. Efforts to augment the technical support and continuing educational process for providers of injury prevention programs should be undertaken. One approach could be to formalize or organize the trauma program managers group in Arizona. This group could prove to be vocal and influential champions for injury prevention initiatives. Examples of technical support and continuing educational support may include activities such as regularly scheduled webinars, face-to-face seminars, and preconference or special education sessions at local or regional trauma conferences. Additional opportunities may include guest expert speakers, presentations on best practices, fundamentals of injury prevention, and prioritizing programs based on data analysis. These

activities could occur in collaboration with the OIP, the BEMSTS, and other organizations throughout the State.

The *2006-2010 Injury Prevention Plan* was created through collaborative efforts of a broad-based group of stakeholders. Numerous databases were used to identify injury prevention priorities. The plan includes goals and objectives. The five key recommendations included: closing the gaps in data collection, implementing evidenced-based interventions, strengthening the infrastructure, providing technical support, and enhancing the knowledge of policy issues. Aspects of these recommendations have been attained. The injury prevention plan is being updated, and the version 2011 draft is completed. The target date for release of the updated plan is January 2013. A multidisciplinary group of injury prevention stakeholders participated in the review and update of this document. The IPAC is encouraged to move this plan through the approval process in a timely manner, distribute the plan to a broadly based group of stakeholders, legislators, the media and the general public.

Some gaps in collaboration, exchange of information, and resource sharing seem to exist. Based on data from the 2006-2010 injury prevention report that identified the top injuries in Arizona, gaps were noted in the types of programs offered to these priority populations, as well as gaps in tracking and reporting. Children's injury prevention programs appear to be the emphasis. Ideally, injury prevention efforts should be distributed and prioritized based on the priority areas of injury identified in the injury prevention plan.

One injury prevention initiative that warrants recognition is the American Automobile Association's (AAA) effort to pass booster seat legislation. The collaboration of multiple organizations and trauma centers plus the plan to provide booster seats to low income families makes it possible to use this project as a best practice model. The strategies used could be a future topic for an educational webinar.

The STAB does not have a designated position for an injury prevention representative. It would be appropriate for a member of the IPAC to be appointed to STAB and to provide routine reports back to the IPAC. This would facilitate better integration of injury prevention into the trauma system. Until such time that the Statute can be changed to include this additional position, adding an IPAC representative as an ad hoc member may help to begin the exchange of information between these programs.

Currently, the BEMSTS has no process for tracking trauma center outreach activities on a systemwide basis. The trauma centers verified by the ACS are required to record and report their outreach activities during their site survey. Obtaining, collating, and developing a report on these outreach activities as a trauma system would provide beneficial information for the trauma community, the constituents, and the public.

Professional outreach activity is present within the State of Arizona. These activities include but are not limited to the provision of courses such as Advanced Trauma Life Support (ATLS), Advanced Trauma Care Nursing (ATCN), Trauma Nurse Core Curriculum (TNCC), Rural Trauma Team Development Course (RTTDC), and disaster courses. Of special note is the rural outreach education that is being delivered by one urban Level I trauma center. A shortage of instructors appears to exist. Augmenting the instructor pool to include emergency medicine physicians, trauma call panel surgeons, trauma program managers, and trauma nurse educators from the Level I trauma centers throughout the state would be an example of a cohesive systemwide trauma outreach program.

Recommendations

- Create a formal position on the State Trauma Advisory Board (STAB) for a representative from the Injury Prevention Advisory Committee (IPAC). Encourage an IPAC representative to participate as an ad hoc member until such time that the statute defining STAB membership can be changed.
- Finalize the *2011 Injury Prevention Plan* and ensure that it is distributed to all stakeholders, community leaders, and legislators.
- Establish a clearinghouse consisting of a comprehensive listing of the injury prevention programs and activities in Arizona.
    - Include resources, links, and available materials.
    - Update annually.
- Monitor the effectiveness of the injury prevention programs offered by state programs.
- Provide technical support regarding all aspects of injury prevention.
    - Educate injury prevention providers to evaluate the effectiveness of injury prevention programs.
- Track and report outreach activities by designated trauma centers commensurate with designation level.
    - Require reporting as one contract deliverable for receipt of Trauma and Emergency Services Fund monies.
    - Incorporate this information in the trauma system annual report.
    - Disseminate the report widely.
- Increase the instructor pool for delivery of team-based trauma training programs, such as the Rural Trauma Team Development Course to rural providers.

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) (White Book).

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, airground 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)**

Current Status

Within the ADHS the BEMSTS has the authority to regulate prehospital care, and four EMS Regional Councils exist. The state has 78 basic life support (BLS) and/or advanced life support (ALS) ground ambulance services, and 18 air ambulance services. Forty-three ALS Base Hospitals provide online medical oversight. Compared to the 2007 ACS TSC, the state now has fewer ground EMS services and ALS base hospitals but an increased number of air ambulance services. The Tribal Reservations and Indian Health Service (which serve a population of more than 400,000 on more than 45,000 square miles) manage their own EMS systems. The Navajo Nation completed an ACS TSC in 2010. Dr. Bentley Bobrow, the current state EMS Medical Director, is employed half time (0.50 FTE) for EMS. He is a board certified emergency physician actively practicing at the Maricopa Medical Center. He has a strong background in EMS. He also currently functions as the State Trauma Medical Director an additional (0.25 FTE). Having a separate State Trauma Medical Director with trauma surgery experience would likely benefit the trauma system.

EMS quality improvement programs are accomplished at the local level with minimal guidance from the BEMSTS. Initial trauma education follows the National Registry for Emergency Medical Technicians (NREMT) guidelines for certification for each provider level. Continuing trauma education is dependent on the guidelines or offerings in the four EMS Regions, the trauma centers, and the individual EMS systems. Pediatric and geriatric trauma continuing education has been sporadic.

Protocols are in place for triage, transport, and patient care, and they were recently updated in June, 2012. No statewide quality improvement activities occur. However, the local administrative medical directors are responsible for assuring quality of care as outlined in EMS rules.

The EMS rules specify physician qualifications and delegation of responsibilities for local administrative medical directors. The EMS rules also outline the

responsibilities for emergency medical technician (EMT) monitoring, evaluation, ongoing education, record keeping, and withdrawal or reinstatement an EMT's administrative medical direction. Administrative medical direction is provided to the individual EMT, not to the prehospital agency. This allows the EMT to practice across the state while maintaining the same administrative medical director.

Online medical direction is generally provided by the ALS Base Hospital or other receiving facility. ARS § 36-2206 does provide civil liability protection coverage for licensed physicians who provide instruction to EMTs at emergency scenes. It was not clear whether that liability coverage for activities as an administrative medical director is provided by the State. The number and identity of the administrative medical directors across the state was not available. No process is in place to evaluate an administrative medical director's performance.

EMTs are required to successfully complete the NREMT written and practical exam for initial certification. Recertification requirements can be met utilizing NREMT recertification or via continuing education requirements specified by the BEMSTS. First Responders must maintain NREMT certification. Most paramedic education programs are nationally accredited; however, the state will likely provide a state accreditation process as an alternative starting in 2013.

Recommendations

- Ensure that the regions specify the appropriate patient destination for each step of the state trauma field triage criteria.
- Hire a state trauma medical director with trauma surgical expertise of at least 0.25 FTE.
- Maintain the state EMS medical director position of at least 0.5 FTE
- Confirm that volunteer administrative EMS medical directors have liability coverage.
- Require review of local EMS quality improvement activities during the agency inspection process.
- Develop a listserv of local and regional administrative EMS medical directors to provide timely delivery of pertinent information and to develop a forum for topic discussion.
- Develop and sustain specific and ongoing prehospital education opportunities for pediatric and geriatric trauma.

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 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)**

Current Status

The system of definitive care facilities within Arizona has seen great change since the ACS TSC in 2007. At that time the state had only 7 designated centers, all recognized by the state as Level I centers. All were located within the heavily populated metropolitan areas of Phoenix, Flagstaff, and Tucson. Since 2007, the state has focused heavily on the development and designation of trauma centers in under-served areas. Now the state has 18 trauma centers in rural areas, most of which are designated at Level IV. This success has certainly improved the availability of high-level trauma care for the rural population. It has expanded the base of the inclusive state trauma system, while at the same time fundamentally altering the balances of power and patient flow within the state.

By intent, the Arizona trauma system is inclusive, with the goal that all acute care facilities will be designated to provide trauma care at an appropriate level, and all will have the responsibility to contribute data to the state trauma registry. The BEMSTS has an established process for the designation of provisional trauma centers, and subsequently for the full designation of trauma centers at Levels I - IV, following the guidelines and process established by the Verification Review Committee of the ACS Committee on Trauma (COT). This structure establishes the necessary framework for maintaining a network of competent facilities staffed by proficient providers. The lead agency has authority both to designate and to de-designate centers. However, beyond the requirement to meet Level-specific standards for ACS-COT verification, the state has no established criteria for designating trauma centers based on geographic location or overall trauma system needs. The enabling statutes have wording that seem to imply that periodic needs assessment for trauma care should be done and that designation of trauma centers could be based upon system needs. However, the BEMSTS clearly feels that it does not have the authority to deny designation to any hospital that meets Level-specific ACS-COT verification criteria.

The development and designation of new trauma centers in underserved rural areas is not controversial. However, the success of this program along with a higher awareness of the benefits of trauma center designation has led hospitals in urban and suburban areas to also seek high level designation. The designation of Level II, III, or IV trauma centers operating within the traditional catchment areas of established Level I trauma centers is viewed as a potential threat to the educational mission and financial viability of the Level I trauma centers. The stakeholders expressed significant differences of opinion regarding the best distribution and utilization of trauma center resources, and legitimate compromises that must be made between the needs of the trauma system and the needs of individual trauma centers within it. The intentional voluntary nature of the trauma system as designed, the lack of a strong trauma plan that outlines the number and level of trauma centers needed within a given region, and the "free enterprise" philosophy of the state have limited efforts to direct the expansion of the trauma system in a controlled fashion.

Arizona is fortunate to have substantial funding for trauma care, much of which comes from Native American gaming income mandated by a voter initiative passed in 2002. This initiative specifically set aside funds to compensate Level I trauma centers for readiness costs, and results in yearly payments ranging up to $500,000 to individual centers. While this fund is certainly of great value, the particular way in which the money is allocated has created several unanticipated side effects that impede trauma system development overall. Since the fund only allocates payments to Level I trauma centers, a clear disincentive for development of Level II or III trauma centers exist. Such facilities have significant readiness costs, but they have no access to supporting funds. As a result, the state has relaxed criteria for Level I designation to protect existing trauma centers, by designating Level I trauma centers that do not meet ACS - COT Level I standards. This largely explains why the state has no current Level II trauma centers and very few Level III trauma centers. The allocation scheme for funds is largely based on volume, a process which heightens competition between existing Level I trauma centers, further impeding system-level cooperation.

The Arizona system is designed to be inclusive, and substantial progress has been made in that direction, especially with the designation of rural Level IV trauma centers and with data collection from a broad group of participating hospitals. However, at a functional level the trauma system operates largely as a loose aggregate of smaller exclusive facilities, centered upon the established urban Level I trauma centers that compete for patient volume. The competing incentives and disincentives, both financial and structural, drive individual facilities to seek designation at a given level, and no established plan or process is used by the state to determine trauma center level and location based upon system need.

To continue progress toward an inclusive and integrated trauma system, the trauma system plan should outline the optimal number and level of trauma centers based upon need. The BEMSTS should develop a transparent process by which such regional needs criteria are used along with facility-specific standards such as those of the ACS - COT to either grant or deny applications for provisional trauma center designation. Such a process is needed to transform the current “free enterprise” trauma system into one in which necessary growth is based on the needs of the population served. The TSC team recommends a moratorium on new trauma center designation until a state-wide assessment of need is performed and a plan has been made regarding the optimal number, level, and location of trauma centers. In addition, the current scheme for funding readiness costs at Level I trauma centers does not seem to provide the most efficient use of these funds for overall trauma system development. To remove artificial barriers to Level II and III designation, and to promote overall system cohesion, the TSC team recommends that this allocation scheme be re-evaluated and reconstructed in a way that provides graduated levels of support to all trauma centers, based primarily upon designation level. Further, these funds should be allocated on a contractual basis associated with specific system-based performance requirements.

The TSC team also believes that the level of financial competition between urban level I centers, especially within the Phoenix area, has the potential to inhibit overall system progress. Significant variance exists among trauma centers with regard to the incoming referral volume and in outreach to rural areas. The TSC team suggests creation of geographic catchment areas for each Level I trauma center, with respect to incoming patient volume, as well as outreach responsibilities. This would serve to balance the patient load and mitigate the adverse effects of competition.

Recommendations

- **Impose a moratorium on additional trauma center designations in Maricopa and Pima counties (assuming a positive response from the Attorney General) to allow for appropriate trauma system plan development.**
- **Establish criteria and standards for designation and de-designation of trauma centers.**
- **Establish geographic catchment areas for individual high-level trauma centers to balance load, minimize temporal maldistribution, and mitigate adverse effects of competition based upon need and performance.**
- Establish level-specific system-based performance requirements tied to trauma center funding.
- Clarify and enforce uniformity of criteria for the designation of trauma centers at each level, particularly to maintain the distinction between Level I and Level II trauma centers.

- Continue to encourage the development of resources, especially Level III centers, in rural regions.
- Establish specific pediatric trauma center designation levels.
    - Ensure that destination standards route pediatric patients to the most appropriate trauma center in the region.

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 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)**

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)**

Current Status

The Arizona trauma system consists of seven adult Level I trauma centers, one pediatric Level I trauma center, three provisional Level III trauma centers, and seventeen Level IV trauma centers distributed among the four EMS regions. Five of the adult Level I trauma centers and the pediatric Level I trauma center are located in the metropolitan Phoenix area within the Central EMS Region.

The statewide guideline for field triage of injured patients is adapted from the current CDC Field Triage Guidelines. The statewide field triage guideline has been adopted by each EMS region with slight variations. Because these are guidelines, and not rules, they are open to local interpretation. Further, these guidelines do not include specific destination criteria which would identify the particular designated facility that should receive transported patients from each region for each step of the triage schema.

Air medical transport is readily available throughout the state. The destination and mode of transport for injured patients from the scene are determined by the local EMS agency. Presumably, air transports from the scene to Level I trauma centers are directed to the closest trauma center; however, no state oversight or monitoring of this process occurs. Similarly, no uniform approach to or oversight of interfacility transports by air occurs.

The movement of the injured patient from Level III and Level IV trauma centers to Level I trauma centers is highly variable and is reliant upon facility to facility contact. It appears that lower level trauma centers often “shop” to see which Level I trauma center will accept the patient first. Pre-existing relationships between professionals and facilities also factor into selection of the facility to which patients are transferred. Although attempts are made to transfer a patient to the facility closest to the patient’s home, it is very possible that a patient is transferred past a closer Level I trauma center to one further away, often secondary to the above-mentioned factors. This lack of a coordinated and directed process for inter-facility transfers contributes to a competitive environment among the Level I trauma centers. The state has no published clinical standards for inter-facility transfer. Although some systemwide review of over-triage and under-triage has occurred, review of individual cases for appropriateness of transfer or lack of transfer appears to be variable at the regional level. Air transport for inter-facility transfer from rural to urban areas is frequently utilized because of a lack of ground transport resources, rather than medical necessity.

The BPHEP developed and monitors the state’s EMSystem, including the HAvBED capability. This system is notified if a facility needs to go on diversion, and facilities update the data on a daily basis. EMS agencies have access to this data for scene calls; however, the data are not available to assist in the coordination of inter-facility transfers. No statewide central communications

center exists that can facilitate both primary triage and secondary triage (inter-facility transfer).

Recommendations

- **Establish regional trauma destination standards and monitor compliance.**
    - **Develop a state framework or template that can be adapted regionally. Talk with other state trauma program managers, e.g. Colorado, to identify potential template models.**
    - **Clearly identify which facilities are appropriate to receive patients identified in each step of the field triage criteria.**
- **Use the statutory authority of the Bureau of EMS and Trauma System to mandate that EMS services comply with accepted field triage destination standards.**
- Develop and disseminate clinical standards for interfacility transfer of injured patients to the appropriate level of care.
    - Monitor compliance as part of the trauma center and systemwide performance improvement processes.
- Expand the existing EMSystem to serve as a resource to identify trauma center capacity and capability, and to optimize resource utilization that expedites interfacility transfer.
- Consider the establishment of ground transport resources in each region to reduce unnecessary, expensive, and dangerous air medical interfacility transports.

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 on 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)**

Current Status

The importance of rehabilitation services within the continuum of trauma care has been recognized, and the development of such services was outlined in the original trauma system plan of 2002-2005. Objectives outlined in the plan included:

- Use national hospital accreditation standards and processes to identify a model for the designation of rehabilitation centers as part of the trauma center network.
- Identify the need for, and distribution of, medical rehabilitation hospitals to meet the need for post-acute trauma medical rehabilitation services.
- Integrate rehabilitation centers into the EMS and Trauma System.
- Ensure that trauma patient flow to rehabilitation facilities is based on patient need and the facility services as well as payer preference.

This rehabilitation plan was reviewed during the ACS TSC in 2007. However, the recommendations regarding rehabilitation in that report have not been addressed. Additionally, the rehabilitation representative on the STAB recently left the position.

Rehabilitation services are appropriately initiated during the acute inpatient stay at the trauma centers, as reported by participants of the 2012 ACS TSC. However, delays in the transfer of patients to rehabilitation facilities were reported, especially for patients with uncompensated care. The state reportedly has approximately 20 rehabilitation centers with almost 800 beds. The majority of these beds exist in urban areas (15 facilities in Maricopa County), and are directly affiliated with acute care hospitals. The state also has eight free-standing rehabilitation centers. However, the state does not have an accurate inventory of the rehabilitation facilities, the number of beds, or the distribution of specialized resources for rehabilitation of traumatic brain injury, spinal cord injury, children, and patients dependent on ventilators. It is unclear if adequate rehabilitation resources exist within the trauma system to meet the needs of injured patients.

It appears that the number of injured patients being transferred from an acute care facility to rehabilitation centers is decreasing, coincidental with the decrease in availability of Arizona Health Care Cost Containment System (AHCCCS) funds. Although it is difficult to draw conclusions without additional data, in 2010, 17% of patients with an ISS > 15 were discharged to a rehabilitation facility, compared to 2011 when less than 9% of all injured patients were discharged to a

rehabilitation facility. No other funding mechanism currently exists to facilitate the rehabilitation continuum of care. As a result, some patients are discharged to home despite the fact that they might have benefitted from inpatient rehabilitation. The potentially negative impact of this is currently impossible to measure because no elements of rehabilitation care are currently being entered into the trauma registry. Thus, no reliable data exist to evaluate timely and appropriate disposition of patients with severe injuries, or functional scoring and outcomes.

Recommendations

- **Identify funding sources to facilitate the timely transfer of patients with uncompensated care to rehabilitation facilities.**
- Ensure the immediate replacement of the rehabilitation representative on the State Trauma Advisory Board (STAB) and the continued representation on the proposed multidisciplinary advisory committee.
- Charge the STAB (or the replacement multidisciplinary advisory committee) to create a task group to facilitate recommendations from the 2007 ACS consultation visit:
    - Develop specific tactics through STAB to achieve the objectives for Rehabilitation Medicine as outlined in the Arizona Trauma System Plan.
    - Integrate patient outcome data from each rehabilitation center with the state trauma registry to benchmark functional outcomes with the acute phase of care.
    - Develop and implement transfer agreements between trauma centers and rehabilitation facilities to ensure appropriate and timely transfer of the trauma patient (to optimize the potential for return to prior level of function).
- Perform a comprehensive system assessment to inventory trauma rehabilitation resources, including availability of specialty beds (traumatic brain injury, spinal cord injury, pediatric, and ventilator dependent) within the state.
- Define rehabilitation data elements to be captured and submitted by trauma centers and rehabilitation centers.
    - Incorporate functional outcomes as part of the systemwide performance improvement process.

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)**

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)**

Current Status

Hazmat First Responder Awareness and Hazmat First Responder Operations courses are available through the Arizona Division of Emergency Management. Arizona has two National Disaster Life Support training centers identified on the NDLS website, one in Phoenix and one in Tucson. The actual availability and participation in the Basic and Advanced Disaster Life Support Courses is unknown.

Much of the disaster preparedness efforts are focused on healthcare facilities. Hazard Vulnerability Assessment is the focus of efforts for the current year of funding from the Office of the Assistant Secretary for Preparedness and Response (ASPR). The BPHEP conducts exercises and prepares after action reports and improvement plans.

It is unclear regarding the extent of cooperation between BPHEP and BEMSTS. BEMSTS did work with BPHEP to develop Alternate Triage, Treatment, and Transport Guidelines for use during a statewide mass casualty event. Disaster table top and field exercises involving some trauma centers and EMS have recently occurred. The extent of the state trauma system and individual trauma center participation and involvement in post-exercise review are unknown. Both the bureaus would benefit from cooperative efforts. The level of participation by EMS with the Local Emergency Planning Committee (LEPC) is unknown.

Recommendations

- Encourage stronger collaboration between the emergency preparedness and the trauma systems, while continuing to support individual hospitals.
- Continue to support and provide prehospital disaster/hazmat training.
- Encourage prehospital and trauma center participation in the Local Emergency Planning Committee (LEPC).

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)**

Current Status

The STAB performance improvement (PI) committee responsible for systemwide trauma PI activity was revised and renamed the Trauma Emergency Medical Services Performance Improvement (TEPI) Standing Committee in 2011 to integrate trauma and EMS PI activities. This committee was established to provide assistance to all three statutory committees – the STAB, EMS Council, and Medical Direction Commission – and to fulfill the responsibilities described in Statute and Rule relating to quality improvement of the State's EMS and trauma system. The DQA Section provides support to the TEPI in its role to develop guidelines, reports, and recommendations to the Statutory Councils.

The Chair and Vice Chair of TEPI are trauma program managers from different trauma centers. The TEPI membership has specific representation from the following groups: an injury researcher, two prehospital EMS coordinators, ground and air ambulance, pediatrics, medical direction commission liaison, EMS medical director, a designated Level IV trauma center, IPAC, a trauma surgeon, rehabilitation, EMS registrar, two trauma program managers, and a Level I trauma center PI coordinator.

By report, progress of TEPI regarding actual trauma system performance improvement initiatives has been slow. Extensive discussions regarding

membership slowed the effort. The TEPI has been reluctant to move forward until the AZ-PIERS EMS data are available. The membership may be augmented as needed over time. Alternate data sources and creative ways of utilizing available data sources should be investigated and operationalized.

The TSC team believes the current management information systems are able to provide adequate and reliable data to support the systemwide PI processes at the local, regional, and state levels. With the support of the DQA Section leading efforts to improve trauma system data quality, the trauma system PI activity should commence immediately.

Some trauma PI reports have been generated and reported to the STAB. However, analysis and follow through with the corresponding PI initiative has not occurred. Currently, no routine audit filters are in use and no routine reporting or case reviews are performed at a regional or state level. A formal list of audit filters does not exist. In summary, minimal systemwide trauma PI is occurring at this time.

No trauma system PI master plan has been developed. The trauma system program manager, in collaboration with the TEPI and other experts within the trauma system, should network with other state trauma programs to compile options for audit filters, standing and ad hoc reports, report formats, tool kits, options for regional case reviews, and PI educational sessions for the stakeholders. A trauma system master plan can serve as a compass for the TEPI, the STAB, and the trauma stakeholders. It will help keep all participants focused on the direction, goals, and objectives of trauma PI for the system. This master plan should be reviewed annually. The actual plan may not need to change significantly on an annual basis. Rather, the appendices for the plan could include the items that change, such as the list of audit filters and the schedule for their reporting.

One example of outreach efforts that support trauma PI is a list of audit filters developed for the Level IV trauma centers by one of the Level I trauma centers. These audit filters include: emergency department (ED) dwell time before transfer, admissions then transfer, data submission completeness, identification of injured patients who should have a trauma team activation, and deaths. It was unclear if these audit filters are actually being monitored. Perhaps the TEPI could develop a list of audit filters specific to the trauma system as well as for the level of trauma center.

The Arizona Trauma and Acute Care Coalition (AZTrACC) has strong desire to do case level trauma PI. When this group was initially formed, trauma PI was one area of focus. However, no peer review protection exists for this group, so AZTrACC will not undertake peer review processes. This is an appropriate decision since the AZTrACC is a physician group, and effective trauma system PI including case review must be multidisciplinary.

Peer review protection for trauma system PI does exist if done under the auspices of the BEMSTS. Participants in the trauma system PI process should be educated about the Statute that provides peer review protection, and how to conduct local and regional system PI sessions in accordance with the protection and privacy laws. This educational activity could be delivered collaboratively by the TEPI leadership, the BEMSTS, and the State Attorney General's Office.

To date, the BEMST has undertaken a few trauma PI projects. These projects consist mainly of reports that focus on areas of concern to the trauma stakeholders. Examples of these trauma PI initiatives are golden hour transport, over- and under-triage, ISS >15 with admission to a non-trauma center with died in ED and died in hospital, ED length of stay with transport to another acute care facility, ED length of stay with transfer to another acute care hospital, falls with age > 65 years with admission to non-trauma and trauma center with outcomes of lived versus died, and mode of transport with a reduction of unnecessary air transports. The DQA Section developed an outcomes report using two statistical methods (Z-statistic and the Barrel Matrix/Survival Risk Ratio). This outcomes report included only the Level I trauma centers. These reports were presented to the STAB. Although this is a good start to one aspect of trauma system PI, additional work is needed to have successful loop closure: report analysis, multidisciplinary case review of the fall outs, and specific corrective actions focused on the root cause.

Recommendations

- **Select the first audit filter from the provided list for review as part of the Trauma and EMS Performance Improvement (TEPI) standing committee's trauma system performance improvement (PI) activities. (See Focus Question 3)**
    - **Schedule a meeting, and then start the review process.**
- **Encourage the trauma system program manager to contact the National Association of State EMS Officials' Trauma Manager Council for sample state trauma system PI plans.**
    - **Use these resources to develop a state trauma system PI plan in collaboration with TEPI.**
- Implement a robust trauma system PI process within the regions and at the state level.
    - Establish specific audit filters, criteria for case review, and other data-driven processes to identify performance issues.
    - Establish and run standing reports for routine review of trauma system performance, locally, regionally, and on a statewide basis.

    - Hold regularly scheduled regional and systemwide performance improvement meetings.
    - Start now!
- Determine systemwide corrective actions based on the PI review findings. For example, implement specific education focused sessions, guidelines, or protocols.
    - Monitor corrective action and document loop closure.

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)**

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)**

Current Status

The Arizona State Trauma Registry (ASTR) is a mature trauma registry. All trauma centers submit data to the ASTR. Level I, II, and III trauma centers enter data into hospital trauma registries and upload those data to the ASTR. Level IV trauma centers enter an abbreviated data set through a web portal. A limited number of non-designated facilities also submit data to the ASTR.

The DQA Section of the BEMSTS is responsible for “coordinating, establishing and administering the Arizona EMS and Trauma System through the collection, analysis, and controlled release of data”. The DQA overseen by Rogelio Martinez currently has the following staff: EMS and trauma data biostatistician, state trauma registry manager, EMS and trauma data manager, and EMS and trauma data epidemiologist.

Data validation occurs at several layers. Error/validation checks occur at the hospital registry level. Additionally, data are validated after being uploaded to the ASTR. Additional “data cleaning” is performed by DQA staff.

A standard data dictionary serves as the basis for orientation and training of new registrars. A beginning effort at determining inter-rater reliability has been undertaken. Standard cases have been redacted and are entered by multiple registrars to identify areas of variation. The process serves, primarily, as a training exercise. Formal statistical calculation of inter-rater reliability has not yet occurred.

A standardized list of routine reports is not yet generated from the ASTR. Reports are generated on at least a biannual basis, however, the focus and content of the reports are not held constant for each reporting period. The ASTR has been used for focused problem solving, e.g. examining the utilization of air medical resources. However, it has not been used to its fullest extent in determining future trauma system configuration needs.

In addition to the ASTR, the BEMSTS and DQA have access to a population-based hospital discharge database (HDD). The HDD includes both emergency department and in-patient admissions. Neither probabilistic nor deterministic data

linkage between the ASTR and HDD have occurred to date, although DQA plans to do so in the future.

The DQA manages the AZ-PIERS. This electronic prehospital record is currently in the deployment and early phase of data collection. It is anticipated that the AZ-PIERS will be fully deployed within the next 12 to 18 months. Data linkage between the ASTR and AZ-PIERS has not yet occurred.

Recommendations

- **Identify and convene a work group consisting of a trauma medical director, trauma program manager, prehospital care providers, and system planners (possibly under Trauma and EMS Performance Improvement [TEPI]) to develop a list of reports that will be essential to develop measurable objectives for the new trauma system plan.**
    - **Include metrics such as distribution of patients, transfer patterns, time to definitive care (field and transfer). See Appendix D.**
- **Assign TEPI with the development of a list of standardized template reports to be run each quarter that will assist in ongoing monitoring of the trauma system performance.**
    - **Run and have TEPI review the same list of reports for at least one full year before adaptation, deletion or substitution.**
    - **Distribute the reports widely to stakeholders and advisory bodies.**
    - Provide DQA staff with direction/vision to better identify trauma system reports that will assist with system planning, development and oversight.
    - Provide DQA staff with trauma system analysis and evaluation training.
- Conduct predictive statistical modeling of changes in distribution of patients, transfer patterns, and times to definitive care (field and transfer) in association with new additional trauma centers.
    - Consider identifying community/urban planners, cartographers, or similar for modeling techniques.
- Continue to work toward the linkage of the Arizona State Trauma Registry, Hospital Discharge data, and the Arizona Prehospital Information and EMS Registry System to better inform trauma system planning, development, monitoring, and evaluation.
- Refine and continue to validate risk-adjusted benchmarking processes.
- Refine, measure, and report inter-rater reliability checks (beyond current training processes).

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 non-designated 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 co-investigators 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. **(I-306.3)**

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. **(I-307.2)**

Current Status

The BEMSTS obtained a 5-year National Institutes of Health grant to study prehospital interventions aimed at decreasing secondary injury in patients with traumatic brain injury (TBI). Institutional Review Board (IRB) IRB approval for this grant was obtained from the University of Arizona IRB. Because the project was deemed to be a public health initiative; it was classified as Health Information

Portability and Accountability Act (HIPAA) exempt. This project provides substantial opportunities to link datasets and measure important interventions. Reportedly, patient care is also changing within the trauma centers because of EMS intervention. Some papers have already been published.

Some investigations of data within the state registry (ASTR) have led to presentations at scientific meetings, but none have yet been published.

Through AZTrACC, all Level I trauma centers are initiating a cooperative venture for multicenter research. Investigators have met to develop a process for IRB approval at each sponsoring institution. The first few projects planned will be retrospective reviews that demonstrate the trauma centers can work well together. After gaining experience, a prospective study will be planned.

Recommendations

- Encourage the Arizona Trauma and Acute Care Consortium (AZTrACC) to consult with American Association for the Surgery of Trauma (AAST) and the Western Trauma Association about potential research questions and for assistance in participating in multicenter trials.

- Develop networking groups that would encourage Trauma Program Managers and Trauma Registrars to ask questions and participate in research projects.

- Investigate long term outcomes of trauma patients.
  - Collaborate with a School of Public Health and the Center for Health Information to link data from AZ Health Care Cost Containment System (AHCCCS) program with the ASTR database.
- Partner with rehabilitation facilities to develop research projects that utilize data tools (e.g., Spider diagrams, Functional Independence Measure (FIM) scores, SF 36) in order to evaluate long-term outcomes.

- Frame research questions that coordinate with performance improvement projects and that assess the impact of the trauma system.

Focus Questions

Focus Question 1:

Changes to the Arizona Trauma Statutes and Rules
Over the past couple of years there have been calls for a number of different changes to the statutes and rules pertaining to our trauma system. Some individuals have called for a mandate that each acute care hospital be designated at some level while others have called for ADHS to limit the number of trauma centers based upon volume and geography. Both sides argue that evidence supports their position.

Question 1A: What evidence-based changes to our trauma system can you make to improve the delivery, efficiency and cost-effectiveness of trauma care to our citizens?

As is inferred within the posed question, there are two fundamental sides to this discussion. Those who would argue for improved access and redundancy through an inclusive and integrated trauma system and those who would argue that dilution of volume by oversaturation of trauma centers results in sub-optimal outcomes. The peer-reviewed literature actually supports both positions although the preponderance of the evidence supports the evolution of inclusive and integrated trauma systems. An inverse relationship exists between the number of Level I and II trauma centers within close proximity and the volume of high acuity trauma seen at each center. The number of such high-acuity cases below which degradation in care is documented is less clear. Evidence does exist that high level trauma centers supported by surrounding lower level trauma centers does not result in under-triage to high level centers, and in fact, the lower level trauma centers serve as a secondary triage point that often catch and refer additional patients to the higher level trauma centers, resulting in less under-triage.

It is the position of the ACS – Committee on Trauma (COT) that inclusive and integrated trauma systems represent the most appropriate model of trauma care. In such a trauma system, all acute care facilities have a role in the treatment of injured patients. However, it does not mean that each acute care facility is allowed to “self-designate” at any level they feel is appropriate. Instead, it suggests that the acute care facility participates in the trauma system at the level that best meets the needs of that system, as determined through formal needs assessment and trauma system planning processes. Such a planning process would ensure that sufficient resources are in place, support the treatment of lower acuity patients closer to their social support networks, and reduce the overall cost of the trauma system by avoiding unnecessary duplication of high level trauma centers and their associated costs.

Question 1B: Do you see a need for specific changes in our statutes and rules? If yes, what are they?

As a long-term objective, the BEMSTS needs the authority to enforce the design of the trauma care system. This could be accomplished through a certificate of necessity process similar to that required for the establishment of new ambulance services. Additional options would be limitations based on the number and level of trauma centers by population, geographic, or temporal distribution.

As a solution to ensuring that critically injured patients are appropriately triaged to the correct trauma center commensurate with their anatomic and physiologic injuries, the BEMSTS should require that each region specifically identify the destination of each patient according to step on the field triage schema and include it as part of the field triage criteria.

Revision of the distribution formula for proposition 202 funds is essential to support the appropriate number, level, and distribution of trauma centers.

A more extensive description of each of these issues is contained in earlier sections of the report.

Recommendations

- **Amend trauma system statutes and rules to:**
    - **Require a demonstration of need as a requirement for any provisional trauma center designation**
    - **Establish standards of care relative to specific trauma destination protocols:**
        - **Establish a state template in rule based on Centers for Disease Control and Prevention (CDC) field triage criteria**
        - **Provide authority to the regions and require them to use the state template by rule to develop detailed destination procedures based on state template.**
- Establish a new overarching statewide multidisciplinary emergency care committee to advise the Arizona Department of Health Services (ADHS).
    - Constitute new committees specializing in Emergency Medical Services, trauma, stroke, ST-Elevation Myocardial Infarction (STEMI), and medical direction to provide guidance to the multidisciplinary overarching committee.
    - Ensure that the main committee and all subcommittees are broadly representative.

- Seek an Attorney General opinion regarding the establishment of a moratorium on additional trauma center designations in Maricopa and Pima counties.
- Revise the rules for the distribution formula of Proposition 202 funds to support statewide trauma system development.

Focus Question 2:

Arizona Focus on Guideline vs Rule

The three statutory committees and four EMS regions have relied upon voluntary guidelines and not mandatory rules for the practice of EMS and trauma in Arizona. We have seen that this can be an effective approach evidenced by our excellent success in improving survival from out-of-hospital cardiac arrest. Recently, changes in the number, location, and level of trauma centers, particularly in the Phoenix metro area, has resulted in calls for ADHS to adopt trauma triage, treatment, and transport RULES governing where EMS may transport trauma patients and which hospitals may receive trauma patients. Statutory and regulatory authority for BEMSTS to adopt clinical care rules does exist, though authority to delegate to the Regions does not.

Question: What recommendations can you make regarding how our statutory committees and regions currently provide clinical direction and oversight in regards to trauma care in our State?

The Arizona trauma system enjoys strong authority to regulate EMS services and providers and to establish standards of care. The rules include the authority to establish protocols for selection of Health Care Institution for Emergency Patient Transport (R-25-504), including to a “special hospital” as defined in R9-10-201 as “licensed to provide services within a specific branch of medicine. It is our opinion that a designated trauma center meets this definition.

It is fortunate that the state has made such progress with voluntary clinical care guidelines. In the situation described with the question, a more active approach appears indicated. Your existing prehospital protocols can include specific destination criteria. Prehospital protocols define the EMS provider scope of practice. By using approved prehospital protocols you can direct the trauma patient to the most appropriate hospital by having each EMS region specify the most appropriate patient destination for each step of the trauma field triage criteria contained in the protocols. This provides clear directions to EMS personnel about which facility in their region is appropriate to receive the trauma patient in their care by simply following the field triage protocol.

Each region should routinely assess and document any over-triage or under-triage and provide feedback to the EMS providers so that field triage destination decisions are continuously improved.

It would also benefit the system to restructure the state trauma advisory board to broadly represent all aspects of the emergency care system (See the Statutory Authority Section). A stronger collaboration between the EMS and trauma providers at both the state advisory committee and regional levels would enable development of systemwide solutions to this and other concerns related to trauma system implementation.

A more long-term solution would be to establish standards of care relative to specific trauma destination protocols in rule. This should include a state template in rule based on the region's adaptation of the CDC field triage criteria and a provision requiring the regions to use the state template to develop detailed destination procedures based on state template. This provides the basis of consistency across the state with the flexibility to adapt locally.

Recommendations

- Consider the establishment of standards of care for trauma destination protocols in rule with a state template of required elements along with flexibility for the regions to develop region-specific detailed destination procedures.
- Have each EMS region specify the most appropriate destinations for trauma patients for each step of the trauma field triage protocol.

Focus Question 3:

Since the Data and Quality Assurance Team was organized within BEMSTS we have been able to utilize the high quality data within ASTR and other ADHS databases to report on system performance issues as well as center performance issues. Over the next 18 months this capability will be augmented as the EMS registry comes on line.

Question: What specific process and outcome metrics would you recommend to best measure the effectiveness of our state trauma system?

A starting point for trauma system PI could be at the regional level. Based on pre-defined audit filters, cases could be selected for review such as deaths with action items and defined parameters for review. Each region could start a PI process within the near future using resources and data that are currently available. One component of PI that could be implemented immediately is regional grand rounds. This educational session could potentially consist of case reviews that are applicable to the chosen theme for the grand rounds, e.g., inter-facility transfer cases with identified opportunities for improvement. Cases would need to be blinded then presented for educational purposes. Following this, and based on the opportunities for improvement identified during the review/presentation and group discussions, progress toward corrective actions could be initiated.

The TEPI and the DQA could provide support and guidance to the regions by identifying opportunities for improvement and suggesting special topics for grand rounds, based on their reviews of the available data sources. This should occur with trauma leadership in each of the regions. If additional data are required to augment the PI review process, the local and regional participating facilities / agencies should support the review by providing the needed information to complete the reviews.

Networking with other states to ascertain various options for implementing and maintaining system PI should be undertaken. Obtaining state system PI master plans, lists of indicators/audit filters, and processes for reviewing complications of care should be obtained, sorted, prioritized, and customized for adoption at the regional level in Arizona.

Over time, the PI processes will need to move from the basic level to a more mature level. Specifically, once the data sources are refined, and some of the basic issues have been corrected, refinement of audit filters and review processes can be adjusted accordingly. The audit filters will become more advanced. Additionally, new issues will present themselves, and therefore, trauma system stakeholders must adapt the PI processes accordingly.

Trauma centers should also participate in nationally recognized risk-adjusted benchmarking programs. TEPI should investigate the possibilities of risk adjusted benchmarking on a systemwide basis.
Many potential audit filters should be considered for trauma system PI. *Some audit filters will require additional data elements and additional review.* Examples of audit filters to consider include the following:

- Deaths with fallouts (for example, a death that was deemed "anticipated mortality with opportunity for improvement" and "unanticipated mortality with opportunity for improvement"). Include in each case review:
    - Timing and sequencing of clinical care, injuries, consultants, procedures, operations, ICU length of stay, hospital length of stay, corrective actions at the facility level.

- Interfacility transfers: (ED to ED)
    - Name of sending facility, time of patient arrival, time to transfer decision, time to acceptance of transfer, time of departure, mode of transport, time of arrival at definitive care facility, name of definitive care facility, patient's health plan.

- Interfacility transfers: (inpatient to inpatient)
    - Date and time of arrival, admitting service, date and time of departure, mode of transport, date and time of arrival at definitive care facility, admitting service, reason for transfer, complications, and length of stay at receiving facility.

- Multiple facility transfers:
    - Date and time of arrival, admitting service, date and time of departure, mode of transport, date and time of arrival at definitive care facility, admitting service, reason for transfer, complications, and length of stay at receiving facility.

- Scene location / incident location and receiving facility:
    - Adherence to prehospital trauma triage guidelines
    - Transport times

- Over- and under-triage

- Adherence to the new (yet to be revised) regionalized prehospital trauma triage guidelines.

Recommendations

- Encourage each region to select at least one of the above indicators and ensure that data are provided to support the performance review process.

    - Have the region monitor the data indicators for at least a year to identify trends and responses to corrective actions.

- Have the state trauma program manager communicate with the National Association of State EMS Officials Trauma Managers Council to gather ideas for trauma system performance improvement indicators using EMS and trauma linked databases.

Focus Question 4

Rehabilitation Participation in the Trauma System
The STAB has had consistent representation from members of the rehabilitation community who have advocated for greater participation in the trauma system.

Question: What recommendations can you make to enhance the participation, evaluation, and performance improvement of the rehabilitation community as a component of our system?

To date, no significant progress has been made with regard to the recommendations made by the ACS TSC team in 2007. Additionally, the STAB rehabilitation representative has recently resigned. The rehabilitation position on STAB should be filled with a provider from a rehabilitation center that has demonstrated expertise in the care of injured patients. The STAB needs to make a commitment to address the rehabilitation component during the development of the trauma system plan. A special task group could be appointed to help develop the initial objectives for rehabilitation in the trauma system plan.

Once the trauma system plan has been developed and approved, it would be appropriate to have STAB appoint a multidisciplinary task group with members from rehabilitation centers, trauma centers, and DQA staff from the BEMSTS. It should convene on a regular basis to:

- Perform a comprehensive system assessment to inventory trauma rehabilitation resources, including availability and distribution of specialty beds (traumatic brain injury [TBI], spinal cord injury [SCI], pediatric, and ventilator dependent) within the state.
- Define rehabilitation data elements to be captured and submitted by trauma centers and rehabilitation centers.
    - Incorporate functional outcomes as part of the systemwide PI process.

Incorporating rehabilitation elements into the trauma registry and having rehabilitation centers participate in data collection and submission will facilitate effective PI efforts, and it will also foster the inclusivity of rehabilitation within the trauma system.

The current trauma system does not always allow for optimal rehabilitation care of injured patients, for example, patients receiving uncompensated care often cannot obtain inpatient rehabilitation services. These patients may either be discharged home prematurely or unnecessarily remain in acute care facilities. These patients should be reviewed by TEPI to identify the extent of the issue. Once the extent of the problem is identified, funding sources may need to be identified within the trauma system to address this issue.

The utilization of Proposition 202 funds to the Level I trauma centers could be reviewed, and consideration should be given to focusing some of those funds towards rehabilitation care, especially since many of the injured patients who would benefit from rehabilitation services are cared for at Level I trauma centers. These trauma centers need to maintain efficient patient flow. Discharge at the "back end" of acute care improves access to the "front end" of acute trauma services. Some trauma centers are already negotiating "charity" beds with the rehabilitation centers. Developing long-standing transfer agreements or actually purchasing some rehabilitation beds should be considered by the Level I trauma centers. If Proposition 202 funds are used to ensure specialty care such as neurosurgery and cardiac surgery, it seems appropriate that the funds could also be used to support rehabilitation. Allocating funding for rehabilitation services will also foster inclusivity within the trauma system, and optimize care for injured patients throughout the continuum of care.

Recommendations

- Establish effective leadership in the State Trauma Advisory Board (STAB) by filling the statutory rehabilitation position.
- Ensure that rehabilitation is addressed in the revised trauma system plan.
- Appoint a rehabilitation task group of the STAB to develop and address the rehabilitation objectives in the trauma system plan.
- Identify the number of patients who do not receive optimal rehabilitation and reasons it is not provided.
- Consider the use of Proposition 202 funding to help fund rehabilitation services for patients without healthcare coverage.

Appendix A: Methodology

The Arizona Department of Health Services (ADHS) requested this trauma system consultation, which was conducted under the auspices of the American College of Surgeons (ACS), Trauma System Consultation (TSC) program. The multi-disciplinary Site Visit Team (SVT) consisted of: three trauma/general surgeons, one emergency physician, a state EMS/trauma director, a trauma program manager, a rural trauma and prehospital specialist, and a public health and injury specialist. Biographical sketches for team members are included as Appendix B of this report.

The primary objective of this ACS trauma system consultation is to guide and help promote a sustainable effort in the graduated development of an inclusive and integrated system of trauma care for the State of Arizona. The format of this report correlates with the public health framework of assessment, policy development, and assurance outlined in the ACS *Regional Trauma Systems Optimal Elements, Integration, and Assessment: System Consultation Guide*. Prior to the visit, the SVT reviewed the ACS Pre-Review Questionnaire (PRQ) submitted by the ADHS. The SVT also reviewed the 2007 Arizona Trauma System Consultation report, a number of related supporting documents provided by the ADHS, and information available on government websites.

The SVT convened in Phoenix, AZ on November 26 – 29, 2012, to review the Arizona trauma system. The meetings during the four-day visit consisted of plenary sessions during which the SVT engaged in interactive dialogue with a broad range of representative trauma system participants. There was also an opportunity for informal discussion with the participants and time devoted to questions and answers. During the survey, the SVT also met in sequestered sessions for more detailed reviews and discussion, and for the purpose of developing a team consensus on the various issues, preparing a report of their findings, and developing recommendations for future development of the trauma system in the Arizona. This report was developed independently of any other trauma system consultations or assessments.

Appendix B: Review Team Biographical Sketches

ROBERT J. WINCHELL, MD, FACS- TEAM LEADER

Dr. Robert Winchell is currently head of the Division of Trauma and Burn Surgery at the Maine Medical Center and Associate Professor of Surgery at the Tufts University School of Medicine. He received his undergraduate degree from the California Institute of Technology, his M.D. from Yale University, and did his internship, General Surgery residency, and Trauma and Critical Care Fellowship at the University of California, San Diego, where he remained on the faculty as Associate Professor of Clinical Surgery in the Division of Trauma through 1999. After leaving the University of California, Dr. Winchell established and subsequently directed the Tacoma Trauma Center in Tacoma, Washington. The trauma center continues to operate successfully as a joint venture between two previously competing hospitals. In 2001, Dr. Winchell moved to the Maine Medical Center and assumed his current post in 2004.

Dr. Winchell has been involved in trauma center and trauma system design and operation in a wide variety of settings covering the spectrum of system development. He was instrumentally involved with both the day-to-day operations and ongoing development of the San Diego County trauma system for over ten years and served as chair of the San Diego and Imperial County Committee on Trauma. He participated in the operation and ongoing development of the Washington state trauma system, serving on the state advisory board, and as chair of the Southwest EMS region. Since moving to Maine, Dr. Winchell has worked to develop the Maine state system, is a member of the state advisory board, and is a past chairman of the Maine State Committee on Trauma. He is Chair of the Trauma Systems Evaluation and Planning Committee of the American College of Surgeons and also serves as a senior site reviewer for the trauma center verification program of the College.

Dr. Winchell is Board certified in General Surgery, with added qualifications in Surgical Critical Care. Dr. Winchell is a Fellow of the American College of Surgeons as well as a member of the American Association for the Surgery of Trauma, the Association for Academic Surgery, the Southwest Surgical Congress, and the Society of Critical Care Medicine. He is author of more than 50 scientific papers and book chapters, and has given over 100 regional, national, and international presentations.

CHRISTOPHER C. BAKER, MD, FACS

Born in Boston and raised in New Hampshire, Dr. Baker trained as a general surgery resident from 1974 to 1981 at the University of California in San Francisco. From 1977 to 1979, he pursued an NIH research Fellowship in immunology at San Francisco General Hospital. In 1981, Dr. Baker returned to the East Coast where he became an Assistant Professor of Surgery at the Yale School of Medicine in New haven, CT. He ran the Level I trauma center there and advanced to Associate Professor in 1986.

In 1989, Dr. Baker moved to Chapel Hill, NC as Professor of Surgery at UNC School of Medicine. He was awarded the Teacher of the Year (1990 – 1991) in the UNC Department of Surgery and in 1992 gave the Convocation address as the Whitehead Lecturer. In 2001 – 2002, Dr. Baker was awarded the Anthony A. Meyer Mentor Award.

Dr. Baker returned to Boston in 2004 to join the Harvard Medical School faculty as Professor of Surgery at Beth Israel Deaconess Medical Center. He was Program Director for the Surgery Residency from 2005 -2007. While at Harvard, Dr. Baker received several awards, including the Harold Bengloff Award for Humanism in Education and the George W.B. Starkey Award for Excellence in Teaching. In December, 2007, Dr. Baker assumed the Chair of Surgery at LSU in New Orleans before coming to Roanoke in November of 2010. Currently, Dr. Baker serves as Chairman in the Department of Surgery at the Carilion Clinic and Professor of Surgery at the VTC School of Medicine.

Throughout the years, Dr. Baker has served on many editorial boards, such as *Journal of Trauma* and the *Journal of Surgical Research.* He has served many professional societies including being Chairman of the ACS committee on Trauma for Connecticut from 1986 – 1989. He served the Society of University Surgeons as Secretary (1988 – 1991) and President (1992 – 1993). He was on the Executive Committee of the National Committee on Trauma, (ACS 1993 - 1996) and President of the Society of Clinical Surgery from 2000 – 2002. During his short time at LSU, Dr. Baker has served as Secretary for the Cohn-Rives Society and on the Executive Council for the Surgical Association of Louisiana. He was also appointed to the State LERN Board in 2008 by Governor Jindal.

Dr. Baker has published over 100 refereed publications, contributed to 20 textbooks, presented over 140 invited presentations and has had over 130 papers presented at scientific meetings. On a more personal note, Dr. Baker holds a Third Degree Black Belt from the American Taekwondo Association, received in 1998. He and his wife, Lynne, have four children.

Dr. Baker's research interests include the immunology of trauma and sepsis, epidemiology of trauma, and trauma systems.

JANE W. BALL, RN, DRPH

Dr. Jane W. Ball served as the Director of the National Resource Center (NRC) at the Children's National Medical Center in Washington, D.C. from 1991 through 2006. The NRC provided support to two Federal Programs in the U. S. Department of Health and Human Services' Health Services and Resources Administration (HRSA): the Emergency Medical Services for Children (EMSC) Program and the Trauma-Emergency Medical Services Systems Program. As director of the NRC, she coordinated the support provided to the Federal Program Directors as well as the provision of technical assistance to state grantees. Support to the Federal Program Directors often included meeting facilitation, preparation of special reports (such as the Model Trauma Systems Evaluation and Planning document), and consultation on Program issues. Technical assistance often included strategic planning, providing guidance in securing funding, developing and implementing grants, developing injury prevention plans and programs, building coalitions, shaping public policy, conducting training, and producing educational resource materials.

Dr. Ball has authored numerous articles and publications as well as several health care textbooks, including *Mosby's Guide to Physical Examination* (7 editions), *Child Health Nursing* (2 editions), *Pediatric Nursing: Caring for Children* (5 editions), *Maternal and Child Nursing Care* (3 editions), and *Pediatric Emergencies: A Manual for Prehospital Care Providers* (2 editions). One of these texts, Pediatric Nursing: Caring for Children, received the1999 and 2001 Robert Wood Johnson Foundation Last Acts Coalition Outstanding Specialty Book Award. *Child Health Nursing* was recognized as an American Journal of Nursing Book of the Year in 2010. As an expert in the emergency care of children, Dr. Ball has frequently been invited to join committees and professional groups that address the unique needs of children.

Dr. Ball served as the President of the National Academies of Practice, an organization composed of distinguished health care practitioners from 10 disciplines that promote education, research, and public policy related to improving the quality of health care for all through interdisciplinary care.

Dr. Ball graduated from the Johns Hopkins Hospital School of Nursing. She obtained her master's degree and doctorate in Public Health from John Hopkins University School of Hygiene and Public Health. She is a Certified Pediatric Nurse Practitioner. She received the Distinguished Alumni Award from the Johns Hopkins University in 2010.

RAJAN GUPTA, MD, FACS, FCCP

Dr. Rajan Gupta is an Associate Professor of Surgery at Dartmouth Medical School and Chief of the Division of Trauma and Acute Surgical Care at Dartmouth Hitchcock Medical Center. He earned his medical degree at Boston

University, and did his general surgical residency at Dartmouth Hitchcock Medical Center. He subsequently did a fellowship in traumatology and surgical critical care at the Hospital of the University of Pennsylvania. He is board certified in Surgery with added qualifications in Surgical Critical Care.

Dr. Gupta is the State Chair for NH for the American College of Surgeons Committee on Trauma, and serves on the Rural Trauma Committee as well as the Trauma Systems Evaluation and Planning Committee for this organization. He is also Chair of the Rural Trauma Committee of the Eastern Association for the Surgery of Trauma. Additionally, he is a member of the NH Trauma Medical Review Committee, and was actively involved with a recent revision of the NH State Trauma System Plan.

Dr. Gupta has presented at national as well as international forums on various topics in traumatology, and has authored numerous manuscripts and chapters on trauma, critical care, and acute care surgery.

HEIDI HOTZ, RN

Heidi Hotz is the Trauma Program Manager at Cedars-Sinai Medical Center, a Department of Health designated and ACS verified Level I trauma center. She is the President of the American Trauma Society (ATS), Past President of the Society of Trauma Nurses (STN), and Past President of the Trauma Managers Association of California (TMAC). She has extensive experience in all aspects of trauma including clinical care, program management, trauma data, trauma performance improvement and patient safety, trauma systems, injury prevention, consultant for trauma centers and systems, educational curriculum development, conference and event planning and all trauma related issues across the continuum of care.

Heidi is the recipient of the STN's Trauma Leadership Award. She is a member of the Trauma Quality Improvement Program (TQIP) Training Project Team of the American College of Surgeons (ACS). She has been a survey team member for the ACS Trauma Systems and Evaluation Program. She has been an invited expert panel member for many national trauma initiatives and projects such as the ATS Leadership Forums, the screening & brief intervention for alcohol in trauma initiatives, the Model Trauma System Plan work group, to name a few. She has lectured on a wide variety of trauma related topics throughout the United States and internationally. She has extensive participation at the member and Chair levels for local, regional, state and national committees. She was the Chair of the Advanced Trauma Care for Nurses® (ATCN) Committee in Arizona for 6 years. She was then appointed the first Chair of the STN's ATCN National-International Committee and spearheaded the special projects team to attain the ACS COT approval of the program as a collaborative effort with the ATLS Subcommittee. She was a member of the STN Board of Directors for over 8 years in the positions of Director at Large, Treasurer, President Elect and

President. She is an author and Faculty Member for the STN's Trauma Outcomes Performance Improvement Course (TOPIC).

JANET KASTL, MA

Janet Kastl is the Director of the Washington State Office of Community Health Systems. The office encompasses Emergency Medical Services & Trauma Systems, Injury and Violence Prevention, Community and Rural Health, and Health Systems Analysis.

Janet directed the Office of EMS and Trauma since passage of the Washington State Trauma Care Act in 1990. She began her career as a Health Planner and became a Regional EMS Administrator when the state's EMS system was in its infancy. An early advocate of addressing trauma care through a systems approach, she played a strong role in the development and successful implementation of a statewide EMS and Trauma System in Washington.

NELS D. SANDDAL, PHD, MS, REMT-B

Dr. Sanddal is currently the Manager of the American College of Surgeons (ACS) Trauma Systems and Verification Programs. Prior to his current position, he served as President of the Critical Illness and Trauma Foundation (CIT), in Bozeman, Montana for 25 years. He worked as the training coordinator for the EMS and Injury Prevention Section of the Montana Department of Public Health and Human Services in the late 1970's. He has served as the Chairperson of the National Council of State EMS Training Coordinators and as the lead staff member for that organization, and similarly for the National Association of EMT.

Dr. Sanddal completed his undergraduate work at Carroll College, received his Master's degree in psychology from Montana State University and his doctorate in Health Science from Walden University. He has been a co-investigator for six state or regional rural preventable trauma mortality studies and has conducted research in the areas of training for medical personnel, suicide, and rural injury prevention and control. Nels served on the Institute of Medicine's Committee on the Future of Emergency Care in the U.S. Healthcare System.

He received his EMT training in Boulder, Montana, in 1973 and has been an active EMT with numerous volunteer ambulance services since that time and has managed three EMS agencies. When he is at his home in Montana, Nels responds with the Gallatin River Ranch Volunteer Fire Department where he serves as the Chief Medical Officer and Assistant Fire Chief.

JIM UPCHURCH, MD, MA, REMTP

Dr. Upchurch began his medical career in 1971 as a Special Forces Medic courtesy of the US Army. He graduated from the University of Texas Medical

Branch at Galveston in 1982 and completed a Family Practice residency from the University of Oklahoma in 1985. Since 1985, he has served as an Indian Health Service (IHS) Physician on the Crow Indian Reservation in Montana. The majority of his clinical practice involves emergency medicine (EM), Emergency Medical Services (EMS), surgery and obstetrics. He maintains current National Registry certification and state licensure as a paramedic. In 2003, he completed a Masters Degree in educational technology from George Washington University.

Dr. Upchurch is a long-standing member of the National Association of EMS Physicians and the American College of Emergency Physicians. Since 1986, he has functioned as EMS medical director for Big Horn County in Montana and guided their basic care program to the advanced life support level, including critical care interfacility transport. He also provides EMS medical direction for Big Horn Canyon National Park and the Incident Medical Specialist Program and Missoula Smoke Jumpers, US Forest Service, Region I.

Dr. Upchurch is director of a small non-profit organization, EMS Education & Training. They offer distance and face-to-face educational opportunities to rural and frontier EMS personnel in Montana who desire to advance their level of care. He is an active ACLS, ACLS EP, ATLS, PALS and PHTLS instructor.

Dr. Upchurch served many years as the volunteer state EMS medical director for Montana and represented Montana on the National Council of State EMS Medical Directors of the National Association of State EMS Officials. He functions at the IHS national level as a consultant on EM and EMS issues. He is a member of the Montana Board of Medical Examiners who license physicians and EMTs.

Appendix C: Acronyms

AAA – American Automobile Association
AAST – American Association for the Surgery of Trauma
ACS COT – American College of Surgeons Committee on Trauma
ADHS – Arizona Department of Health Services
AHCCCS – Arizona Health Care Cost Containment System
ALS – advanced life support
ARS – Arizona Revised Statute
ASPR – Assistant Secretary for Preparedness and Response
ASTR – Arizona State Trauma Registry
ATCN – Advanced Trauma Care Nursing
ATLS – Advanced Trauma Life Support
AZ-PIERS – Arizona Prehospital Information and EMS Registry System
AZTrACC – Arizona Trauma and Acute Care Coalition

BEMSTS – Bureau of Emergency Medical Services and Trauma System
BIS – Benchmarks, Indicators, and Scoring
BLS – basic life support
BPHEP – Bureau of Public Health Emergency Preparedness
BWCH – Bureau of Women's and Children's Health

CDC – Centers for Disease Control and Prevention
CODES - Crash Outcome Data Evaluation System
CON – certification of need
COT – Committee on Trauma

DQA – Data and Quality Assurance Section

ED – emergency department
EMS – Emergency Medical Services
EMSC – Emergency Medical Services for Children
EMT – emergency medical technician

FIM – Functional Independence Measure
FTE – full time equivalent

IPAC – Injury Prevention Advisory Committee

HDD – hospital discharge database
HIPAA – Health Information Portability and Accountability Act
HRSA – Health Resources and Services Administration

LEPC – Local Emergency Planning Committee

MDC – Medical Directors Commission
MTSPE – Model Trauma Services Planning and Evaluation

NREMT – National Registry for Emergency Medical Technicians

OIP – Office of Injury Prevention

PI – performance improvement
PIERS – Prehospital Information and EMS Registry System
PRQ – Pre-Review Questionnaire

RTTDC – Rural Trauma Team Development Course

SBIRT – Screening, Brief Intervention, and Referral to Treatment
STAB – State Trauma Advisory Board
STEMI – ST Elevation Myocardial Infarction
SVT – site visit team

TBI – traumatic brain injury
TEPI – Trauma and EMS Performance Improvement Standing Committee
TNCC – Trauma Nurse Core Curriculum
TSC – Trauma System Consultation

Appendix D: Tables

Tables Generated using the Available Trauma Registry

- Injury and demographic characteristics of patients transported to a Level-1 Trauma Center (via EMS) and discharged from the ED (or in less than 24 hours).

- Characteristics of patients who are over-triaged to a Level-1 Trauma Center based upon an ISS less than 16.

- Transport characteristics (e.g., transport time) of patients arriving (via EMS) hypotensive or hypoxic, based upon presenting ED vital signs.

- Elapsed time in local hospital before inter-hospital transfer to Level-1 Trauma Center stratified by hospital (blinded if necessary).

- Injury Zip Code for patients with transport times (from scene to Level-1 arrival) greater than 30 minutes.

- Average “on-scene” time for patients transported by EMS with an ISS greater than 15 stratified by injury type and/or EMS service (blinded if necessary).

- Injury and patient characteristics for patients dying in a Level-1 Trauma Center stratified by mode of EMS arrival (inter-facility transfer vs. direct transport) and transport time.

- Injury characteristics of patients admitted to local hospitals, not transferred to a Level-1 Center in less then 10 hours.

- Outcome (and hospital LOS) for patients admitted to a Level-I Trauma Center but injured in rural vs. urban Zip Codes.

- Comparison of documented field triage criteria by ISS and outcome for patients transported from the field to a Level-I Trauma Center.

Tables Generated using Hospital Discharge Data (e.g., UB-04)

- Injury and geographic characteristics (e.g., Zip Code or county) of patients discharged (alive or dead) from non-trauma centers with ISS > 16.

- Comparison of over-triage (ISS < 16 and transport to a Level-I Trauma Center) and under-triage triage (ISS > 16 and discharged from a non-designated hospital).

- ICD-9-CM codes resulting in injury death in non-designated hospitals stratified by patient age.

Table to Validate the Completeness of the Trauma Registry Dataset

- Comparison of the number of patients contained in the trauma registry with patients contained in the hospital discharge data meeting trauma registry inclusion criteria. This database comparison will estimate how many patients fulfilling registry inclusion criteria are not include statewide registry by Level-I Trauma Center.

Appendix E: Participant List

Noreen Adlin
Joanna Allhands
Michael Allison
Tish Arwine
Bill Ashland
Bentley Bobrow
Leilana Badonie
Harry Beck
Darren Bock
Vicki Bennett
Bentley Bobrow
Gail Bradley
Bozena Branicz
Joel Bunis
Mary Cameli
Vatsal Chikani
Michelle Chung
Paul Dabrowski
Jacqueline DeBeche
Corey Detlefs
Carol Devendorff
Daniel Didier
Kevin Driesen
Jeff Farkas
Laura Flores
Randall Scott Friese
Pam Goslar
Michelle Guadnola
David Harden
Rebecca Haro
Melissa Harte
Jennifer Herbert
Don Herrington
Joyce Hospodar
Anthony Huma
Will Humble
Philip Johnson
Shannon Johnson
Steven Johnson
Debbie Johnston
Ralph Zane Kelley
Christina Kwasnica
Chasmaine Leoni
Dana Levy
Alicia Mangram
Tony Marinello
Maria Martinez
Rogellio Martinez
Donna Meyer
Frank Mitchell
Sungwoo Moon
Terry Mullins
Tracie Newman
Susan Nicolas
Pamela Noland
David Notrica
Brian O'Leary
Laura Oxley
Wade Patten
Hollee Penrod-Simpson
Scott Petersen
Michael Pfleger
Dawn Polkabla
Jim Prohaska
Michelle Pabis
Kevin Ray
Anita Ray Ng
Rod Reed
Peter Rhee
Anthony Rhorer
Dave Ridings
Claudia Romo
Roy Ryals
Jeffrey Salomone
Chris Salvino
Kim Savage
Tracey Schlosser
Gary Smith
Tomi St. Mars
Ronni Stedman
Tiffiny Strever
Michael Thooft
Karin Toci
Mark Venuti
Anne Vossbrink
Frank Walter
Lori Wass
Laurie Wood
Dale Woolridge
Linda Worthy
Ithan Yanofsky
Betty Yunick
Michelle Ziemba