



**Trauma System Consultation
State of Arkansas
Little Rock, AR**

June 5th – 8th, 2011

**American College of Surgeons
Committee on Trauma**

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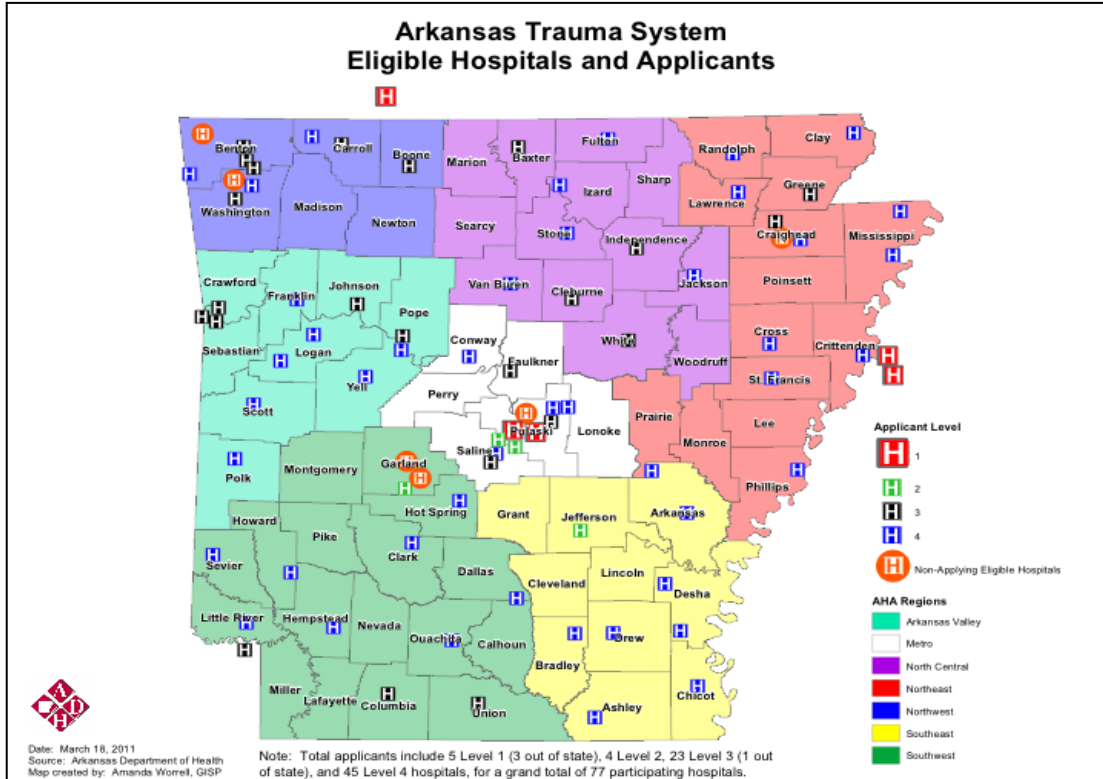
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Executive Summary

Arkansas, known as the Natural State has approximately 53,000 square miles, making it 29th in geographic size. The state's population is 2.9 million, ranking Arkansas at 32nd in size by population. Approximately 20% of the population lives in rural areas.

Arkansas' state motto is "Regnat Populus," or the people rule. The state bird is the mocking bird, and the state flower is the apple blossom. Arkansas is the only diamond producing state in the United States.

Arkansas has organized its trauma system into seven regions. The state has 82 acute care facilities, and 77 of these hospitals have signed letters of commitment to become part of the voluntary trauma system. Twenty-nine of the acute care facilities are federally recognized as critical access hospitals. As of the date of the American College of Surgeons trauma system consultative visit, 18 trauma centers have been verified, including 3 level I, 3 level II, 2 level III and 9 level IV — this includes one level I pediatric trauma center. The map below identifies the trauma system boundaries and the distribution of hospitals that have either been designated or have signed letters of intent to become designated. Note that the map includes facilities in surrounding states that have been designated by the Arkansas trauma system.



Significant characteristics of the state, injury, and health care system as they relate to the trauma system include the following:

- Legislation and funding support has recently been passed in 2009.
- Tremendous progress has been made in a short period of time.
- Acute care facilities have demonstrated strong voluntary participation.
- The primary mechanism of injury in the state is blunt trauma outside of the major urban center.
- The emergency medical services and disaster planning services have had limited integration with the trauma system.
- The availability of a centralized call center to facilitate inter-facility transfers and to direct patient destination is functioning well given its relative newness.
- The infrastructure for a statewide trauma registry is in place.
- Processes for system evaluation, performance improvement, and research are in the planning phases.
- Strong commitment has been demonstrated from the legislative, administrative, and executive branches of government.

Enabling legislation has existed since 1993; however, it wasn't until the passage of trauma system act and the dedicated funding stream from tobacco tax revenue in 2009 that the system has blossomed. Since that time rapid, but focused, activity has led to the designation of several trauma centers, the distribution of significant resources to support facility participation, the establishment of the regional trauma advisory council infrastructure, and the establishment of the Arkansas Trauma Call Center (ATCC). The amount of progress that has been made in a little over a year operations is truly remarkable.

Advantages and Assets

- History of strong commitment to the trauma system from the government, institutions, and people has been demonstrated.
- The current system has strong trauma medical leadership.
- The state's vision is a comprehensive and inclusive trauma system.
- Energy, governmental, and public support have resulted in rapid progress in system development.
- Stable funding has been provided for system development.
- The state infrastructure is well staffed.
- The infrastructure is working within a public health framework with mechanisms for trauma data collection and reporting.
- The integration of the injury prevention infrastructure will further support the public health approach to injury control.
- The ATCC is a valuable asset to get injured patients moved quickly to the most appropriate facility.

- The state has the resources and plans for remote communication and education.
- The state has reasonable geographic distribution of trauma centers.
- Legal protection is strong for data confidentiality and performance improvement activities.

Challenges and Vulnerabilities

- Arkansas's trauma system is new and development is incomplete.
- Because of the system's newness, personnel have limited operational experience.
- Rules and regulations out-of-step with the developing trauma system.
- The state has limited coverage of some specialties.
- Anticipated staffing challenges exist in surgery and emergency medicine.
- A lack of local expertise currently exists to fill all regional leadership needs.
- Most stakeholders lack a broad familiarity with the trauma system concept and operations beyond system leadership.
- A potential imbalance exists in hospital designation levels.
- Potential difficulties are likely to arise with the coordination of emergency medical services (EMS) and air medical transport resources.
- The trauma system is not currently integrated with disaster resources.
- The state has limited rehabilitation resources.
- Utilization of available clinical data is limited.

Themes Emerging During the Consultation

- Strong central leadership should be used until the regional committee structure matures.
- Work on education regarding the trauma system's goals and function should be continued.
- Incentives for some hospital designation levels should be reconfigured.
- The leadership should determine which activities and functions to centralize and which to regionalize.
- Hospital and EMS standards and practices should continue to be refined.
- Begin to analyze and use the clinical data you currently have.
- You have made great progress, and are poised for the next steps
 - Maintain the vision
 - Define the plan
 - Not everything good is voluntary
 - Level does matter
 - Carpe Diem
 - Start using data now
 - Find and develop the next generation of leaders

Priority Recommendations

Statutory Authority and Administrative Rules

- Update and strengthen trauma system rules, including rigorous standards for hospital trauma center designation and de-designation.
- Form a joint executive committee from the Governor's Emergency Medical Services (EMS) Advisory Council and the Trauma Advisory Council (TAC) to enable consistency of rule making.
 - Coordinate revisions of rules for EMS and the trauma system within the Arkansas Department of Health and with active involvement from the Governor's EMS Advisory Council and Trauma Advisory Council.
 - Revise EMS licensure rules to update and enforce compliance with trauma triage criteria.

System Leadership

- Encourage the Trauma Advisory Council (TAC) to assume a stronger leadership role in performance improvement and clinical policy development until the Trauma Regional Advisory Council (TRAC) network is more fully developed.
 - Create the Trauma Outcomes and Performance Improvement Committee (TOPIC) as a subcommittee of the TAC.
 - Establish state level templates for field triage, destination, inter-facility transfers, and similar clinical functions, subject to later regional modification.

Trauma System Plan

- Develop a comprehensive trauma system plan based on the consolidated findings of the various assessments and reports to serve as a guide for the state's trauma system development for the next 3 to 5 years.

System Integration

- Ensure that the trauma system plan integrates the trauma system with emergency medical services, public health, emergency preparedness, and incident management.

Financing

- Trend annual financial information to document trauma care costs.

Emergency Medical Services

- Secure funding for a State Emergency Medical Services (EMS) Medical Director (full time is desirable) who has responsibility for:
 - Establishing state guidelines for EMS, trauma, and air medical protocols.
 - Reviewing local and regional EMS agency and air medical protocols for consistency with state guidelines.
 - Providing assistance and training to regional and local EMS medical directors.
 - Leading regional and statewide EMS performance improvement initiatives.
 - Leading the statewide air medical performance improvement program.
 - Working collaboratively with the State Trauma Medical Consultant

Definitive Care

- Concentrate on ensuring good geographical coverage of level III trauma facilities with consistent general surgical and orthopaedic resources.
- Establish and enforce destination protocols that route patients to designated facilities according to estimated severity (e.g., the Centers for Disease Control (CDC) Field Triage Guidelines step 1 and 2).
- Require field providers and transferring hospitals to utilize the Arkansas Trauma Call Center (ATCC) or applicable destination protocols for severely injured patients (e.g., the CDC Field Triage guidelines step 1 and 2).
 - Require field providers and receiving hospitals to comply with ATCC recommendations or applicable protocols.
 - Track and analyze all variances.

System Coordination and Patient Flow

- Incorporate destination and transfer performance criteria into grants and contracts to drive compliance.

Rehabilitation

- Identify and provide financial support to an adult rehabilitation facility that can accommodate patients with traumatic brain injury, spinal cord injury, and ventilator needs.

System-wide Evaluation and Quality Assurance

- Contract with national experts to assist in the development of a Performance Improvement (PI) plan that outlines the state and regional PI process and system indicators.

Trauma Management Information System

- Design and begin running standard reports from the trauma registry (recognizing that early reports will have errors) for a user group to help achieve consensus on the report format and structure.

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 thorough 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)**
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

The Arkansas Department of Health (ADH) and the trauma program are to be commended for the strong linkage with and support from the ADH Epidemiology Branch for the injury control program. The assignment of a full-time epidemiologist to the trauma program who is physically located in the Trauma Section but is organizationally positioned within the Injury Prevention and Control Branch is a great asset. This will enable the epidemiologist to be integrated into the program and to anticipate various data analyses that will be valuable for injury surveillance and program development. The epidemiologist assigned to trauma is supervised by, and receives guidance from, the Epidemiology Branch Chief for Analytical Epidemiology, clearly reflecting the commitment of the ADH to the trauma program.

The ADH has access to all appropriate national and state injury mortality data, as well as the morbidity data through the Hospital Discharge database (UB 04). Clinical data are not yet available as the trauma registry is in its first year of data submission. EMS run reports will also be available in the future with data linkage planned. Direct data linkage will be possible for patients whose destination is managed by the Arkansas Trauma Call Center (ATCC) through the unique trauma band identification system.

A pilot project is focused on the collection of emergency department (ED) data from 3 emergency departments. If successful, statewide collection of ED data is planned in the near future. The state did submit an application to the Centers for Disease Control and Prevention (CDC) for a Violence Injury Prevention Core Grant that was approved but, at the time of the TSC visit, had not yet been not funded. This funding would have helped with expansion of the ED data collection project.

Injury data are reported to the state legislature along with the required trauma program reports. Injury data were provided to, and used extensively by, advocates for the 2009 legislative session that resulted in funding for the trauma program, the graduated licensing law, and the primary seatbelt law. Data are also provided upon request to organizations involved in injury prevention, and to support prevention efforts of the state's hometown health initiative.

The trauma program epidemiologist is collaborating closely with the newly created Injury Prevention Center based at the University of Arkansas Medical Sciences (UAMS) Arkansas Children's Hospital (ACH). Injury data are being used to identify priorities for injury prevention program efforts that will be tasked to the trauma centers and Trauma Regional Advisory Councils (TRACs).

The Epidemiology Branch does make data available on the state website; however, it is not easily accessible to the general public. Through collaboration with the Injury Prevention Center, timely publications that combine injury data and strategies for injury prevention efforts are produced for the public. More readily accessible web-based injury data and prevention materials are planned for the future for all age groups through the trauma program's Injury Prevention Center.

RECOMMENDATIONS

- Increase the availability of the data about the pattern of injuries across the lifespan for the general public and partners in injury control.
- Develop reports from the clinical databases that describe injury morbidity, injury mortality, and associated costs of injury as the databases become available.
- Develop the report template that will illustrate the progress in trauma care development to include linked data between the Emergency Medical Services database, Arkansas Trauma Call Center, and the trauma registry that can be used to educate the public and elected officials.
 - Populate the template as data become available.

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

The Arkansas trauma program has not yet investigated the Benchmarks, Indicators, and Scoring (BIS) tool as a means for assessment of trauma system development. It did not appear that many participants of the trauma system consultation (TSC) process were knowledgeable about the BIS tool contained in the 2006 Health Resources and Services Administration's *Model Trauma System Planning and Evaluation* document.

A review of the 16 BIS indicators included in the Pre-Review Questionnaire (PRQ) packet was not completed prior to the TSC visit. When asked who would likely be engaged in the process of reviewing and scoring BIS indicators, the Trauma Advisory Council (TAC) was identified as the primary group.

Interest in conducting a trauma system self-assessment using the BIS was expressed for future system assessment and development of priorities for system planning. Information about the process was requested, but concern was also expressed over the amount of time needed if all 113 indicators were assessed at one time.

RECOMMENDATIONS

- Select two to three sections of the Benchmark, Indicator, and Scoring (BIS) tool that match current trauma system development challenges (e.g., Benchmark 102 focused on the trauma management information system, Benchmark 203 focused on a trauma system plan and system integration, Benchmark 205 focused on evaluation of system performance, Benchmark 302 focused on the emergency medical services system, and Benchmark 305 focused on integration of the trauma system and disaster preparedness planning).
 - Commit the time for a self-assessment of these sections within the next 3 months that can be used as a baseline for future comparison of system development.
 - Include the Trauma Advisory Council and all members of Trauma Advisory Council subcommittees in the process.
 - Repeat the targeted BIS assessment 12 months later to evaluate progress.

- Commit to a full BIS assessment, inviting all stakeholders to participate, within 2 to 3 years.
 - Use a facilitator for the BIS process to assist the stakeholders in analyzing findings and establishing priorities for the next stage of trauma system development.
- Repeat the full BIS assessment every 3 to 5 years to identify trauma system development successes and challenges.

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 pre-described 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 post injury 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 State of Arkansas passed its initial Emergency Medical Services (EMS) System legislation in 1975. This legislation was subsequently updated in 1981 and 1985. It focused on the prehospital EMS system and did not address clinical trauma system components. Current administrative rules for EMS were initially adopted in 1987, with some updates since then.

In 1993, the Arkansas Legislature passed the Trauma System Act 559, enabling the ADH to adopt trauma system regulations and to designate trauma centers. Administrative rules to implement this act were adopted by the Arkansas Board of Health in December 2002. However, Act 559 provided authority only for voluntary participation in the trauma system with no incentives for hospitals and other trauma system-related organizations to meet the new standards. It also did not include any penalties for hospitals choosing not to meet designation requirements. As a result little progress was made in developing a comprehensive statewide trauma system over the next several years.

In 2009, the Arkansas Legislature passed Act 393, the Trauma System Act, authorizing up to \$25 million annually to implement a statewide trauma system. This Act mandates a broad range of activities, including start up and maintenance funding for the following: trauma centers (Levels I – IV), EMS providers and agencies, rehabilitation service providers, quality improvement organizations, TRACs, command and communications networks, injury prevention programs, and data collection and evaluation systems (Arkansas Trauma Registry). Specific language in this statute also provided for protecting the confidentiality of patient records in the Trauma Registry. It additionally provides strong protection for the peer review and performance improvement processes.

Act 393 also designates the Arkansas Department of Health as the lead agency to implement the trauma system, and provides for a 26 member Governor's Trauma Advisory Council (TAC). The 2002 rules and regulations were updated and revised in March 2009.

Under Act 1386, the fiscal year 2010 appropriation bill, over \$19.265 million was appropriated to the ADH to implement the Trauma System Act. These funds were increased to \$19.739 million in 2011.

Currently, the ADH is implementing the trauma system under the administrative rules adopted in 2009, but ADH officials and several trauma system stakeholders have determined that the rules need additional revision.

The evolving Arkansas trauma system has many strengths that will help ensure its success over time. Among these is the fact that the current legislation provided the ADH with the authority to develop a comprehensive, state-of-the-art, trauma system. The statute is broad, allowing for the development of rules, regulations and policies that will support the development of the system, and at the same time, allowing response to changing needs as the system matures. The regulations pertaining to trauma destination triage are not tied to EMS licensure. Additionally, this strong legislative and regulatory framework is supported by sound financial support.

Conversely, several challenges and opportunities must be acknowledged regarding the Arkansas trauma system at this early stage of development. For example, the administrative rules for trauma center designation and trauma system development are not as specific or strict as they may eventually need to become in order to ensure quality participation in the system. The accountability of hospitals, EMS organizations, and other components of the trauma care system seems weak and is not strictly enforced. No clearly defined processes exist for conflict resolution among stakeholder groups, such as possible disagreements between EMS providers and designated trauma facilities over trauma destination triage and transport protocols. Current EMS and trauma rules are not totally consistent and could result in future conflicts between EMS provider agencies and designated trauma hospitals.

RECOMMENDATIONS

- **Update and strengthen trauma system rules, including rigorous standards for hospital trauma center designation and de-designation.**
- **Form a joint executive committee from the Governor's EMS Advisory Council and the Governor's Trauma Advisory Council to enable consistency of rule-making.**
 - **Coordinate revision of rules for EMS and the trauma system within the Arkansas Department of Health and with active involvement from the Governor's EMS Advisory Council and Trauma Advisory Council TAC.**

- **Revise EMS licensure rules to update and enforce compliance with trauma triage criteria.**
- Establish processes for possible future conflict resolution among stakeholder groups while are all working together cooperatively.
- Establish a regular review and revision schedule of the trauma statute and regulations.

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 ADH has overall leadership and regulatory authority over both the trauma system and EMS system, both housed within the ADH's Center for Health Protection. The trauma system and EMS system are in separate branches in this center, and each system has its own multidisciplinary advisory council. This organizational structure has evolved since the focused ACS trauma system consultation in 2008, at which time the trauma and EMS programs were housed together in the same branch. The Center for Health Protection has taken specific measures to facilitate integration including weekly meetings between branch leadership and a formal liaison committee linking the trauma and EMS advisory councils. Even though the Preparedness and Emergency Response Branch is also housed within the Center for Health Protection, interviews with stakeholders and review of the organizational structure suggest that integration of this function with the trauma system is suboptimal.

The TAC is composed of a broad group of constituencies, including strong representation from the Arkansas Hospital Association (AHA). However TAC representation is typically at a high level, involving a single representative from individual professional groups spanning physician, nursing and prehospital disciplines. The TAC has standing subcommittees for Hospital Designation, Emergency Medical Services, Injury Prevention, Finances, Rehabilitation, and for the TRACs. Notably absent from the TAC subcommittee structure is a focus on quality improvement and disaster and emergency preparedness. The governance model calls for the development of seven TRACs, and it is envisioned that the quality improvement activities and regional operational details will be primarily the responsibility of the individual TRACs. Although substantial

progress has been made with the TAC organizational structure, and the Arkansas trauma system as a whole, the TRACs have not yet developed into a strong working infrastructure.

From an overall perspective, the leadership structure of the trauma system appears robust and organized in a way that will facilitate cooperation and integration among the separate components of the system. Strategically, placing the trauma system program and EMS in separate branches of a center that also contains significant epidemiology and injury prevention functions fits well with the public health model of an inclusive system. As with any new system, the functional implementation of the organizational structure is immature and evolving, as evidenced by limited integration with the disaster and emergency preparedness programs. Additionally, while the concept of a network of strong regional councils is a good one, the operational challenges of standing up such a system quickly are formidable, and the top-level governance structure lacks the components necessary to provide strong central leadership in the interim.

The trauma system is developing what should become a very strong infrastructure for trauma data collection and analysis, but these systems are immature, and data do not yet exist to inform policy decisions, performance improvement, or educational missions

Strong individual leadership exists at the top levels, and these leaders appear to have a shared common vision. They have accomplished a great deal in a short time; however, current medical and surgical leadership is largely provided by pediatric specialists working in the larger urban centers. It was difficult for the TSC team to determine the level of engagement of stakeholders and front-line personnel at the regional and facility level. Very few front-line personnel were present at the interview sessions, and thus the TSC team heard little testimony from the TRACs and trauma center leadership. Secondary evidence suggests that leadership and engagement in the regions and trauma centers may require substantial development to support strong regional councils.

The Arkansas trauma system has many assets and advantages that will serve to develop a highly functioning trauma system, including the following:

- The overall functional organization is within a public health framework.
- Some evidence that a specific structure and practices exist to facilitate integration between branches of the Center for Health Promotion.
- The system is blessed with strong individual leaders and with an overarching commitment of the highest levels of administration and staff.
- The emerging TRACs will be an increasingly important asset over time.
- The developing data infrastructure and stated focus on performance improvement and research will serve to continually improve the system over time and to document those processes and outcomes.

Some challenges also currently face the trauma system, including the seeming lack of engagement of front-line providers, especially within adult surgical disciplines. While the TRACs are a strength as noted above, the heavy reliance on the TRAC subcommittee of the TAC for oversight of core clinical system functions could be a problem given the immature TRAC structure and apparent lack of regional expertise and leadership. A lack of central structure to support core system functions appears to exist during interim development of TRAC network. The TSC team felt that poor integration with disaster and mass casualty programs exists. A focus on the development of new leadership and for succession planning will be essential to sustain the high level of energy being displayed at this early juncture in the developmental process. Finally, the current lack of available data will hamper data-driven planning and evaluation until such time as it becomes fully operational.

RECOMMENDATIONS

- **Encourage the Trauma Advisory Council (TAC) to assume a stronger leadership role in performance improvement and clinical policy development until the Trauma Regional Advisory Council (TRAC) network is more fully developed.**
 - **Create the Trauma Outcomes and Performance Improvement Committee (TOPIC) as a subcommittee of the TAC.**
 - **Establish state level templates for field triage, destination, inter-facility transfers, and similar clinical functions, subject to later regional modification.**
- Until the TRAC network is more fully developed, collect and analyze regional quality improvement data at state level.
- Provide support and resources to develop strong regional councils.
- Identify, educate and develop future leaders.
 - Identify potential projects within the TAC subcommittees and TRACS that are important for aspects of state trauma system development that could be leadership development opportunities for stakeholders.
- Create a mechanism that supports better coordination between trauma, EMS and disaster preparedness.
- The Trauma Advisory Council and trauma system leadership should continue strong efforts to educate the public and front-line providers on the existence and function of the system.

Coalition Building and Community Support

Purpose and Rationale

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

- Trauma system plan development
- Regionalization: promoting collaboration rather than competition between trauma centers
- System integration
- State policy development: authorizing legislation and regulations
- Financing initiatives
- Disaster preparedness

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

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

OPTIMAL ELEMENT

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

CURRENT STATUS

Arkansas is blessed with very active and engaged stakeholders who were successful in having the state legislature appropriate funding for development and implementation of the trauma system. The graduated licensure and the primary seat belt laws were passed during the same legislative session to address leading causes of injury deaths in Arkansas. Stakeholders remain actively engaged in the implementation of the trauma system, including injury prevention. The energy of stakeholders has remained high with the rapid and simultaneous development of multiple trauma system components. Evidence of this energy is the large number of stakeholders who attend open meetings of the TAC and TAC subcommittees. These stakeholders include trauma coordinators, trauma registrars, EMS providers, the Arkansas Hospital Association, and the press. The TAC subcommittees are comprised of some TAC members and other stakeholders.

Key organizations have representation on the TAC, (e.g., state chapters of the American College of Surgeons, Emergency Nurses Association, Medical Society, Emergency Medical Technician Association, Ambulance Association, Trauma Nurses' Society, American College of Emergency Physicians, and Academy of Family Physicians) which provides a mechanism to keep other health professionals informed about trauma system development. One designated TAC member represents the public.

Regional development with the TRACs is another avenue of coalition building, enabling many more stakeholders to become participants in trauma system development. Videos have been developed targeted at hospitals and providers to educate and inform regarding the trauma system and their roles in its development.

Succession planning for trauma system leadership within the TAC and TAC subcommittees has not yet been addressed. The TRACs provide a mechanism for future trauma system leadership development by gain experience in regional trauma system planning and program implementation.

The TAC recognizes that the public has not yet been actively informed or educated about the trauma system and suggested the need for a marketing plan. The press has been engaged in trauma system development, addressing the crisis of injury in the state. One reporter has been helpful by writing a series of articles about trauma and the need for the trauma system. The TAC also recognizes the need for ongoing education directed to the public and policy makers as members of the legislature have a term limit.

RECOMMENDATIONS

- Continue support of broad-based coalition development in the Trauma Regional Advisory Councils.
- Continue education efforts and work to engage front-line providers in trauma system leadership.
- Collect and review models of public education regarding the trauma system developed by other states to identify an approach and format for Arkansas' trauma system public education.
- Consider using the proposed education initiative to coordinate development of public education materials that can also educate policy makers.
 - Identify stakeholders to partner in the development and dissemination of the public education.

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 ADH is the lead agency for the Arkansas trauma and EMS systems. The ADH Center for Health Protection has five Branches, three of which are involved in the trauma system, including: the Injury Prevention and Control Branch; the Health System Licensing and Regulation Branch (which includes the EMS Section), and the Preparedness and Emergency Response Branch. The Injury Prevention and Control Branch has a Trauma Section and an Injury Prevention Section. Participants reported that within the Center for Health Protection frequent opportunities exist for the Branch Chiefs, Section Chiefs, and the Center Director to meet and collaborate with each other. The Trauma and EMS Chiefs are beginning to become more actively involved with the Preparedness and Emergency Response Branch to help prepare for, and respond to, mass casualty emergencies.

The Trauma System Act and annual appropriation legislation also provide for a reasonable level of staffing and funding for the agency. In addition to the Injury Prevention and Control Branch Chief and two support staff, additional personnel for the trauma system program includes a Trauma Section Chief and seven other staff members, and Injury Prevention Section Chief and three other staff members. Unfortunately, no funding is currently available to fill the Injury Prevention Section Chief position. The trauma systems program has a Trauma Medical Consultant paid by contract. Currently no State EMS Medical Director is available to advise and consult with EMS Section staff and the EMS Advisory Council. Although the agenda and plans for developing and maintaining the Arkansas Trauma System are ambitious, such as efforts to designate most Arkansas hospitals as trauma centers, the current staffing levels and funding appear to be reasonably adequate to meet the expectations described in the Trauma System Act of 2009.

Additionally, participants expressed a high level of understanding of the trauma program and system needs, and good lead agency support was apparent to the TSC team, from the Director of the ADH down to the Trauma Section Chief. The Trauma Medical Consultant is very knowledgeable about the trauma system and

its needs, and he appears to be providing excellent advice and consultation to the ADH and the TAC. The trauma program manager is, likewise, knowledgeable, energetic and dedicated.

The TSC team found the TAC members to be knowledgeable about trauma system needs and supportive of the ADH's efforts to develop and implement the system. A common vision of what the trauma system should evolve into was expressed by key stakeholder representatives. An "esprit de corps" appeared to exist among ADH leadership, consultants, and stakeholders. Contract funding has led to good cooperation from hospitals interested in trauma center designated, EMS agencies, and other trauma system-related organizations.

Some additional challenges face the trauma system with regard to the lead agency and human resources. The separation of Trauma, EMS, and Preparedness and Emergency Response programs in different branches will continue to require efforts to promote coordination and cooperation for system integration. The current state salary structure for some staff, such as registered nurses, is neither consistent nor competitive with salaries in the medical system.

RECOMMENDATIONS

- Ensure the continuing integration and collaboration between the Trauma Branch, EMS system, and Disaster and Emergency Preparedness Branch by having the directors of Arkansas Department of Health and the Center for Health Protection conduct periodic reviews.
 - Adapt the organizational structure as the system matures.
- Allocate funding to fill the Chief of Injury Prevention position.
- Allocate funding for a State EMS Medical Director consultant position.

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

The pace of trauma system development in Arkansas has been remarkable since the passage of the Trauma System Act and funding in 2009. Priority activities such as the designation of trauma centers and the development of a statewide trauma registry have quickly come to life. The ADH and the various stakeholder groups, including the TAC are to be commended for their ability to quickly formulate and implement a strategy focusing on one or more attributes of the trauma system. Seven one-year goals were identified in the February, 2010 TAC retreat, and remarkable progress has been demonstrated. Several goals have been fully met and the others are in-progress. The only goal that has remained elusive is the inclusion of physiatrists on the TAC. However, to date, the Arkansas trauma system does not have an overall blueprint to help guide the construction and refinement of the Arkansas Trauma System.

The Arkansas Trauma System and its stakeholders have a wealth of information on which to base a trauma system plan. These include the report by Bowman (2008) *An Assessment of Trauma Care in Arkansas Resources, Capabilities and Quality of Care*, the initial focused trauma system consultation in 2008 by the American College of Surgeons (ACS), the *Arkansas Emergency Medical Services Needs Assessment Survey* (2009), and the minutes of the February 20, 2010 TAC retreat. Additionally, the 2006 Health Resources and Services Administration (HRSA) *Model Trauma System Planning and Evaluation* guide provides a strategy for organizing the plan within a public health framework. The process for development of a trauma system plan is further supported by strategic plans for injury prevention and for disaster and emergency preparedness, the recent assessment of rehabilitation capacity, and the detailed information assembled in the PRQ for the 2011 ACS TSC.

Dialogue with stakeholders during the TSC visit suggests that the TAC intends to wait until the receipt of the TSC report to begin the strategic planning process. This will permit the recommendations contained within this report to be considered for focused inclusion in the trauma system plan. Additionally, it was

suggested by some of the stakeholders that completion of the Benchmarks, Indicators and Scoring (BIS) process outlined in the HRSA *Model Trauma System Planning and Evaluation* guide could further inform the strategic planning process. The strategy for completing the BIS is outlined in a previous chapter.

The fact that one and five year goals have been established is seen as a positive interim step in trauma system planning. Additionally, the fact that progress has been made on several of these goals is also positive. The TAC, supported by the regional infrastructure is poised to lead in the development of a trauma system plan.

Some weaknesses exist that will hamper further system development until addressed. Among the most important of these is that no trauma system plan currently exists. Without that plan the state has no clearly written description of the mission, vision and goals of the Arkansas trauma system. The current identified goals from the TAC retreat have no assigned responsibility or accountability for their completion (who, when, how). Readily available national tools, such as the 2006 HRSA) *Model Trauma System Planning and Evaluation* document have not been utilized to date.

RECOMMENDATIONS

- **Develop a comprehensive trauma system plan based on the consolidated findings of the various assessments and reports to serve as a guide for the state's trauma system development for the next 3 to 5 years.**
- Immediately formulate and implement a process by which a trauma system plan will be completed.
- Implement and monitor progress according to the plan.
- Evaluate and revise the plan on an established schedule, e.g. every three years.

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

Successful implementation of a statewide trauma system requires broad integration across many agencies and services. High level integration of the statewide trauma system with public health, injury prevention, EMS, disaster management and incident command is essential. In addition, integration with public safety, mental health, social services, law enforcement and child protective services provides is also important for the implementation of the trauma system.

In 2008, at the request of the ADH and in anticipation of action by the Arkansas House and Senate on trauma system funding, the ACS Committee on Trauma (COT) conducted a focused trauma system consultation. The Section of EMS and Trauma Systems of the ADH had been charged with the development of a statewide trauma system plan in the 1993 trauma system enabling legislation (Act 559). This statute also established a state TAC and TRACs. The 2008 ACS TSC team identified challenges and opportunities for trauma system development and provided recommendations for moving forward.

Among the challenges listed in the 2008 report were:

- *Absence of a clear structure for leadership, oversight or enforcement, and*
- *Fragmentation and separation of existing system elements.*

One significant recommendation was:

- *Secure funding for a fulltime state EMS and trauma medical director.*

Full development of the Arkansas trauma system was supported by the passage of the Trauma Systems Act in 2009. This statute designated the ADH as the state agency responsible for the implementation and coordination of the trauma system and provided for a 26 member TAC. The TAC includes representation from many of the stakeholders vital to the successful development of the trauma system and it provides one level of system integration for several key elements. Another level of system integration is possible through the TAC subcommittees (Hospital Designation, Finance, TRACs, EMS, Injury Prevention, and Rehabilitation). The TRACs represent further opportunity for integration at the local/regional level.

In the current administrative structure of the ADH, the Section of EMS and Trauma Systems no longer exists. Trauma, injury control and prevention, EMS,

and emergency preparedness and response are organized within Branches under the Center for Health Protection:

- The Trauma Section and the Injury Prevention Section are part of the Injury Prevention and Control Branch.
- The EMS Section is part of the Health System Licensing and Regulation Branch
- Disaster Management is part of the Preparedness and Emergency Response Branch

Within the ADH, integration between public health, injury prevention and the trauma system is apparent at many levels and has been instrumental in the early advancement of the trauma system. Integration with medical leadership is strong, most clearly evident by the excellent leadership provided by the Trauma Medical Consultant to the Injury Prevention and Control Branch. Housed in separate branches and separate buildings, EMS and Trauma appear to be less tightly integrated. These programs are no longer located within a single section, and the recommendation for a State Trauma and EMS Medical Director has not been enacted. Given the critical role that prehospital triage and transport play in the trauma system, the trauma system has a need to more fully integrate EMS licensing functions, medical direction, training and performance improvement (PI) with trauma system planning, rules and operations. The development of a comprehensive trauma system plan that addresses these issues is vital. Given the practical realities of resources and geography of Arkansas coupled with the relatively early stage of development of the trauma system, it is understandable that this has not been completely resolved. An incremental approach to improved trauma system and EMS integration may be necessary, but progress towards this goal should be a system priority. In effect, much has been accomplished but future progress requires clear resolution of this issue.

The ATCC, established in 2009 as part of the Trauma System Act to facilitate prompt communication and coordination of available hospital resources, plays a key role in integrating prehospital, hospital and system resources to promote optimal and timely care delivery for injured patients throughout the state. The ATCC works closely with the TAC and the TRACs, and it provides opportunities for data-driven PI and accountability. The dashboard function at the ATCC provides an easily accessible web-based system that identifies available resources and facilitates patient movement to trauma facilities appropriately matched to a patient's needs.

The trauma system program does not yet appear to be significant integration with the Office of Rural Health, mental health services, social services, or child protective services. Given the well-documented association of these special populations with increased injury rates, strong integration with these agencies

and constituents is important for the optimal outcomes of the trauma system. Although represented on the TAC, public safety and law enforcement's integration with the trauma system was not readily apparent. Their role in trauma systems is similarly important.

The fact that the trauma system program has strong integration with the injury prevention and public health sectors is commendable, especially for the strong, integrated trauma medical leadership. The TRACs represent an emerging critical regional structure for integration. Well structured and adequately funded contracts with providers and agencies have the potential to enhance integration. Finally, the trauma system program has recognized the need to increase the focus on rehabilitation.

Challenges include the fact that the state lead agency does not yet have a comprehensive written trauma system plan, based on national guidelines, and the trauma system has not established clearly defined methods of integrating the trauma system plan with the EMS, emergency, and public health preparedness plans. Trauma and EMS are not fully aligned, especially in regards to prehospital triage destination guidelines and protocols. The absence of integration with the Office of Rural Health, mental health services and child protective services and only modest integration with law enforcement/public safety should be addressed.

RECOMMENDATIONS

- **Ensure that the trauma system plan integrates the trauma system with emergency medical services, public health, emergency preparedness, and incident management.**
 - Increase integration and alignment of trauma and EMS
 - Continue support of ATCC and expand its role in system PI and incident management
 - Pursue system integration with the Office of Rural Health, mental health services, substance abuse, and child protective services.
 - Enhance system integration with law enforcement and public safety.

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 source of trauma system funding in Arkansas is the “Act 180 of 2009.” This statute established an enhanced tobacco tax generating approximately \$70 million dollars for the health care programs. The Arkansas Legislature, through Act 393 of 2009 (A.C.A. 20-13-801 et.seq.), created a comprehensive trauma care system under the auspices of the ADH and the Board of Health. The statute provides guidelines for the care of trauma victims, and it is to be fully integrated with all available resources including, but not limited to, existing EMS providers, hospitals, or other health care providers with an interest in participating in trauma system development. Act 393 appropriated \$19.7 million specifically for trauma system planning, implementation, maintenance and ongoing trauma program development.

Although the funding is specifically appropriated for trauma system development, this is not a dedicated and protected “special fund”. The ADH has \$20 million of dedicated tobacco tax derived from the General Fund. This \$20 million is deposited in the ADH’s Public Health Fund and made available for trauma system development. This funding is legislated into the ADH appropriation bill during the annual fiscal legislation. It does include a special legislative waiver allowing the carry-over of unused funds from fiscal year to fiscal year (July 1 – June 30). Lead agency funding for system administration and oversight is capped at 10 percent of the total allocated funds.

The fiscal year (FY) 2012 trauma system budget totals \$33,042,520 of which \$19,712,003 is base funding for 2012 and \$13,330,517 is carry-over funding from FY 2011. The large carry-over funding amount is the result of first year start-up activity.

Program Development Funding

The legislature exhibited significant foresight in its structuring of the appropriation, providing considerable flexibility for the trauma system design and start-up. The trauma system's expense category allows the program flexibility in how the funds are utilized, whether through subgrants to trauma system participants, contracts with partners and vendors, or purchase of goods or services.

At the beginning of the fiscal year, the program and ADH Chief Fiscal Officer designate how these funds will be spent (subgrants, contracts, other goods and services). The state's accounting system allows flexibility if there are issues during the year which require a redirection in funds. This is a positive variation from the general operations of the agency and again, it provides much needed flexibility in starting up such a significant program.

As funds for the trauma system are separately appropriated, the only personnel who can be directly funded by trauma are those occupying the positions specifically designated in the trauma system appropriation. Through cost allocation, the agency is working on ways that trauma systems funds may be able to reimburse other staff for work that occurs to support trauma activities, within the parameters of state law.

The Arkansas Administrative Statewide Information System (AASIS), operated by the Department of Finance (DFA), is the accounting and human resources infrastructure through which all funds are tracked and all financial transactions occur. The separate appropriation of trauma tobacco tax funds by the Arkansas General Assembly requires measures to prevent the co-mingling with other ADH funding. To meet this requirement the trauma funds are held in two separate subfunds: 1) Trauma Program general operating funds and 2) Trauma system expenses.

Within these two subfunds, the tobacco tax revenue is identified by a unique internal order number, which pertains only to these funds (AATR00XX). These funds are then distributed to various cost centers for those entities which use these funds:

- Injury/Trauma Branch
- Trauma Section
- Injury Section
- Trauma Registry
- Epidemiology

Each of these cost center/internal order combinations receives a budget that is categorized according to a commitment item identifier (salary, fringe benefits, maintenance and operations, professional fees, capital outlay, etc.). As all

expenditures occur through AASIS, each financial transaction (invoice, bi-weekly pay check, etc.) is coded with the cost center/internal order combination, so that the expenditure hits against a particular budget.

All expenditures must be pre-authorized by at least two levels of purchasing authority. Any transaction has an authorizing document in AASIS, whether payroll authorization, purchase order, or other initiating document. No expenditure can be made without reference to the authorizing document. Invoices are reviewed at the program and ADH Accounts Payable levels to assure proper expenditure of funds. AASIS allows tracking of budget, funds, and expenditures as needed, whether daily, weekly, or monthly. At any given point, the status of a purchase or contract, current expenditures, outstanding obligations, and balance on hand can be obtained. General financial reports are produced and reviewed closely at the agency, center, and program level on a monthly basis, with more frequent monitoring if needed.

Program Funds: Allocation Methodology and Reporting

Act 393 of 2009 (A.C.A. 20-13-804 et.seq.) states

“the department shall allocate funds deposited into the Public Health Fund to administer this subchapter. The allocation of available funds shall be developed and modified with: (A) The advice of the Trauma Advisory Council; and (B) The approval of the State Board of Health.”

The TAC has a Finance Subcommittee composed of trauma system stakeholders. In February, the amount of funds available for the new fiscal year is presented to the Finance Subcommittee. The Finance Subcommittee has the following subcommittees which develop proposed budgets for their areas of jurisdiction:

- EMS
- Hospital Designation
- TRACs
- Injury Prevention
- Rehabilitation

Each subcommittee chair submits a budget request to the Finance Subcommittee for consideration. The Finance Subcommittee then provides a total recommended budget to the TAC for approval. ADH agency staff work with each subcommittee on budget requests. ADH presents the TAC recommended budget to the Arkansas Board of Health for final approval in April each year.

Act 393 of 2009 requires ADH to provide a financial and programmatic report to the Senate Public Health, Welfare, and Labor Committee and to the House

Public Health, Welfare, and Labor Committee in November and April of FY11 and annually thereafter. Monthly financial reports are available to the TAC.

ADH reports on all expenditures in broad categories. For example, grants to EMS agencies are one category with the total amount available to all agencies, total amount spent, and the balance. Financial reports by individual agency are not currently provided.

Funding and Year One Objectives

Building an “inclusive” voluntary trauma system and incorporating all interested stakeholders is the primary goal of the program. Accordingly, incentives and accountability measures have been built primarily around encouraging participation. The major focus of start-up and initial sustainability funding has been to provide sufficient support for the following:

- Overcoming the financial barriers preventing active engagement of key stakeholders such as academic medical centers, community hospitals and EMS agencies
- Building the advisory, educational and operational infrastructures required for capacity-building
- Encouraging the active participation of professional and community organizations and individuals

Programmatic activities to meet these objectives are represented in the approved budgets for fiscal years 2010 - 2012. Programmatic accountability is currently achieved primarily through the contracting and grant-award processes, including monitoring the achievement of the contract requirements.

Developing incentives to encourage 100% hospital participation has been a primary objective. To meet this objective, the Board of Health has allocated 50% of the trauma funds to support hospitals participating in the system (see budget below). During FY10 and FY11 (July 1, 2009- June 30, 2011), one-half of the start-up funding was provided to all hospitals submitting a letter of intent to participate. Once a hospital passes a designation review, it receives the second half of start-up funds and a first year sustaining grant. Through April 2011, 77 of the 82 licensed hospitals in the state have submitted a letter of intent to pursue designation and an application for funding. Through June 8, 2011, eighteen hospitals have been designated. Each hospital receiving funding from the ADH is minimally required to participate in the appropriate TRAC, submit patient data to the trauma registry, and participate in the ATCC. The terms of this participation have not been previously defined in the contracts.

Designated trauma centers receive sustaining grants each year they maintain their designation status. Funding is based on the designation level. Hospitals are allowed to use these funds for any trauma-related expense they require. This includes surgeon on-call pay, physician salaries, training, equipment, supplies,

travel, etc. No specific disincentives exist now other than failure to meet the minimal participation requirements of the contract.

The TAC currently does not recommend funding for uncompensated and undercompensated care. Instead, funding is offered to provide services and meet participation requirements, such as TRAC participation and trauma registry submission. During FY12 (July 1, 2011- June 30, 2012), designated trauma centers will be eligible for performance-based incentive funding in addition to its annual sustaining grant. The process for establishing higher level outcomes-based and PI metrics and accompanying incentives has yet not been established.

Among the many strengths in the area of finance is the significant commitment made by the Governor and Legislature to developing a trauma system to serve the citizens of Arkansas. They have done so in a manner that establishes a systematic and comprehensive approach that meets two of the finance “optimal elements” recommended by the ACS COT:

- Appropriating funding that supports the planning, implementation, and ongoing management of the administrative and clinical care components of the trauma system.
- Appropriating designated funding for the lead agency

The Arkansas system is experiencing an excellent start-up. Opportunities for improvement in the area of financing are linked to the immaturity of the system. The “optimal elements” recommended for system finance include aligning operational budgets with a trauma system plan and priorities. Although no set duration for a system plan is required, a five-year framework is generally accepted. Arkansas has not yet established a definitive 5 year trauma system plan. The ADH’s priorities for this start-up stage, however, are well defined and the budgets are aligned, providing a strong foundation for meeting the element of long-term alignment.

The second area of major opportunity is also linked to the immaturity of the system. The optimal elements recommended include integrating PI with the financial goals and operation of the trauma system. This is being done only on a very elemental basis during the start-up phase. Funding and financial incentives are aimed at encouraging participation and “participation” is defined primarily as entry into the system through accepting funding, participating in TRACS, submitting data to the registry, and using the ATCC. These requirements provide an immediate foundation for system building and are appropriate for the current stage. They are insufficient for building a long-term financially viable, high performance, high reliability trauma system.

The development of a trauma system plan in the very near term will be essential to building on the considerable momentum established during the start-up phase in Arkansas. The need for a trauma system has already been determined

through a number of studies on Arkansas injury and the burden it imposes on its citizens. A potential next step would be to conduct a “trauma demand” study. Such a study would look at historical and current traumatic injury in the state, its distribution (geographically, by injury type, and severity). It would also project demand 3 – 5 years into the future and assess the resources, their distribution, and the costs required to meet that projected demand. This projection cannot be done solely on the basis of historical utilization. The establishment of a trauma system is, in itself, a variable that will increase existing utilization rates.

A demand study can provide the basis to visualize future demand and to establish system objectives over the next five years. The study enables aligning projected demand and needed system capacity with funding priorities and financial incentives designed to encourage capacity-building in each sector of the trauma system. Correspondingly, each of the Finance Subcommittee stakeholder subcommittees should submit their annual budget requests within a 5-year framework. The submission for FY 2013 to be submitted in February 2012 should contain requested appropriation for items meeting system objectives for 2013 but it should also contain projected requests for fiscal years 2014 – 2017. The 2014 – 2017 requests from the Hospital, EMS, Injury Prevention, Rehabilitation and TRACS subcommittees should reflect annually upgraded capabilities in alignment with the system plan.

Financial incentives should be structured to support the achievement of upgraded capability and capacity for the system, individual trauma centers, the ATCC, EMS and other agencies. For the trauma centers special attention should be paid to training and education on strategies for maximizing trauma reimbursement, with a special emphasis on successfully capturing trauma activation fees.

Given the current starting point for the Arkansas system, it is reasonable to anticipate significant improvement in access to definitive trauma care, preventable deaths and clinical outcomes. The “burden of injury” defined in cost to society is expected to decrease. However, as the system matures, “new costs” and currently “hidden costs” will become evident. It is important that the cost of providing system-based trauma care be captured as accurately as possible. Capturing and analyzing these costs should be built into the system at this early stage and reported in a transparent fashion that educates the public, elected officials and key policy- and opinion-makers. Capturing these costs is essential to establishing the long-term viability of the system, including embedding the concept of cost-effective care.

Although covered in another section, there is a need to note that rehabilitation is a critical part of the trauma care continuum. Adequate injury-focused rehabilitation capacity is essential to providing the “on-demand” bed availability required in a highly reliable trauma system. Arkansas has very limited adult injury related rehabilitation capacity. The barriers to building capacity must be analyzed

and financial incentives to support capacity development should be given serious consideration.

RECOMMENDATIONS

- **Trend annual financial information to document trauma care costs.**
 - Utilize cost data to provide an analysis of the resultant system-wide financial advantages.
- Conduct a trauma “demand study”, to include projected resource utilization and distribution of major injury categories over a minimum of 3 years and optimally over a 5 year period.
 - Cross-match projected care utilization to projected resources (human, operational, financial and capital) requirements
 - Identify corresponding annual objectives designed to build trauma system capacity for each stakeholder grouping
 - Develop targeted financial incentives aimed specifically at encouraging the development of appropriate levels of coverage in underserved areas of the state.
 - Actively engage the Arkansas Hospital Association (and other associations as relevant) in resource and cost identification, best practice, performance improvement, cost-effectiveness and capacity-building strategies, including on a contractual basis if necessary and appropriate.
- Develop an analysis of the barriers (focused on, but not limited to, financial barriers) to development of adequate rehabilitation bed capacity (as opposed to a “needs analysis”) and a 3 - 5 year strategy with specific targets (including educational, organization-building, public-private partnerships, legislation and legislative support, targeted financial incentives, etc.) to strengthen capacity.
- Upgrade performance requirements in grants and contracts to include outcomes-based and performance improvements measures.
 - The measures should be linked directly to the 3 – 5 year objectives of the trauma system plan and development strategy of the Lead Agency.
 - Develop and implement a standardized system of financial accountability for trauma centers of all levels, prehospital agencies, including where possible, aeromedical, and Trauma Regional Advisory Councils.
- Finance Subcommittee stakeholder groupings (Emergency Medical Services, Hospital Designation, Injury Prevention, Trauma Regional Advisory Councils

and Rehabilitation), submit annual budget requests in a 5 year budget framework.

- Identify new sources of funding to be added over the next 5 - 10 years to meet trauma system development requirements as identified in the Trauma System Plan. Investigate:
 - Section 402 and 408 Highway Safety.
 - Funding for injury prevention.
 - Disaster Preparedness funding.
 - The state's capital funding process to support facility and equipment infrastructure development
 - Health Resources Services Administration (HRSA) Rural Hospital Flexibility Grant funding.
- Develop a strategy for maximizing reimbursement for trauma care.
 - Establish and pursue trauma activation fees.
 - Establish and disseminate guidelines for optimizing the physician and hospital reimbursement.

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 are available and usable for routine public health surveillance

OPTIMAL ELEMENTS

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

- a. The trauma system leaders (lead agency, advisory committees, and others) inform and educate constituencies and policy makers through community development activities, targeted media messaging, and active collaborations aimed at injury prevention and trauma system development. **(I-207.2)**

II. The jurisdictional lead agency, in cooperation with other agencies and organizations, uses analytic tools to monitor the performance of population based prevention and trauma care services. **(B-304)**

- a. The lead agency, along with partner organizations, prepares annual reports on the status of injury prevention and trauma care in state, regional, or local areas. **(I-304.1)**

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 Arkansas Legislature and trauma system constituents are to be commended for their vision and in passing legislation and funding for trauma system development that includes a strong focus on injury prevention and outreach. This foundation will enable the state to develop injury prevention strategies based on sound epidemiological data that will be provided to the public by members of the emergency healthcare system. The State Injury Prevention Program (SIPP), established through Arkansas Children's Hospital Injury Prevention Center (IPC) is a resource many states will envy. The IPC operates under a contract with the state trauma program to assess injury prevention programs, catalog injury prevention activities, and to provide technical assistance to trauma centers that will assist them in building awareness of injury issues across communities. The IPC will also expand support to include technical assistance for EMS agencies and their injury prevention efforts.

An expressed need is to have better statewide coordination of prevention activities, which is an activity that will be provided by the SIPP. The Injury Community Planning Group will also assist the SIPP in coordination prevention efforts once it is fully organized and operational.

The SIPP conducted a statewide needs assessment regarding injury epidemiology and identified the need for interventions related to the following: motor vehicle safety, pediatric motor vehicle safety, home safety, recreational safety, and intentional injury activities. The assessment was conducted through a SurveyMonkey™ process requesting information from hospitals, EMS providers and community organizations. The assessment included the identification of injury prevention activities, capacity, staffing, and the potential need for technical assistance from the SIPP in the future. In addition, a Safe States Alliance, State Assessment Team Review is planned in August of 2011. This will enable the state to update the injury prevention plan and to set new goals and priorities for outreach and injury prevention.

The needs assessment identified areas where injury prevention efforts and education are needed. These include rural areas, targeted prevention for adult and elder populations, and occupational safety.

Since the trauma program resides within the ADH, an opportunity exists to work with the Office of Rural Health and the Hometown Health Initiative which has grass roots coalitions located throughout the state. Approximately 50 state employees work with the Hometown Health coalitions and five serve as regional coordinators. Funding for these coalitions to support injury prevention programs and activities may be supported by the trauma program.

The ADH has been successful in passing the trauma legislation. This success along with the passage of a primary seatbelt law and a graduated driver's license law will reduce mortality from trauma-related injuries.

Additional strengths of the SIPP include a strong coalition with organizations such as the Injury Free Coalition for Kids and Mothers Against Drunk Driving (MADD). The emergency healthcare providers also have the availability of the Tandberg system which allows videoconferencing for outreach education. The trauma program has staff proficient in epidemiology. They also have a health injury project specialist and administrative specialist to administer injury and outreach programs and analysis.

The trauma and EMS program staff, along with access to ADH databases, will provide a strong foundation for injury analysis. Development of a public access database is intended so healthcare providers, policymakers and the public can derive a better understanding of the status of injury in Arkansas, their community or region.

The SIPP has evaluation tools in place including pre- and post-tests to assess the effectiveness of education. The trauma data collection system and SIPP are in their infancy. As each matures Arkansas will have an outstanding platform and mechanism to evaluate injury prevention programs.

RECOMMENDATIONS

- Utilize the expertise of the State Injury Prevention Program to
 - Assess the effectiveness of injury prevention programs.
 - Serve as a clearinghouse for the coordination of injury prevention efforts throughout the state.
 - Provide technical assistance to EMS agencies.
- Expand the focus of Injury Prevention Center resource document to encompass all injuries and age groups.
- Regularly produce reports which identify the status of injury prevention and trauma care in Arkansas that serve as the foundation to:
 - Target media messaging aimed at injury prevention and trauma system development.
 - Educate policymakers, healthcare professionals and the public to foster collaboration and cooperation for trauma system enhancement and injury control.
 - Target injury prevention programs to communities based on the needs assessment and analysis of available data.
- Ensure web-based access is provided to the public and policy makers for reports on the status on injury, trauma care, and the effectiveness of injury programs.
- Foster collaboration with the Hometown Healthcare Initiative coalitions and TRACs to assess and implement injury prevention and outreach programs.
 - Educate state staff within the Hometown Healthcare Initiative Coalitions regarding the meaningful use of data to target injury prevention efforts.
- Complete the consumer access database of evidence-based injury prevention strategies.

- Update the injury prevention plan by involving stakeholders, state trauma and EMS staff, TRACs, Highway Safety Office, Office of Rural Health, Hometown Healthcare Initiative Coalitions, and other community injury prevention organizations upon completion of the Safe States Alliance, State Technical Assessment Team (STAT) review.

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, inter-facility 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

The Section of EMS is based in the Arkansas Department of Health, within the Center for Health Protection's Health System and Licensing Regulation Branch. One of the Section's main responsibilities is to certify and re-certify Emergency Medical Technicians (EMTs) as well as EMT instructors, EMT training sites ambulances and prehospital care provider services, including air ambulances. All ambulance services must provide copies of their treatment protocols, to be reviewed by the Section before a license is approved. The Section may revoke provider, instructor, ambulance, or ambulance service licenses. The state last had a National Highway Traffic Safety Administration (NHTSA) Technical Assessment in 1989. The Section is currently implementing a statewide EMS data collection system that is National Emergency Medical Services Information System (NEMSIS) compliant.

A Governor's EMS Advisory Council exists, but it has no standing or current ad hoc committees or subcommittees. The Council is not involved in the day-to-day activities of the EMS Section, for example, the review of agency protocols. Furthermore, no formal relationship exists between the TAC and EMS advisory

councils, although the TAC does have an EMS subcommittee. Having a State EMS Medical Director to provide regular and frequent input to the EMS Section, as well as liaison with the TAC and State Trauma Medical Consultant, would be invaluable.

The state has issued recommendations for basic life support (BLS) protocols. Compliance with these recommendations is not mandatory. No recommendations have been issued for advanced life support (ALS) protocols or trauma protocols, in general (treatment or destination). Furthermore, the TAC has not reviewed the BLS protocols addressing trauma care.

The TSC team heard a general consensus among medical directors, emergency physicians, and trauma surgeons that prehospital care providers are adequately trained and doing a good job in the treatment of trauma patients. However, no data are available at this time to support those opinions. Furthermore, The TAC has not reviewed the Arkansas EMT requirements relevant to trauma care.

All ambulance services must have a medical director under whom the EMS providers function. However, no medical direction oversight is provided at the regional level. In Arkansas, agency medical directors report directly to the Section of EMS. No structure exists at a local or regional level that addresses problems between EMS agencies and hospitals, consistency of protocols or policies, or efficient use of resources. At a local or regional level, any of these problems can only be addressed by going to the medical director of that ambulance service, or to the Section of EMS. In some areas, local professional organizations or providers and ambulance services may attempt to address these issues in an ad hoc manner.

An overriding concern of **all** the stakeholders in regard to EMS and a statewide trauma system is getting patients to the right place at the right time, while maintaining maximal efficiency of EMS resources. The lack of comprehensive statewide trauma triage protocols and destination protocols, coupled with the lack of a statewide regional EMS structure is particularly problematic. A particular challenge, that can be particularly acute in rural areas, is the need for inter-facility transfer outside of a rural ambulance service's area. Not having a regional EMS system, and in particular, a regional EMS medical director, will make it more challenging for the TRACs to address this issue in an effective manner. Addressing this leadership vacuum at the TRAC level would be a relatively quick means by which to address the issue.

Minimal requirements exist for ambulance service medical directors. Tremendous variation is found within the state regarding the qualifications, training, experience, and commitment of these medical directors. General concern has been expressed among EMS providers, ambulance services, and among many medical directors regarding this variability, particularly as it relates to providing

trauma care. A state EMS Medical Director would be able to provide assistance and consultation to local medical directors.

Arkansas has six air ambulance services providing rotary wing services that perform scene calls, as well as inter-facility transports (4 in-state and 2 out-of-state). One in-state service is not associated with any specific facility, and their rotary wing aircraft are distributed throughout the state. Additionally, no specific destination protocols exist for air ambulances responding to trauma-related scene calls. No evaluations have been performed to determine how the current delivery of rotary wing air ambulances address the needs of injured Arkansas residents, or to determine the frequency and nature of inappropriate air ambulance transports for trauma.

In January of 2011, the ATCC became operational. Although administered under the Trauma Section of the Injury Prevention and Control Branch, the service has been contracted to Metropolitan Emergency Medical Services (MEMS), the largest prehospital care provider in Arkansas, based in Little Rock. Thus, from the outset, the ATCC has been well integrated with the EMS system and is being staffed by personnel who have an in depth understanding of the current EMS system as well as being experienced in prehospital trauma care.

All Arkansas counties have access to 911 Services, with E911 available in all but four counties, W911 is available in all but one county. Deficiencies in E911 and W911 should be corrected by fall of 2011, or early 2012.

RECOMMENDATIONS

- **Secure funding for a state Emergency Medical Services (EMS) Medical Director (full-time is desirable) who has responsibility for:**
 - **Establishing state guidelines for EMS, trauma, and air medical protocols.**
 - **Reviewing local and regional EMS agency and air medical protocols for consistency with state guidelines.**
 - **Providing assistance and training to regional and local EMS medical directors.**
 - **Leading regional and statewide EMS performance improvement initiatives.**
 - **Leading the statewide air medical performance improvement program.**
 - **Working collaboratively with the state Trauma Medical Consultant.**

- Request, schedule, and conduct a National Highway Traffic Safety Administration Statewide EMS Technical Assistance Team assessment.
- Simplify, enact, and enforce trauma triage and destination guidelines (consistent with Centers for Disease Control field triage guidelines) across the state to include all facilities and EMS agencies.
- Develop a set of statewide uniform trauma treatment protocols for both basic life support and advanced life support EMS agencies.
- Evaluate the current helicopter coverage to improve the effectiveness and efficiency of scene response and inter-facility transfer.
- Develop a strategic plan to enhance recruitment, training, and retention of EMS providers.
- Develop a joint subcommittee of the TAC and EMSAC on Trauma Care.
 - Task the joint subcommittee to develop requirements for trauma-specific continuing medical education for EMS providers.
- Recruit and contract with an EMS Medical Director for each TRAC.

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

Many operational functions of the trauma system have been active for less than a year at the time of the TSC visit, being implemented after passage of the 2009 trauma system legislation. In that time, a great deal has been accomplished, but the system is very much in its infancy.

Beginning in 2009 the ADH solicited all licensed hospitals to participate in the trauma system, with associated financial support. The ADH estimated that 82 facilities were eligible, including 29 critical access hospitals. By April 2011, 77 facilities had made an initial application. The ADH has established criteria for four levels of hospital designation loosely based upon 2005 ACS COT criteria, and it has established a process for site visits and hospital verification. The solicitation process for trauma system participation also included key trauma resource hospitals in neighboring states that provide care for a significant number of Arkansas residents. To date, the ADH has designated 18 facilities including 3 adult level I centers (2 of which are in adjoining states), 1 pediatric level I center, 3 level II centers (two in the Little Rock metro area), 2 level III centers, and 9 level IV centers. An estimated 30 to 40 additional facilities are expected to become designated within the next year, mostly at level III and IV. If the current trend continues, the majority of licensed facilities will be participants in the inclusive trauma system. Current leadership has emphasized the voluntary nature of the system, a concept somewhat at odds with a truly inclusive model, but to date voluntary participation appears to be quite broad.

The stated intent of the trauma system is to match injured patients with the closest appropriate facility. Field triage and interfacility transfer protocols intended to accomplish this goal remain somewhat vague, inconsistent, and are also voluntary in nature. Current regulations allow for either the patient or an attending physician to override destination choices dictated by trauma protocol, though stakeholders report this to be uncommon. (It is noteworthy that very few front-line EMS providers from outside the Little Rock area were present during the interactive sessions). Outside the immediate vicinity of the level I centers, the initial destination is most commonly a smaller hospital with limited resources, resulting in the need for inter-facility transfer. Stakeholders relate that prior to system implementation, this process was difficult and time consuming as emergency physicians often placed calls to several facilities before finding one that would accept a given patient.

A major and innovative step forward was taken with the establishment of the ATCC which began operations in January 2011. This facility is intended to answer calls both from EMS providers in the field, as well as hospitals. The ATCC utilizes a real-time internet-based dashboard to assess hospital capacities, and attempts to match a patient with the closest appropriate facility. The ATCC then contacts the identified hospital for acceptance. At the present time, the contacted hospital may decline a particular patient, despite having a “green” dashboard, and this occurrence is tracked by the ATCC. At present the majority of calls are for inter-facility transfers. Preliminary results are reported to be good, with shortened time and greater ease in patient placement. Field call volume to the ATCC is increasing with the deployment of more robust communications equipment to EMS ambulances, and results are also reported to be good. At present, the decision to utilize ATCC is voluntary, both at the prehospital and hospital level. Participation in the ATCC is encouraged through the deliverables associated with the grant program.

Arkansas is a rural state, and faces significant resource challenges related to the provision of definitive trauma care, especially at the level of general surgery, neurosurgery, and other medical and surgical specialties. Arkansas currently has one level I adult and one level I pediatric center, both located near the geographic center of the state. These high level centers are supported by two out-of-state level I centers, one on the eastern border and one to the north. Based both upon estimated injury frequency and resource availability, it seems unlikely that additional level I resources can be established or supported.

Currently there are few applicants for level II designation, as incentives for both providers and hospitals seem to favor designation at lower levels even when hospitals may have specialty coverage. This circumstance, combined with real-time indications of specialty coverage and central call coordination through ATCC, has led to the de-facto creation of a system where patients are directed based on instantaneous availability of needed specialty coverage with little or no reference to level of trauma center designation. While this system has great

potential to efficiently provide initial operative care, it fails to address more systematic components of care, such as intensive care unit (ICU) care for traumatic brain injury patients, which are not guaranteed by the sporadic presence of a specialty surgeon. It should more commonly be the inability to provide such consistent longitudinal coverage (e.g. ICU care) that dictates facility designation at a lower level, to avoid placement of a patient at a facility lacking comprehensive and full-time specialty coverage. The current system based upon immediate, but sporadic, availability of a specialty surgeon, without ICU care capability, may result in secondary transfer or suboptimal care.

Under the current system, the primary difference between level II and level III trauma center designation surrounds the availability of resources for the management of central nervous system (CNS) injury. As the majority of brain and spinal injuries are treated non-operatively, this differentiation runs more deeply than the immediate availability of a neurosurgeon, and must include a constant institutional commitment to the non-operative ICU and in-house care as well. Therefore, the need to recruit additional level II centers within Arkansas will be driven by the need to provide more system resources for the management of CNS injury. Based upon the transport times involved, input from stakeholders and recent needs assessment data, it seems likely that the existing level I centers in central Arkansas are sufficient to provide care for the severe CNS injury patients, and that the resources needed to establish additional level II centers may not be well utilized. Instead, field and inter-hospital destination protocols should be adjusted to ensure that patients with severe CNS injury are ultimately routed to the level I centers. Less severe injuries can be managed locally, especially with good teleradiology capability.

The primary difference between level III and level IV designation surrounds the ability to provide strong general surgical and orthopedic support. This includes the ability to rapidly control hemorrhage and resuscitate patients in hemorrhagic shock. Unlike patients with CNS injury, operative intervention is frequently required, and such patients are more likely to be too unstable for longer transport, reinforcing the need to maintain a strong distributed resource network of level III trauma centers. It follows that trauma system resources should be focused upon identification of hospitals capable of becoming strong level III trauma centers, and then provide the necessary incentives and support to promote these hospitals to become designated at level III. The particular barriers to level III designation should be carefully evaluated, and if appropriate, level III designation criteria should be adjusted to minimize these barriers with the goal of establishing sufficient level III resources to provide good geographic coverage. Field and inter-hospital destination protocols should be adjusted to ensure that patients with physiological or anatomical criteria (CDC Field Triage Guidelines step 1 or step 2) are routed to facilities designated at least at level III or higher---when possible. Less severely injured patients and patients with uncomplicated single system injuries are efficiently handled by the current system which routes

based upon instantaneous resource availability without regard to level of designation.

While the desire for voluntary participation in the trauma system is understandable, the priority of having all acute care facilities participating in the system may be more readily achievable and sustainable through mandatory participation. As the system matures, this priority is likely to become the more important. The desire to have voluntary participation of EMS providers in system-driven triage decisions is less well supported. The triage of severely injured patients (CDC Field Triage Guidelines step 1 or step 2) through the ATCC and according to system protocol should be mandatory. Equally, while it is reasonable that the ATCC has been initiated with the understanding that ATCC triage decisions are advisory only, it should be the clear expectation that a hospital with a “green” dashboard should not refuse ATCC-directed patients, and any deviation from that expectation should be closely tracked and analyzed by the TAC.

Among the other strengths in this developing trauma system include the high percentage of hospitals with initial voluntary participation is admirable. The fact that the system provides financial support for hospital and provider readiness is, likewise a strong attribute. The engagement of out-of-state resources to fill system needs fits well with the overall mission of excellence. Also of note is the centralized triage resource (ATCC) capable of matching patients to closest appropriate facility, whether field or inter-hospital transport. The emerging discussion of the centralization and use of televideo consultations for hand coverage is forward thinking.

Not unique to Arkansas, the real and anticipated resource limitations, including neurosurgery, general surgery, emergency medicine, and specialty orthopedics poses a threat to future system development. The tendency for hospitals to designate below potential capabilities could be a detriment to the system in certain key geographic areas. The transfer or disposition of patients by the ATCC based upon instantaneous and perhaps sporadic resource availability without consideration of designation level could lead to unintended patient outcomes. Too much latitude for non-compliance with ATCC recommendations and TAC/TRAC destination protocols exists.

RECOMMENDATIONS

- **Concentrate on ensuring good geographical coverage of level III trauma facilities with consistent general surgical and orthopaedic resources.**
- **Establish and enforce destination protocols that route patients to designated facilities according to estimated severity (e.g., the Centers for Disease Control (CDC) Field Triage Guidelines step 1 and 2)**

- **Protocols should be written to facilitate expeditious placement of patients with severe CNS injury at level I centers**
- **All patients with physiological or anatomical markers of injury (CDC Field Triage Guidelines step 1 or 2) should be routed to centers designated at level III or above whenever possible**
- **Patients without anatomic or physiologic markers of severe injury can be routed based upon instantaneous resource availability alone**
- **Require field providers and transferring hospitals to utilize the Arkansas Trauma Call Center (ATCC) or applicable destination protocols for severely injured patients (e.g., the CDC Field Triage Guidelines step 1 and 2).**
 - **Require field providers and receiving hospitals to comply with ATCC recommendations or applicable protocols.**
 - **Track and analyze all variances.**
- Continue efforts to designate hospitals, with goal of 100% participation
- De-emphasize development of level II centers in areas already under the umbrella of level I facilities
- Utilize the grant contracting process to ensure level-specific compliance with specific trauma system priority initiatives
 - Adopt an incremental approach to raise level-specific resource and performance expectations
- Evaluate and update trauma center designation criteria to ensure compatibility with current standards.
 - Carefully evaluate real and perceived barriers to designation at a given level, especially level III.
- Enforce designation criteria uniformly to ensure consistent compliance with standards

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 passage of Act 393, the Trauma Systems Act, in 2009 and the funding appropriated by the legislature in 2010 provided Arkansas the opportunity to develop and implement an inclusive, statewide trauma system to improve patient outcomes and to ensure that the right patient is transported to the right facility at the right time. Impressive progress has been realized in a very short period of time by a dedicated group of stakeholders and supportive entities across the state. Many complex problems have been addressed, and preliminary evidence shows measurable improvements in outcome. Attaining optimal performance, system efficiency and patient flow is complicated by many factors. In Arkansas, as in many other states, these factors include geography, maldistribution of resources, the lack of an enforceable set of trauma system rules that regulate the movement of patients within the system, the inertia of pre-existing “solutions,” and the local culture of providers, agencies and facilities. Inclusion of out-of-state trauma centers in the system has ameliorated some of the challenges faced by regions distant from Little Rock where the state’s Level I trauma centers are concentrated.

Presently, prehospital triage guidelines are not consistent with the national Field Triage Guidelines published by the CDC in 2009. Patients and EMS providers have significant discretion in decisions regarding the destination facility. In addition, a “paradox” in the written rules exists, as described to the TSC team: take patients to the local facility with appropriate capacity/capability versus take patients to highest appropriate designated level trauma center within a geographic area. This situation exists, in part, because of under-designation of trauma centers, which is most often due to the reluctance of medical staff to engage in the trauma system, but also to the fact that Arkansas has only recently begun designating trauma centers. In effect, designation becomes subordinate to local assessments of capacity and capability. A partial remedy to this situation has been the successful deployment of the ATCC. Established in 2009 as part of Act 393 to facilitate prompt communication and coordination of available hospital resources, the ATCC plays a key role in integrating prehospital, hospital and system resources to promote optimal and timely care delivery for injured patients throughout the state. Currently, it is believed that a substantial number of inter-facility trauma transports are routed through the ATCC. The use of the ATCC by EMS providers is sporadic but growing.

The use of a unique trauma patient identifier (the trauma wrist band) allows tracking of trauma patients through the system, and it should be a valuable tool for system evaluation and PI. The trauma wrist band is applied at the point of first

contact of the trauma patient, and its use is required as part of the ATCC referral process. The trauma wrist band remains with the patient throughout his/her course of treatment. The dashboard function at the ATCC provides an easily accessible web-based resource that identifies available resources and facilitates patient movement in the system. Driven by recently introduced trauma system enhancements and funding, the ATCC, the dashboard, and the trauma wrist band appear to have been widely adopted. The ATCC works closely with the TAC and the TRACs to provide opportunities for data-driven PI and accountability.

Opportunities for improvement clearly exist in the prehospital triage and transport of patients. In addition to more explicit algorithms drawn from national guidelines, firm enforcement of triage guidelines is needed. This is particularly true for special populations such as traumatic brain injury (TBI) and spinal cord injury (SCI). The ATCC cannot currently mandate triage or transfer decisions. Anecdotally, improvements in flow of patients have been reported. For example, a significant decrease in the amount of time emergency physicians spend securing the transfer of a trauma patient to an appropriate level of care has occurred, because the ATCC now has this responsibility, resulting in a shorter time to definitive care.

Destination protocols are currently formulated regionally. Opportunity exists for these to be improved and become more consistent. These protocols are currently being reviewed at the state level, and feedback is being provided to each region. Special consideration appears to be needed for the southeast region which appears underserved both in terms of EMS providers and hospital resources.

Very few data were provided regarding the integration of flight services into the system. It does not appear that air medical services have been closely involved in the developing plan, although they represent a valuable resource in this rural environment with limited and often distant high-level resources.

Inter-facility transfer of patients appears to be occurring in a more efficient manner, thanks to the ATCC and the dashboard. Under-designation of hospitals and the difficulty in securing medical staff support at some level III and IV trauma centers continue to create difficulties in the system. Allowing hospitals flexibility in managing their resources has allowed improved access to these trauma centers on an intermittent basis. For example, a hospital with one neurosurgeon may change its dashboard status in neurosurgery to unavailable if the neurosurgeon is performing a procedure or out of town then change it back to available when the neurosurgeon is again available. The current rules would allow such a facility flexibility to do so for up to one third of the time, while retaining its designation. Although helpful at this stage of trauma system development, this is not an ideal long-term solution. The presence of a single provider on an occasional or sporadic basis does not speak to the commitment and capability of the facility to care for a patient during the entire hospital stay. Monitoring resource availability

and “refusals” via the dashboard should provide objective data for remedial solutions.

The trauma system is in the process of developing regional solutions for hand and re-implantation call utilizing telemedicine technology (e.g. Tandberg and Movi). Hand surgeons in different locations within a region provide coverage depending on their availability and telemedicine is used as a tool for evaluation and triage of patients to the appropriate location. The opportunity exists for this approach to be used for other special populations that require highly specialized care. Other opportunities for deployment of this technology in underserved areas such as the Southeast region of the state may evolve.

The fact that the Arkansas trauma system is evolving along the lines of an inclusive trauma system and the inclusion of outside facilities in the system are seen as strengths. Additionally the ATCC and dashboard and the real-time system status patient management capabilities of the facilities could evolve into a huge asset for both routine and catastrophic responses. The trauma wrist band that allows for patient tracking across the system is unique and could help facilitate better system evaluation and PI. The development of unique strategies for areas of resource deficiencies, such as hand surgery and replantation along with the use of televideo resources to address these needs is commendable.

One of the key issues facing the system is the “loose” nature of the trauma destination triage criteria. First it is not reflective of the most current thinking on the topic (CDC – 2009). Second limited enforcement of the protocols currently exists. Finally, the lack of resources in the Southeast region of the state has not been addressed by a clear plan to overcome the lack of such resources.

RECOMMENDATIONS

- **Incorporate destination and transfer performance criteria into grants and contracts to drive compliance.**
- Develop and implement written triage rules consistent with Centers for Disease Control Field Triage Guidelines.
- Resolve facility designation versus facility availability guidelines for triage decisions.
- Integrate air medical services into the evolving triage plan.
- Use accumulating data from the Arkansas Trauma Call Center to drive performance improvement at the regional and state levels.
- Perform a system coordination and patient flow needs assessment for each region.

Rehabilitation

Purpose and Rationale

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

The trauma system should conduct a rehabilitation needs assessment (including specialized programs in SCI, TBI, and for children) to identify the number of beds needed and available for rehabilitation in the geographic region. Rehabilitation specialists should be integrated into the multidisciplinary advisory committee to ensure that rehabilitation issues are integrated into the trauma system plan. The trauma system should demonstrate strong linkages and transfer agreements between designated trauma centers and rehabilitation facilities located in its geographic region (in or out of state). Plans for repatriation of patients, especially when rehabilitation centers across state lines are used, should be part of rehabilitation system planning. Feedback on functional outcomes after rehabilitation should be made available to the trauma centers.

OPTIMAL ELEMENTS

I. The lead agency ensures that adequate rehabilitation facilities have been integrated into the trauma system and that these resources are made available to all populations requiring them. **(B-308)**

- a. The lead agency has incorporated, within the trauma system plan and the trauma center standards, requirements for rehabilitation services, including interfacility transfer of trauma patients to rehabilitation centers. **(I-308.1)**
- b. Rehabilitation centers and outpatient rehabilitation services provide data on trauma patients to the central trauma system registry that include final disposition, functional outcome, and rehabilitation costs and also participate in performance improvement processes. **(I-308.2)**

II. A resource assessment for the trauma system has been completed and is regularly updated. **(B-103)**

- a. The trauma system has completed a comprehensive system status inventory that identifies the availability and distribution of current capabilities and resources. **(I-103.1)**

CURRENT STATUS

Rehabilitation was recognized as a priority early in the development of the present trauma system. As a result, a rehabilitation subcommittee of the TAC was created and is active with a broad representation of stakeholders. A needs assessment of rehabilitation resources available to injured patients was recently completed and data are being finalized. Funding has been allocated for rehabilitation at the level of \$500,000 per year. These funds will be distributed after the results of the recently completed needs assessment are reviewed and a plan is developed.

The needs assessment consisted of a self-report survey conducted in a semi-structured interview format. The review noted 1137 rehabilitation beds at 30 facilities (5 out of state, 50% free standing). Slightly more than half of the facilities are non-profit. Although the number of available beds appears large for the population served, it is clear that inadequate specialty capacity exists. Only 15% of the beds are designated for specific diagnoses. Four pediatric ventilator rehabilitation beds exist at the Arkansas Children's Hospital in Little Rock, but no adult rehabilitation beds exist for ventilated patients in the state. As a result, many (if not most) severe TBI and SCI patients either go out-of-state for rehabilitation or are admitted to in-state facilities, but patients do not get comprehensive, diagnosis-specific rehabilitation. Although responding facilities reported that unfunded services varied between 1 and 80%, trauma clinicians report that transfer of unfunded patients to rehabilitation is a slow and difficult process.

Although the number of rehabilitation beds, facilities and providers is large, significant variation was reported in admission guidelines, care standards, physician and staff qualifications, and engagement with the trauma system. About 30% of facilities were noted to be Commission on the Accreditation of Rehabilitation Facilities (CARF) accredited. Half of the medical directors were reported to be physical medicine and rehabilitation physicians.

Generally, follow-up and long term outcomes are not readily available and specialized community resources post-discharge from rehabilitation are limited. This is especially true for the more severely injured patients and those with limited or no insurance.

Arkansas, at first glance, appears to be resource rich in terms of the total number of beds and rehabilitation facilities. At least 30% of these facilities have met Commission on the Accreditation of Rehabilitation Facilities (CARF) standards. The recent completion of a needs assessment pertaining to rehabilitation could serve to inform the trauma system as it develops a plan and allocates resources to meet the goals and objectives of that plan. The fact that the trauma system financing includes resources for rehabilitation is notable.

At closer look it becomes apparent that, while giving the illusion of being resource rich, when it comes specifically to injury rehabilitation, a paucity of specialty resources exists. This is particularly true in the areas of TBI and SCI rehabilitation beds. The scarcity of those resources is exacerbated if the patient is uninsured or is ventilator dependent. The level of medical expertise and oversight of rehabilitation centers and programs across the state appears to vary dramatically. Limited follow-up for patients and their families following debilitating injury events also is a challenge.

RECOMMENDATIONS

- **Identify and provide financial support to an adult rehabilitation facility that can accommodate patients with traumatic brain injury, spinal cord injury, and ventilator needs.**
- Fund the development of focused injury rehabilitation at a small number of in-state centers that secure and maintain Commission on the Accreditation of Rehabilitation Facilities (CARF) accreditation.
- Include or link long-term rehabilitation outcomes to the state trauma registry.
- Provide grant funding for community resources to support survivors of TBI, SCI, and other severe injuries and their families.
- Support vocational rehabilitation for injury patients.
- Facilitate entry into Medicaid for severely injured patients, and support dedicated injury Medicaid beds at selected rehabilitation facilities.

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

The ADH has a fully functional and well-equipped emergency operations center that can serve as a backup for the state Emergency Operations Center (EOC) if necessary. The EOC houses a communications center with redundant communications capabilities. State trauma personnel are fully trained in the National Incident Management System (NIMS) Incident Command Structure (ICS) and have had some participation in recent disaster exercises.

The ADH serves as the Emergency Support Function 8 (ESF 8): Public Health and Medical Services lead agency for the health and medical related disasters. The ADH has a Public Health Preparedness Branch which serves as its emergency management arm.

Though the TSC team did not see the Surge Capacity and mass casualty incident (MCI) plans, the team was informed that they exist but require updating. The plans should also be better integrated with the trauma and EMS programs. These plans help define the roles and direct resources when medical assets have been outstripped at the local level.

The ATCC is an outstanding resource for use during a disaster. The ATCC assesses the capacity and capabilities of the emergency healthcare system on a daily basis and assists with scheduling the transfer of patients between facilities. The ATCC's ability to manage and coordinate ground and air transportation may be a benefit to the system, providers, and patients in the event of a disaster.

Through a capabilities and analysis exercise, the ADH identified a gap in communication capabilities with EMS providers. To address this issue, T1 lines have been funded which also support teleconferencing capabilities. The purchase of 600 Arkansas Wireless Information Network (AWIN) radios was also funded, and these radios are currently being distributed to EMS providers.

The state has also implemented an electronic incident and resource management system (EMsystems) which is utilized by ATCC, hospitals, and the state. The state reported plans to acquire and implement Web EOC, which will enhance the capability for responders and engaged EOCs to monitor the incident and share information.

The emergency healthcare system has adopted the Simple Triage and Rapid Transportation (START) disaster triage guidelines statewide. However, testimony was provided that, while the hospital emergency managers or ED directors may have knowledge of the triage system, this information has not permeated the entire medical staff at the hospitals. Comprehensive training is needed, and a mechanism to track training and exercise participation should be established.

Though exercises have been conducted and response to real events have provided additional opportunities to test disaster plans, little evidence was provided of how real “lessons learned” are applied. Participants reported the need to clarify roles, communicate “who’s in charge” and incorporate all available resources for response to a disaster, including the ATCC.

The trauma system program leadership should have working knowledge of hospital and EMS capabilities and assets for disaster and MCI response. In addition, the trauma system may be able to acquire and assist with the deployment of additional equipment, materials and personnel, when needed.

RECOMMENDATIONS

- Form an ad hoc workgroup of stakeholders, including the trauma and EMS advisory councils and the Arkansas Trauma Call Center (ATCC), to develop an operational plan for the utilization of air medical services and other air resources such as the National Guard in the event of a disaster.
- Integrate the ATCC into the Arkansas Department of Health (ADH) disaster response plan, to assess the capacity of the emergency healthcare system, track patients and monitor EMS and hospital resources.
- Include the trauma, emergency medical services (EMS), public health, and hospital preparedness staff members in updating the state medical surge, Mass Casualty Incident, Continuity of Operations, and ADH response plans.
- Compile and analyze the inventory of available EMS and hospital resources, including communications capabilities, to ensure the emergency healthcare system has the ability to surge in the event of a disaster.
- Establish a cache of state health and medical assets to support the emergency healthcare system based on a comprehensive statewide assessment of EMS and trauma resources and a gap analysis.
- Under the leadership of the Center for Health Protection’s emergency preparedness manager, establish an internal disaster workgroup that utilizes recommendations from the after-action reports and integrates the lessons learned into response plans for dissemination.
- Ensure the ADH is in compliance with National Incident Management System (NIMS) and clearly identifies its Incident Command Structure (ICS) in the event of disaster or in exercise drills so external partners clearly know who is in charge.
- Utilize an on-line training mechanism (e.g., A-TRAIN) to track hospital medical staff disaster training and participation in exercises.

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 trauma system leadership stated a desire to build a strong systemwide evaluation and PI process into the emerging trauma system at the earliest possible point. The rapid development of the system, coupled with the fact that the trauma registry is just now reaching a critical mass of cases, has hampered the desire to initiate PI processes. Those points notwithstanding, progress has been made in laying the groundwork for system PI.

The TRACs assisted the TAC with the development of a list of “Trauma Data and Audit Filters.” As expected, at this early juncture the indicators relate to structure and process. Several of the audit filters will be easy to glean from the trauma registry. Many others will require additional data abstraction and follow-up. The indicators include measures that are applicable across the trauma designation spectrum. The filters only minimally capture items of trauma system interest from prehospital or inter-facility transferring agencies. No audit filters were identified concerning the data acquisition process itself, either in the trauma registry or the prehospital data set. The ATCC has a series of PI indicators as well which will be useful in monitoring prehospital and inter-facility transfer behavior over time.

While the trauma data and audit filters serve as a good source for informing PI processes, it is unclear who will oversee the data and actually perform the PI. A paucity of trauma PI experience was reported at local facility levels, and it is not known if the TRAC’s have the administrative infrastructure to assist with PI

across their regions. The need for training of individual trauma program managers in PI activities was noted.

An interest was expressed in partnering with the ACS Trauma Quality Improvement Program (TQIP). TQIP would allow individual facilities to compare their performance outcomes in pre-defined clinical conditions against facilities of similar size and configurations both within and outside of Arkansas.

Additionally, the trauma program has access to some resources to engage a Quality Improvement Organization (QIO) to assist with PI activities. The request for proposal for the QIO has not yet been developed, and the stakeholders are still determining how to best harness the skill set of a QIO. Some thoughts have included using their abstractors in a training manner for local trauma registrars (after they have been appropriately trained themselves), using them in a data validation role, and potentially using them in a data entry role at the smaller facilities with limited personnel capacity.

The enabling trauma legislation has robust data and PI process protection and can serve as a model for other states. The application of this protection includes the regional and provider level PI processes.

The trauma program and TAC have outlined the structure and purpose for a committee to monitor and evaluate the trauma system. The Trauma Outcomes and Performance Improvement Committee (TOPIC) will be charged with reviewing the registry, performance measures, benchmarks, and performance indicators. They will be broad based and multi-disciplinary, reporting to the Trauma section, the TAC, and trauma medical consultant.

The trauma program has additional resources within the state to assist with the implementation of a statewide PI program. The Center for Injury Prevention, the School of Public Health, and the medical school may provide interns or contractual services, as specific needs and activities are identified.

Because the data collection system is in its infancy, it is unclear how robust the data are or will be. Running reports may assist in more clearly defining the data and outcomes even though current data are limited.

Once a PI plan is developed that outlines the statewide and regional process, a mechanism must be in place to regularly educate EMS providers, medical directors, and hospitals on how to measure outcomes and processes based on performance indicators. The development of an educational program could become part of the contract with the QIO. Consideration should be given to conducting an annual forum specifically targeted to discuss, inform and educate trauma system constituents on the PI process and program.

RECOMMENDATIONS

- **Contract with national experts to assist in the development of a Performance Improvement (PI) plan that outlines the state and regional PI process and system indicators.**
- Continue to pursue statewide participation in the Trauma Quality Improvement Program (TQIP) of the American College of Surgeons.
- Use all available databases to assess trauma system performance and outcomes.
- Ensure that financial incentives for hospitals and for the EMS agencies are aligned with system needs, achieving system performance measures, and strategic planning goals.
- Utilize the resources available through the National Association of State EMS Officials – Trauma Managers Council for PI measures and state PI programs.
- Use available EMS and trauma information to assess the cost effectiveness of the overall trauma system.
- Integrate and use the Arkansas Trauma Call Center data for statewide and regional system PI.

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

Several of the trauma management information system components exist in Arkansas. Among these databases are the hospital discharge data (UB 04), motor vehicle crash data, prehospital provider electronic patient care reports, and the trauma registry. An emergency department database is currently in field test trials. These datasets are in varying stages of maturity and evolution (see below). These datasets cannot currently be analyzed, either separately or in an aggregate form, to provide a complete and comprehensive trauma management information system (MIS) to inform policy development or to evaluate the structure, process or outcome of the trauma system across all phases of care.

Hospital Discharge Database

Adheres to National Standards: Yes – Uniform Billing (UB04)
 Status: Mature
 Use: Epidemiological reports, injury prevention
 Linkage: Probabilistic

EMS Patient Care Reporting Database

Adheres to National Standards: Yes – (NEMSIS Gold)
 Status: Data validation in process
 Use: Summary activities, injury surveillance, linkage to trauma registry
 Linkage: Deterministic through trauma band

ED Discharge Database

Adheres to National Standards: Unclear
 Status: In field test trials (3 EDs)
 Use: Injury surveillance
 Linkage: Unclear – Probabilistic

Trauma Registry

Adheres to National Standards: Yes – National Trauma Data Standard (NTDS)

Status: Data validation in process

Use: Inform trauma policy, linkage to above datasets, system PI

Linkage: Deterministic through trauma band

Knowledge and skills exist both within the ADH and in other agencies and entities to complete the build-out of the various data sources. Additionally, some expertise is available to help link various datasets. The trauma wrist band as a common identifier will contribute to a deterministic, rather than probabilistic, linkage process across the trauma registry and prehospital datasets.

The trauma registry, which is the foundational building block of the trauma MIS, is a combination of on-site electronic data entry through the NTRACS™ product and a web-based portal for data entry from smaller facilities. NTRACS and the web-based portal are both products of a single software vendor. The data are housed on a secure server at the ADH. A standard data dictionary has been developed and limited orientation/training has been provided. The trauma registry system has been on line since early 2011. Stakeholders noted that it will be at least another six months before they will feel confident in the sufficiency and quality of the data to help inform policy to perform system PI (other than indicators relative to data quality).

Arkansas has significant epidemiological resources and support which are not common in many statewide trauma systems. The essential framework (NTDS compliant registry/NEMSIS compliant prehospital data system) for eventual data linkage is in place. The trauma wrist band adds additional robustness to the probability of data linkage. A single data dictionary has been established for the trauma registry, and plans are in place to train registrars in the nuances of the dictionary and data entry systems. These plans include the potential use of the video teleconferencing assets already in place. The early development of an ED discharge data system is encouraging and could eventually add additional depth to the trauma MIS.

Linkage of data systems is never as easy as might be imagined and the system will be faced with unknown future challenges regarding linkage and validation of data. Clearly, at this juncture, variable interpretation of the data dictionary is probable. It is not known if all resources have been used to facilitate development of the MIS, e.g. NHTSA Section 408 funds.

RECOMMENDATIONS

- **Design and begin running standard reports from the trauma registry (recognizing that early reports will have errors) for a user group to help achieve consensus on the report format and structure.**
- Begin Trauma Registry and prehospital data linkage even as validation and data cleaning continues
 - Secure a small “test” database from each source, separate from the main databases, and begin the linkage process.
- Establish benchmarks for data validity and reliability from each submitting trauma center and EMS agency and monitor performance against those benchmarks.
- Work with the emerging emergency department dataset to ensure that linkage with the trauma registry and prehospital data system is built in at the front end.
- Examine all options for the use of the quality improvement organization, including registrar training, data validation, and even data entry at small facilities to provide optimal benefit for the trauma program.
- Engage the hospital trauma registrars to define their training and technical assistance needs, as well as to improve data quality.
 - Provide the training.
 - Consider using the videoconferencing system for training and technical assistance functions with remote trauma registrars.

Research

Purpose and Rationale

Overview of Research Activity

Trauma systems are remarkably diverse. This diversity is simply a reflection of authorities tailoring the system to meet the needs of the region based on the unique combination of geographic, economic, and population characteristics within their jurisdiction. In addition, trauma systems are not fixed in their organization or operation. The system evolves over years in response to lessons learned, critical review, and changes in population demographics. Given the diversity of organization and the dynamic nature of any particular system, it is valuable when research can be conducted that evaluates the effectiveness of the regional or statewide system. Research drives the system and will provide the foundation for system development and performance improvement. Research findings provide value in defining best practices and might alter system development. Thus, the system should facilitate and encourage trauma-related research through processes designed to make data available to investigators. Competitive grants or contracts made available through lead authorities or constituencies should provide funds to support research activities. All system components should contribute to the research agenda. The extent to which research activities are required should be clearly outlined in the trauma system plan and/or the criteria for trauma center designation.

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

Trauma Registry-based Research

Investigators examining trauma systems can use the information recorded in trauma registries to great advantage to determine the prevalence and annual incidence rate of injuries, patterns of care that occur to injured patients in the system's region, and outcomes for the patients. These data can be compared with standards available from other trauma registries, such as the NTDB. Such comparisons can then enable investigators to determine if care within their region is within standards and can allow for benchmarking. Initiating and sustaining injury prevention initiatives is a vital goal in mature trauma systems. Investigators can take a leadership role in performing research using trauma registry data that identify emerging threats and instituting public health measures to mitigate the threats. For example, a recent surge in death and disability related to off -road vehicles can be identified and the scope of the problem defined in terms of who,

where, and how riders are injured, and then, through presentations and publications, the public can be informed of a new threat.

Trauma system administrators have a responsibility to control investigators' access to the registry. The integrity and reliability of data in a trauma systems registry are essential if accurate research and valid conclusions are to be reached using the data. Trauma system administrators should have a process that screens data entered into the system's composite registry from individual institutions. There should be a mechanism that ensures that the information is stored in a secure manner. Investigators who seek access to the trauma registry must follow a written policy and procedure that includes approval by an authorized institutional review board. Trauma registry data may include unique identifiers, and system administrators must ensure that patient confidentiality is respected, consistent with state and federal regulations.

Population-based Trauma System Research

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

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

Participation in Research Projects and Primary Data Collection

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

Measures of Research Activity

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

OPTIMAL ELEMENTS

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

- a. The lead agency has available for use the latest in computer/technology advances and analytic tools for monitoring injury prevention and control components of the trauma system. There is reporting on the outcome of implemented strategies for injury prevention and control programs within the trauma system. **(I-301.4)**

II. The lead agency ensures that the trauma system demonstrates prevention and medical outreach activities within its defined service area. **(B-306)**

- a. The trauma system has developed mechanisms to engage the general medical community and other system participants in their research findings and performance improvement efforts. **(I-306.1)**
- b. The effect or impact of outreach programs (medical community training/support and prevention activities) is evaluated as part of a system performance improvement process. **(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

Although in the very early stages of development and implementation, the Arkansas Trauma System is already taking steps to identify research priorities and build research collaborations among the participants in the system. In fact, the trauma system is already considering several quasi-experimental studies which can be implemented during the early phases of developing the system---this is very innovative thinking.

Later during 2011, the trauma leadership will meet with research experts from within and outside the state to identify research priorities and strategies to address study the system. Ideally, Arkansas can design and develop a trauma system that will facilitate research rather than needing to reverse engineer the trauma system at a later date to accomplish conduct research. However, one important component that has not been considered is the value of forming a standing trauma system research committee or group. This group could identify research strategies, review research proposals, and facilitate efficient compliance and project application processes.

A particularly strong research collaboration already existing is the systems partnership with the ACH Pediatric Injury Prevention Center, directed by Dr. Mary Aitken, who is also the Chief of the Center for Applied Research and Evaluation at UAMS. This Center has already conducted injury prevention research within the state. Although in the prior focus of the IPC has been childhood injuries, it has recently expanded its scope and expertise to include injuries across the lifespan. The IPC has also provided expertise for evaluations within the system that are not related to injury prevention. The trauma system should continue to make use of these resources for evaluation and also research that is not limited to injury prevention. Potential research collaboration also exists with the UAMS. The Department of Emergency Medicine and Department of Surgery both comprise faculty with expertise in clinical research. They are also working together to try to develop a specific Injury Research Program or Center at UAMS.

The ADH has very clear guidelines that define the requirements for using data belonging to the Department, such as data from the system trauma registry. Particularly insightful is their distinction between evaluation projects, research projects that are only making use of preexisting data, and research projects that will include interventions or involve primary data collection. These guidelines will be very helpful in facilitating evaluation and research within the trauma system. Furthermore there is data management, analytical, and epidemiologic expertise within the ADH, in particular within the Injury Prevention and Control Branch within the Center for Health Protection, and in the Analytical Epidemiology

Branch of the Center for Public Health Practice that can be made available to investigators conducting research within the trauma system.

The trauma system has also identified institutions within the state, such as the University of Arkansas School of Public Health and the University of Arkansas School of Public Policy which can collaborate on research. Institutions or resources outside of the state that can facilitate the research have not yet been identified for trauma system research. For example, the University of Alabama in Birmingham has a CDC funded Injury Prevention and Control Center. The mission of this center includes collaborating with institutions and groups within its geographic region to develop and implement research involving all aspects of injury control, including acute care.

The trauma system should also consider having bi-annual reports that describe ongoing or completed research within the system. This is an activity that a future trauma system research committee could oversee. The system also needs to begin identifying resources for funding research including starting a special fund or foundation which could support systemwide research.

RECOMMENDATIONS

- Establish a trauma system research group or committee to:
 - Identify research priorities for the system
 - Provide scientific review and approval of research proposals using the trauma system data
 - Develop strategies to enhance the efficiency of Institutional Review Board review for system-wide research
 - Develop guidelines for investigators who are considering research studies within the trauma system regarding the review process as well as research regulatory issues
- Identify sources for funding trauma system research
- Inventory, catalogue and distribute, through a bi-annual trauma system report, all trauma related research completed by entities within state borders, including the statewide trauma system.
- Develop a collaboration with the Centers for Disease Control funded Injury Prevention and Control Center at the University of Alabama at Birmingham.

Focused Questions

Question 1

What is the best way for our State to continually assess, or benchmark, its progress in all areas of our trauma system? Is there a best practice model that is available, or guidance to develop our own?

Current Status:

Multiple tactics can be employed to assist with the ongoing monitoring, evaluation, and benchmarking of the Arkansas trauma system. The Benchmark, Indicator and Scoring (BIS) tool contained in the HRSA (2006) *Model Trauma Systems Planning and Evaluation* document provides a structured method to periodically engage stakeholders in creating a system snapshot across all of the elements of a comprehensive, inclusive and integrated system. This tool primarily measures structure and, to a lesser degree, process. The real strength of the BIS is that following the snapshot completion, it can be used to set goals for the system. For instance, the group may choose to try and move a particular indicator from a score of a 3 to a 5 over the course of several years by establishing it as a priority and determining action steps to make it happen. The indicator can be rescored and progress toward, or attainment of, the indicator can be documented. Similarly aggregation of the indicator scores across a benchmark allows for the movement of the median score for broader categories. The State of Utah was one of the original pilot states to undergo a BIS in 2005, and the state has continually used the tool to mark progress towards previously established benchmarks.

One of the elusive measures is a determination of the degree of system integration. During the height of the health management organization process, several authors [Gilles, et al (1993); Devers, et al (1994)] described scales to measure “integratedness.” While those scales cannot be directly translated to trauma system integration, recent work by the Mains, Sanddal, Coniglio, Sanddal (unpublished - 2011) have revised the previous integration measures to make them more applicable to trauma system measures. Arkansas may provide an excellent opportunity to apply, validate, and assist in the refinement of this measurement scale. This scale, which focuses primarily on structure and process, would again allow for repeated measures to mark progress over time.

Changes in process will be captured by the trauma management information system as it comes on-line, including information from EMS, trauma registry and ATCC records. The desired change in behavior -- identifying those patients requiring expeditious transport to high levels of trauma care -- will serve as the appropriate measure. It is assumed that a higher proportion of high acuity patients will be treated at the highest level centers serving each region or

catchment area, with complex multi-system trauma and treatable neurological cases ending up at level I or level II centers. Benchmarks can be set around measures like the “time to transfer decision (calling the ATCC),” total time to definitive care, plus over- and under-triage rates. Using over- and under-triage rates, the trauma system can evaluate “triage efficiency” as a surrogate of the system’s efficiency in patient flow and triage. Given the availability of ATCC data, the dashboard, and the trauma wrist band, you are in a unique position to address this frequently cited problem.

Changes in outcomes can be monitored by measures of mortality and morbidity. The “naturally occurring experiment” of the Arkansas trauma system provides a unique opportunity to, potentially, mark tremendous changes in mortality in a relatively short period of time. The most common approach to such measures is a preventable mortality study. Several pre- and post-system implementation preventable mortality studies have been conducted. Most recently, Esposito and colleagues conducted a pre- voluntary trauma system (1995) and a post-voluntary trauma system implementation (2003) in Montana, noting an approximate 50% reduction in preventable deaths and a similar reduction in opportunities for improvement over an eight year period. With the focused energy and resources associated with the Arkansas trauma system, similar life and limb savings could be realized much sooner. However, in order to measure the impact, the pre-system analysis would need to occur relatively soon.

Benchmarking opportunities for individual centers exist at the national level using existing and evolving datasets. Participation in the ACS COT National Trauma Data Bank (NTDB) (<http://www.facs.org/trauma/ntdb/index.html>) provides access to reports on major outcome variables such as severity-adjusted mortality, length of stay, and data completeness/quality. The most recent report from the NTDB provided 2010 data on over 680,000 trauma patients from 682 facilities (<http://www.facs.org/trauma/ntdb/pdf/ntdbannualreport2010.pdf>). This included 210 level I trauma centers, 220 level II trauma centers, 198 level III or IV trauma centers including 153 Pediatric level I or II trauma centers.

In addition to the NTDB, the ACS offers the opportunity to participate in the Trauma Quality Improvement Program (TQIP). As noted on its website (<http://www.facs.org/trauma/ntdb/tqip.html>), participation in TQIP:

- Provides risk-adjusted benchmarking of designated/verified trauma centers to track outcomes and improve patient care.
- Utilizes the infrastructure of the NTDB to collect valid and reliable data, provide feedback to participating trauma centers, and identify institutional characteristics that are associated with improved outcomes.
- Builds upon this existing infrastructure through enhancements in the following areas: *data collection, benchmarking, and identifying structures and processes of care.*

TQIP currently includes 110 trauma centers from across the United States and holds an annual meeting for training and sharing of information. Participation in TQIP would provide exceptional opportunities for networking and joining the national conversation on trauma quality and patient safety.

Other changes in treatment expectations and associated outcomes could be measured as systemwide, regional or multi-institutional protocols are implemented. Participation in such studies could be reflected as deliverables in future contracts with facilities.

As noted in the research section of this report, the development of a research committee under the TAC is essential to ensure that a thoughtful approach is taken to the unique research opportunities of the emergency Arkansas trauma system. The convention of the research group in August of this year could serve at the genesis for such a permanent committee and could lay the groundwork for the development of a formal research plan.

Recommendations:

- Implement Benchmark, Indicator and Scoring (BIS) as an ongoing monitoring, evaluation and benchmarking tool for the Arkansas trauma system (see Indicators as a Tool for System Assessment section of this report for additional instruction).
- Conduct a pre- and post- preventable injury mortality study for Arkansas using this year's Trauma System implementation as the intervention
- Conduct a trauma triage efficiency study
- Participate in the National Trauma Data Bank by submitting data from the state trauma registry
- Encourage statewide participation in American College of Surgeon's Trauma Quality Improvement Program.

Question 2

Are there opportunities to improve the coordination of the prehospital service with the State's trauma system? Can we make changes, or standardize our medical direction, trauma care and destination protocols in a way that would enhance the system?

Current Status:

Multiple opportunities exist to improve the coordination of prehospital services with the State's trauma system. The overall approach to taking advantage of these opportunities is based on actions both at the State and local levels. The results of these actions will include standardization of medical direction for trauma care and destination protocols, as well as enhanced trauma care training for prehospital care providers.

First, Arkansas needs to hire an EMS Medical Director. The EMS Medical Director would provide input and assistance to the EMS section for its day-to-day activities such as: protocol review and development, training and certification criteria, and disciplinary actions. Tremendous variation was noted within the state regarding the qualifications, training, experience, and commitment of agency medical directors. General concern was expressed by providers, agencies and many medical directors regarding this variation, particularly in the area of trauma care. A State EMS Medical Director would be able to provide assistance and consultation to local medical directors. A standardized training program could be made available to all medical directors, such as the National Association of EMS Physicians (NAEMSP)/Critical Illness and Trauma Foundation (CIT) on-line medical directors training program (www.medicaldirectorsonline.org). Another important role of the State EMS Medical Director would be to liaison with the TAC and the State Trauma Medical Consultant in the development and implementation of statewide trauma treatment and destination protocols. Additionally he/she could enhance trauma care training for prehospital care providers.

Currently, members of the Governor's EMS Advisory Council, sit on the EMS Committee of the TAC. However, a more formal relationship between the Governor's EMS Advisory Committee and the TAC is needed. For example, a Trauma/EMS Executive committee, co-chaired by the State Trauma Medical Consultant and the State EMS Medical Director, could be formed. This committee would facilitate timely development of statewide trauma treatment and destination protocols, and implementation strategies for these protocols. In particular, given the state's extremely decentralized approach to EMS medical control, the State EMS Medical Director would be invaluable in addressing trauma system implementation issues arising at the local level. Furthermore, this committee could identify priorities for prehospital trauma care training and strategies to address those priorities.

At the local level, given that no regional EMS medical direction currently exists. It is critical that each TRAC designate an EMS Medical Director. Ideally the Director would be one of the current medical directors from an agency within the region who is experienced, well respected, and passionate about delivering outstanding trauma care. Such a person would be invaluable in helping to implement policies and protocols developed at the state level. In particular, he/she would be critical in identifying potential problems and possible solutions for destination policies/protocols. Also the regional medical director would work collaboratively with local agency medical directors in implementing protocols, assisting with training, resolving problems and assuring that local medical director concerns are being addressed at the TRAC meetings. Furthermore, the regional EMS Medical Director would liaison with the State EMS Medical Director.

The ADH, the Trauma Program, and trauma system is beginning to be integrated into the disaster response system. The trauma, EMS, public health, and preparedness staff within the ADH have training and expertise which will serve the department well in its ESF 8 lead agency role. However, to further integrate the trauma system and to assist the ADH to make health and medical policy decisions, development of a Disaster Medical Advisory Committee may be beneficial. This committee should be multidisciplinary and have broad representation from EMS (field provider, RN, emergency physician), trauma (trauma surgeon), emergency management, and public health. This committee should report to the Director of the ADH. Roles for this committee may include review of the medical surge, MCI and department response plans, assist with disaster planning, recommend resource and cache needs, develop crisis standards of care guidelines (when resources are depleted), and ensure protocols and guidelines for triage, treatment and transport of patients are consistent and appropriate across jurisdictions. The committee may also provide direct assistance to the ADH in the event of a disaster as to when to implement crisis standards of care and other medical treatment and resource decisions.

Other state EMS and Trauma Offices may provide models and best practices for system integration and planning for disaster response. Several states have implemented call centers that play a key role in disaster response. They have also worked on plans to coordinate air medical services, and they have developed state medical caches (trailers equipped with medical supplies, interoperable communications systems) and personnel resources (strike teams) that can be deployed upon request to assist county and multi-county regions. More definitive information on system integration can be found in the National Association of State EMS Officials (NASEMSO) (2010) Monograph, *Status of State Trauma System Planning and Development...* and *State EMS Office Involvement in Domestic Preparedness*.

NASEMSO has an active disaster committee and many resources available on its website to assist states with system integration, planning, response and resource management. It would be most beneficial to the ADH to ensure active participation with this organization for appropriate state personnel. NASEMSO has councils for state trauma managers, data managers, EMS medical directors, EMSC coordinators, and EMS professional development. They also have an active listserv for each council which provides a ready resource for gathering information quickly from peers.

Additional disaster integration resources and materials are available on-line through the Agency for Health Research and Quality, CDC, Homeland Security, Department of Transportation's Office of EMS, and Health and Human Services. The Disaster Management and Emergency Preparedness (DMEP[®]) produced and promulgated by the ACS COT serves as a good resource for training trauma personnel in issues of disaster response.

Recommendations:

- Ensure the integration of disaster triage tags and trauma bands to enhance patient tracking capabilities and assessment of care after a response.
- Direct or prioritize funding to support a state disaster exercise for all system participants, to assess the emergency healthcare system's ability to surge in response to a disaster resulting in death and overwhelming traumatic injuries.
- Partner with the Arkansas Hospital Association, to ensure that administrators and medical staff in each facility are trained and knowledgeable regarding Incident Command Structure, disaster triage guidelines and medical assets.
- Expand the use of the Health Alert Network to ensure that hospitals and emergency medical services agencies are able to be notified in the event of a disaster and to receive specific information for participation in drills and real events.
- Ensure that the Trauma Regional Advisory Councils and HPP healthcare coalitions are integrated in disaster planning and response efforts.
- Consider integrating the assessment of hospitals' disaster capabilities and resources as part of the trauma center verification/designation process
- Consider using the National Association of State EMS Officials' resources:
 - EMS Incident Response Readiness Tool to assess state and local capabilities to respond to mass casualty incidents
 - Model State EMS Disaster Response Plan as models for disaster planning and response at the state level.

- Continue to support disaster training for staff and consider requesting the Federal Emergency Management Agency's Emergency Management Institute integration courses to be conducted in Arkansas for key policy, operations and coordination staff.
- Engage the disaster medial advisory committees and other trauma and EMS advisory committees to review and update the mass casualty incident rules.

Question 3

Are there opportunities to structure our hospital or EMS grant funding formulas or process to maximize the impact on outcomes in our trauma system?

Current Status:

Understanding and evaluating the health of a trauma system's finances is one of the most difficult yet absolutely essential aspects of system building. Establishing a firm financial foundation in the initial stages of system development is a key determinant in how well and how rapidly the system will mature. It is also the key to weathering the inevitable crises that will strike any trauma system, especially as American healthcare is in transition.

A principle that should be considered at the most appropriate opportunity is ensuring in statute that trauma and emergency care must be financially and organizationally insulated from the state's economic cycles. The difficulties, political, philosophical and otherwise, in adopting and enacting this concept are understood by all.

Financial incentives should be structured to support the achievement of upgraded capability and capacity for the system, individual trauma centers, the ATCC, EMS, rehabilitation, and other agencies. Revisiting, redesigning, and restructuring incentives becomes increasingly important as the system matures.

Several areas where the appropriate structuring of financial incentives can have a significant impact include the following:

- Systemwide capacity development such as encouraging level III trauma center development in underserved regions of the state.
- Encouraging individual trauma center and EMS agency capacity-building in the following areas:
 - Human resource capability development
 - Registry development
 - Equipment and capital
 - Operational capacity, such as improved access
 - Patient safety and clinical outcomes
 - Injury prevention

Recommendations:

- Require annual funding requests from receiving facilities and agencies to be submitted within a 5-year framework reflecting annually upgraded capabilities in alignment with the trauma system's 5-year plan and objectives.
 - Link the starting point for all funding requests for needs by the requesting facility to the trauma system plan (as opposed to starting from a hospital's own equipment or personnel priorities).
- Require contracts for trauma centers and EMS agencies to contain required performance clauses aligning specific trauma system plan objectives with specific priorities in the home region of the requesting facility or agency and specific performance improvement, patient safety and outcome measures.
- Revise the distribution of trauma center grant funds based on an assessment of the desired distribution of trauma center levels in each region.
- Consider increasing incentives for level III development in rural areas or increasing base grants to level IV facilities to help offset the costs of Advanced Trauma Life Support (ATLS), Trauma Nurse Care Center (TNCC), and Rural Trauma Team Development Course (RTTDC) training programs, trauma registry participation, etc. (These monies can be very targeted and/or time limited.)
- Collaborate with the Arkansas Office of Rural Health and Primary Care to identify other potential resources from the U.S. Department of Health's Rural Hospital Flexibility Grant Program to specifically assist Critical Access Hospitals in attaining level IV designation.
- Revise the EMS grant applications to include a more formal needs-based process. For example, a careful analysis of needs may reveal that some services in smaller communities have greater needs than services in larger communities.
- Disburse a portion of the sustainability funding as matching grants, in particular to hospitals, for targeted areas of capacity development.
- Establish capital and equipment support as a separate funding process with a specific funding cap. Different levels of funding can be allocated according to a mix of system requirements, geographic needs or trauma center capacity objectives.
- Involve the Arkansas Hospital Association (AHA) and other associations in developing the financial incentives based on the system plan and the barriers preventing effective capacity development

- Revisit funding for uncompensated and undercompensated care for hospitals and physicians but with formulas designed to ensure continued system financial viability.
- Educate and train hospitals on the utilization of cost data and analysis to develop maximization strategies for reimbursement and cost effective care, including negotiations with third-party carriers regarding reimbursement schedules.

Acronyms Used in the Report

ACH – Arkansas Children’s Hospital
ACS – American College of Surgeons
ADH – Arkansas Department of Health
AHA – Arkansas Hospital Association
ALS – advanced life support
ASSIS – Arkansas Administrative Statewide Information System
ATCC – Arkansas Trauma Call Center
ATLS – Advanced Trauma Life Support
AWIN – Arkansas Wireless Information Network

BIS – Benchmarks, Indicators, and Scoring
BLS – basic life support

CARF – Commission on the Accreditation of Rehabilitation Facilities
CDC – Centers for Disease Control and Prevention
CIT – Critical Illness and Trauma Foundation
CNS – central nervous system
COT – Committee on Trauma

DFA – Department of Finance

ED – emergency department
EMS – emergency medical services
EMT – emergency medical technician
EOC – emergency operations center
ESF 8 – emergency support function 8

FY – fiscal year

HRSA – Health Resources and Services Administration

ICS – incident command structure
ICU – intensive care unit
IPC – Injury Prevention Center

MADD – Mothers Against Drunk Driving
MCI – mass casualty incident
MEMS – Metropolitan Emergency Medical Services

NAEMSP – National Association of Emergency Medical Services Physicians
NASEMSO – National Association of State EMS Officials
NEMSIS – National Emergency Medical Services Information System
NHTSA – National Highway Traffic Safety Administration
NIMS – National Incident Management System

NTDB – National Trauma Data Bank
NTDS – National Trauma Data Standard

PI – performance improvement
PRQ – pre-review questionnaire

QIO – quality improvement organization

RTTDC – Rural Trauma Team Development Course

SCI – spinal cord injury
SIPP – state injury prevention program
START – Simple Triage and Rapid Transportation
STAT – State Technical Assessment Team

TAC – Trauma Advisory Council
TBI – traumatic brain injury
TNCC – Trauma Nurse Core Curriculum
TOPIC – Trauma Outcomes and Performance Improvement Committee
TQIP – Trauma Quality Improvement Program
TRACs – Trauma Regional Advisory Councils
TSC – trauma system consultation

UAMS – University of Arkansas Medical Sciences

Appendix A: Methodology

The Arkansas Department of Health (ADH) 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: two 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. The ADH made a request for a financial specialist to be added to the team as well. 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 Arkansas. 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 ADH. The SVT also reviewed a number of related supporting documents provided by the ADH and information available on government websites.

The SVT convened in Little Rock, Arkansas on June 5-8th, 2011, to review the Arkansas 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 Arkansas. 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 the head of the Division of Trauma and Burn Surgery at the Maine Medical Center and Associate Clinical Professor of Surgery at the University of Vermont School of Medicine. Dr. Winchell received his undergraduate degree from the California Institute of Technology and his M.D. from Yale University. He 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, a successful new trauma center operated as a joint venture between two previously competing hospitals. Dr. Winchell moved to the Maine Medical Center in 2001 and assumed his current post in 2004.

Dr. Winchell has been involved in trauma center and trauma system design and operation throughout his career, in a wide variety of settings covering the spectrum of system development. He was 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 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 coming to Maine, Dr. Winchell has worked to develop the Maine state system, is a member of the state advisory board, and served as chairman of the Maine State Committee on Trauma. Dr. Winchell is the current 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 40 scientific papers and book chapters, and has given over 100 regional, national, and international presentations.

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 the 1999 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.

SAMIR M. FAKHRY, MD, FACS

Dr. Fakhry graduated from the American University of Beirut, School of Medicine in 1981. He completed his residency in general surgery and his fellowship in critical care and trauma at the University of North Carolina at Chapel Hill in 1988.

From 1988 until 1991 he led the trauma program as Director for Trauma Services at George Washington University Medical Center in Washington D.C. In 1991, he became Director of Surgical Critical Care Services at UNC Hospitals in Chapel Hill, NC. While at UNC, he rose to the rank of Associate Professor of Surgery with Tenure and was awarded several teaching awards by the medical students and the surgical residents. He remained there until 1997 when he was recruited to the Inova Regional Trauma Center at Inova Fairfax Hospital in Falls Church, Virginia as the Chief of Trauma Services.

From August 1997 until December 2008, he held the position of Chief, Trauma and Surgical Critical Care Services at the Inova Regional Trauma Center. He was also Associate Chair for Research and Education, Department of Surgery; Medical Director for the Inova Regional Trauma Center Injury Prevention Program and Professor of Surgery, Virginia Commonwealth University - Inova Campus. In January of 2009, Dr. Fakhry was appointed Professor of Surgery and Chief of the Division of General Surgery at the Medical University of South Carolina (MUSC) in Charleston, South Carolina. He is also the Physician Leader of the Surgical Acute and Critical Care Service line at MUSC.

Dr. Fakhry has been heavily involved in trauma and surgical critical care research and in injury prevention. His research interests include trauma systems, medical informatics applications, traumatic brain injury, intestinal injury, motor vehicle crashes, aggressive driving and surgical education. He has authored over 100 peer-reviewed publications, abstracts and book chapters. He is a member of many national societies and serves on several national committees and boards. Dr. Fakhry was Principal Investigator (PI) for the Crash Injury Research and Engineering Network (CIREN) Center at Inova Fairfax

Hospital from May, 2000 until December, 2008. He is currently PI together with Dee Ford MD on an NIH funded research project entitled “Critical Care Excellence in Sepsis and Trauma” (CREST). The goal of CREST is to improve patient outcomes for sepsis and trauma by educating providers and providing access to specialist consultation via telemedicine technology to participating rural hospitals in South Carolina.

MARK JOHNSON, MPA

Mark S. Johnson has over 30 years of experience in Emergency Medical Services (EMS) and Trauma Systems development at statewide and regional levels, including over 25 years as Chief of EMS, and later Community Health and EMS, for the State of Alaska. He also supervised development of Injury Surveillance and Prevention programs in Alaska (20+ years) and served as President of the State and Territorial Injury Prevention Directors Association (STIPDA) in 2000 and 2001. Mark has served on numerous state and national committees related to EMS, multiple casualty incident response, and injury prevention, and has published numerous articles on these issues.

In addition to his EMS, trauma care system, and injury prevention program experiences, Mark’s other public health management experience includes supervision of Alaska’s: Primary Care and Rural Health program (8 years); Health Promotion program (7 years); Tobacco Prevention and Control program (7 years); and the Behavioral Risk Factor Surveillance System (7 years).

Mark retired from State of Alaska in August 2004. Since then, he has done part time consulting and volunteer work with a variety of national and state EMS and Injury Prevention organizations.

He currently serves as a voting representative on the Alaska Trauma System Review Committee and is Chairman of the Alaska EMS for Children Advisory Committee.

Mark has a Masters in Public Administration degree from the University of Alaska.

He has received several state and national awards for his work on EMS and injury prevention programs, as well as the Alaska Public Health Association’s “Alaska Meritorious Health Service Award” (2005).

RONALD F. MAIO, D.O., M.S., FACEP

Dr. Maio received DO degree, in 1976, from Michigan State University’s College of Osteopathic Medicine (MSUCOM). After completing his internship and serving in the US Army in Germany as general medical officer, he did an Emergency Medicine Residency at MSU affiliated hospitals in Lansing, Michigan, and is board certified in Emergency Medicine. In 1988 he received an MS in Clinical Research Design and Statistical Analysis from UM SPH.

Dr. Maio is the Director of the Office of Human Research Compliance Review (OHRCR) for the University of Michigan, and is a Professor of Emergency Medicine and former Associate Chair for Research for the Department of Emergency Medicine. Prior to being appointed Director he was the Assistant Dean for Research Regulatory Affairs at the

Medical School and also was the founder and Director of the University of Michigan's Injury Research Center, based in the Department of Emergency Medicine.

Dr. Maio has practiced emergency medicine in both the rural and non-rural setting, was an assistant medical director for two EMS systems in Michigan, and, served on the board of the Huron Valley Ambulance Association based in Ann Arbor, Michigan. Dr. Maio has also served on numerous state and federal committees and panels and has served as the chair for the National Association of EMS Physicians' (NAEMSP) Research Committee.

Dr. Maio's primary areas of research have been in traumatic injury and also the effectiveness of EMS systems. His research has ranged from epidemiologic studies and observational studies to randomized controlled trials (RCTs) and he has conducted studies in children and adults. In regard to injury he has particular interests in the relationship of alcohol and other drugs to the occurrence and severity of injury and the outcomes following injury and also in regional variation in motor-vehicle crash morality.

NELS D. SANDDAL, PHDC MS, REMT-B

Mr. Sanddal is currently the Manager of the American College of Surgeons (ACS) Trauma Systems and Verification Programs. Prior to his current position at the (ACS), Mr. Sanddal served in a consultant role for the ACS Trauma Systems program, participating as a reviewer in over 20 consultations. Previously, Nels served as President of the Critical Illness and Trauma Foundation (CIT), in Bozeman, Montana. CIT is a non-profit organization dedicated to improving the outcomes of people who are injured in rural America through programs of prevention, training, and research. He also served as the Director of the Rural EMS and Trauma Technical Assistance Center which was funded by the Department of Health and Human Services, Health Resources and Services Administration. Mr. Sanddal 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, as well as the National Association of EMT.

Mr. Sanddal has been a co-investigator for six state or regional rural preventable trauma mortality studies and has conducted research in the area of training for prehospital and nursing personnel as well as in rural injury prevention and control. He is a core faculty member for the NHTSA Development of Trauma Systems course and has conducted several statewide EMS assessments for NHTSA. Mr. Sanddal served on the IOM Committee on the Future of Emergency Care in the U.S.

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

He completed his undergraduate work at Carroll College, received his Master's degree in psychology from Montana State University and is currently completing his doctorate in Health and Human Behavior from Walden University.

JOHN H. SPEARMAN

Mr. John Spearman is Senior Vice President for External Affairs at the University of Maryland Medical Center in Baltimore Maryland. He served as Vice President for the R Adams Cowley Shock Trauma Center, a trauma and critical care hospital at the Medical Center from 2000 to 2009. He also served as Shock Trauma's Director of Administration and Director of Strategic Planning and Marketing for the three years prior. He has a BS degree in labor and industrial relations from the State University of New York, and has a MBA from Loyola College in Maryland.

Mr. Spearman's current responsibilities include providing strategic leadership to the Medical Center's relationships with external stakeholders, including extending its expertise to health empowerment initiatives of community-based stakeholders. John also guides the Medical Center in providing expert resources to state and federal officials and agencies on trauma and healthcare policy.

In his role as the Medical Center's lead for global health initiatives, John also maintains a portfolio of domestic and global partnerships, specializing in the trauma and EMS systems development. At the request of Ambassador Zhou Wenzhong, he organized the Medical Center's Response Team to the Sichuan Earthquake and was instrumental in the six month UMMC/STC response to the Haitian earthquake.

As Vice President for Shock Trauma, Mr. Spearman was responsible for the operational and fiscal management of the 104 bed trauma hospital with over 7,700 annual admissions, 450 FTEs and revenues of \$133 million. He also oversaw new program development, capital planning, acquisition and projects; federal and state legislative portfolios, as well as, relations with EMS agencies, trauma centers, and emergency departments throughout the state.

Mr. Spearman has served as the Chair of the Maryland Trauma Center Network (TraumaNet) and as Chair of its Legislative Committee for eight years. TraumaNet is an association of the state's 14 general trauma and specialty trauma centers. He led the successful effort to pass the Trauma Physician Services Act in 2003, which generates \$13 million annually in new revenue to reimburse trauma physicians and hospitals for uncompensated and under-compensated care and trauma call.

Mr. Spearman also serves or has served in numerous capacities in professional organizations focused on trauma and emergency care, including serving as a board member of the American Trauma Society for 10 years and on the Health Resources and Services Administration Trauma Stakeholders Group in its development of the Model Trauma System Planning and Evaluation document. John was a long-time a member of the Maryland State EMS Advisory Committee and the Maryland Medevac Replacement Committee.

JOLENE R. WHITNEY, MPA

Jolene R. Whitney has worked with the Bureau of Emergency Medical Services and Preparedness, Utah Department of Health for 30 years. She spent the first 6 years of her career as a regional EMS consultant. She became Assistant Training Coordinator in 1986. She has been a program manager for EMS systems and trauma system development since 1991. She is currently the Deputy Director for the Bureau, which

includes managing 20 staff and several programs including Trauma System Development, state grants program, fiscal reporting, Chemical Stockpile Emergency Preparedness, EMS Strike teams, ED, Trauma and Pre-hospital databases, CISM, medical direction coordination, EMS Licensing and Operations, and EMS for Children.

Ms. Whitney has a Master's degree in Public Administration from Brigham Young University and a B.S. in Health Sciences, with an emphasis in Community Health Education from the University of Utah. She was certified as an EMT-Basic in 1979. She also obtained certification as an EMT instructor and became certified as an EMT III (Intermediate) in 1983. She has attended numerous conferences, courses, and workshops on EMS, trauma, and disaster planning and response.

Ms. Whitney is a co-author of five publications on preventable trauma mortality, domestic violence, challenges of rural trauma in the western states and medical surge capacity planning. She is the previous past Chair for the State Trauma Managers Council for the National Association of State EMS Officials. She is currently serving on the Highway Information and Traffic Safety Committee for NASEMSO and participated in the development of a rural MCI assessment tool. She is a member of the American Trauma Society and Utah Emergency Managers Association.

In 2010, Ms. Whitney participated on an Institute of Medicine planning committee and served as a panel Chair for a rural response to MCI workshop. She was recently nominated to serve on the Crisis Standards of Care Committee with the IOM.

Ms. Whitney spent 250 hours in the Olympic Command Center, serving as an EMS liaison for the 2002 Winter Olympics in Salt Lake City, Utah. Jolene has completed the ICS training for 100, 200, 300, 700 and 800 series. She is currently working on the development of the Utah DMAT-1 and serves as the acting planning chief for the team.

She has been involved with all aspects of EMS including ambulance licensure, EMS council implementation, certification and training, computer testing, and curricula development. She has experience in statute and rule development, grant writing, system plan development, coalition building, and disaster preparedness. She has served on several national committees and teams, including five state EMS system assessments for NHTSA, five trauma system consultations for ACS, reviewed rural trauma grant applications for HRSA, contributed to the HRSA model trauma system plan, the National Trauma Data Standards, the NASMESO trauma system planning guide, and the NHTSA curriculum for an EMT refresher course.

Appendix C: Consultation Participant List



AMERICAN COLLEGE OF SURGEONS

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Highest Standards, Better Outcomes

Arkansas Trauma System Consultation Participant List

Austin Porter, M.P.H.	KC Jones
Bill Temple, J.D.	Lee Crawford
Bob Bennett	Linda Nelson RN
Cathee Terrell, RN	Lisa Hutson
Cathy Flanagan, MPH	Lynda Lehing, R.N., B.S.N.
Chuck Mason	Margaret Holaway, R.N., R.N.P.
Clint Evans, M.D.	Marie Lewis, M.P.H.
Debra Wright	Mark Johnson, MPA
Diane Smithson	Mary E. Aitken, M.D., M.P.H.
Diannia Hall-Clutts, R.N.	Mike Sutherland, MD
Donnie Smith	Myra Wood, R.N.
Ed Parham	Nels D. Sanddal, MS, REMT-B
Gary Ragen	Paula Duke, R.N., M.P.H.
Gordon Reeve, Ph.D., M.P.H.	Paula Lewis
Greg Brown	R. Todd Maxson, M.D. FACS
Holly Michaels	R.T. Fendley
James Graham, M.D.	Renee Mallory, B.S.N., R.N.
Jamie Owens	Renee Patrick, B.S.N., R.N.
Jamin Snarr	Robert "Bo" Ryall, M.P.A.
Jane Ball, RN, DrPH	Robert J. Winchell, MD, FACS
Jeff Tabor	Ron Robertson, MD
Jim Brown	Ron Stark
Joe Bates, M.D., M.S.	Ronald F. Maio, D.O., M.S.
John Benjamin	Samir M. Fakhry, MD, FACS
John H. Spearman	Scott Gordon
Jolene R. Whitney, MPA	Scott Lewis
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