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Trauma Systems Evaluation and Planning Committee

Trauma System Consultation Report

State of Iowa

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AMERICAN COLLEGE OF SURGEONS

*Inspiring Quality:
Highest Standards, Better Outcomes*

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Executive Summary

Overview

The state of Iowa has a long history of trauma system development, dating back over 20 years. Iowa adopted a fairly comprehensive trauma system plan in 1994. With the passage of legislation in 1995 the Iowa Department of Public Health (IDPH) was authorized to enact the trauma plan with specific authority to: create trauma center standards, verify that those standards were being met in each facility, and develop a trauma registry reporting system. A significant strength of the system design was that all acute care facilities were required to participate in the trauma system at some recognized level. Though the enabling statute is strong, the state has not enacted a strong set of administrative rules to operationalize the trauma system, and many important procedures remain unstandardized. Coupled with a strong tradition of local rule, this has created an environment where the lead agency has little operational control over the trauma system.

Unfortunately, the enabling statute did not include provisions that would allow the lead agency to control the location, level, or number of trauma centers. No dedicated line item or other protected source of funding was provided. As a result, the IDPH has few identifiable and stable trauma-related resources. Most resources that do exist have been focused on management of the verification process for Iowa trauma care facilities. Few resources and little effort has been focused on maintaining and developing other aspects of the trauma system, including revision of the trauma system plan which has not been updated from the original 1994 version.

The enabling statute established the trauma system advisory council (TSAC), with a broad stakeholder base. The statute also established the System Evaluation Quality Improvement Committee (SEQIC) that was administratively separate from the TSAC. While active stakeholder participation in both the TSAC and SEQIC occurred over the intervening years, progress has been limited by lack of clear procedural rules, changes in leadership, and significant disagreements between stakeholder groups and the lead agency over specific issues. These factors led to the current state of relative stagnation and some residual hard feelings between stakeholders and the lead agency.

In the 1990's a number of regional EMS (and secondarily trauma) advisory committees were established. Over time participation and engagement declined and the regional committee activities decreased. Currently, little evidence of a functioning regional infrastructure is evident.

On a positive note the injury prevention activities are robust. Individual regional activities have proven effective. Additionally, the efforts and collaboration of the

Injury Prevention Research Center of the University of Iowa is an extremely positive relationship with the trauma system program.

Current Status

Iowa has a functionally inclusive trauma system, with all acute care facilities participating, even though at a self-identified level. All facilities are also required to submit a minimum set of data on all injured patients. By rule, the IDPH does not have the role of designating trauma care facilities at a particular level; rather the IDPH functions to verify the facilities at the level they have self-selected. The verification program related to trauma care facility recognition is not robust. The criteria used to gauge a trauma facility category are loosely based on most current version of criteria published in the American College of Surgeons Committee on Trauma (ACS-COT) *Optimal Resources for the Care of the Injured Patient*. Many of the ACS-COT standards have been diluted to make it easier for trauma facilities to comply. Level I trauma facilities are required to use the ACS-COT trauma center verification process. Level III and Level IV trauma facilities are evaluated by an in-state process utilizing reviewers from within Iowa. Level II trauma facilities may opt for either the ACS-COT process or the in-state process. The in-state verification process does not include a review of patient care during site visits. Additionally, due to changes in personnel and vacancies in key positions, the IDPH is significantly behind schedule in conducting on-site visits to confirm paper applications.

Beyond the trauma facility designation process, the IDPH has limited control over how the trauma system functions. Iowa is largely a home (county) rule state, and coupled with little strong guidance at the state level to establish minimum standards and procedures, decisions regarding patient flow through the system are made essentially by individual EMS agencies. Significant variability in triage and transfer patterns result that decrease efficiency and hamper mechanisms for trauma patient transfer and disaster response. Some independent efforts to create regionalized efforts around trauma and disaster management were noted.

The independent nature of the trauma system makes systemwide, or even regional, performance improvement (PI) very difficult. Though the enabling statute appears to contain strong protections for confidentiality of PI proceedings, this is not the operational perception at IDPH. Thus, PI efforts have been constrained to de-identified data and aggregate statistics. Though underlying data sources are fairly strong, the lack of ability to focus beyond issues that can be addressed by aggregate data has limited the impact and the enthusiasm for ongoing system-level PI.

The IDPH and trauma system stakeholders also feel that system development has stalled and stagnated. Explanations for this were cited as the need for coordinated and cooperative leadership, better communication between and among the regulators and stakeholders, and unity of effort. One unifying element of these observations is the lack of a shared vision for trauma system

development based on an up-to-date trauma system plan. Barriers to trauma system performance evaluation, as well as inadequate and unreliable financial support, were also cited as contributory factors.

Advantages and Assets

Iowa has a long history of participation in organized trauma care as one of the first states to fully embrace an inclusive trauma system model that provided a role for all acute care facilities, regardless of geographic location or hospital capabilities. The inclusiveness was provided by strong statutory authority and supported by committed stakeholders.

The IDPH has a recently renewed interest and engagement with the trauma system, as well as recognition that change is necessary to carry the Iowa trauma system to the next level. The Iowa trauma system has several strong attributes, including a high degree of participation by the medical examiners and the expertise of the University of Iowa Injury Prevention Research Center.

Challenges and Vulnerabilities

While consolidation of the EMS, trauma, and emergency preparedness programs could strengthen all three programs, it is possible that the trauma system could be relegated to obscurity due to the priorities and associated funding streams of the other two programs. The trauma system must communicate and demonstrate its value and importance to both EMS and emergency preparedness programs to retain the resources it has and to potentially gain more.

Delays in patient transfer and, therefore, to definitive care appear to exist because of the reluctance or refusal of local EMS agencies to accept interfacility transfers. Data regarding the frequency of this challenge are needed. The trauma care facility assessment (verification) process is adequate in concept but falls short in execution. The IDPH acknowledges that they are delinquent in many on-site visits. This gap seems to be particularly pronounced for the Level IV trauma care facilities. These facilities serve as the gateway for many injured patients.

Systemwide PI activity is limited by both an infrastructure in which to conduct such activities and a distrust of the legal protections provided. Without such PI activity at state or regional levels, trauma system growth will continue to be inhibited.

Priority Recommendations

Indicators as a Tool for System Assessment

- Complete an assessment of the current trauma system performance that can assist in system planning and serve as a baseline for ongoing system benchmarking.

Statutory Authority and Administrative Rules

- Create a broadly representative ad hoc subcommittee under the authority of the Trauma System Advisory Council (TSAC) to review all statutes and regulations pertaining to trauma with a focus on updating and/or revising sections needing attention.
- Codify into administrative rule the scope, function and rules of governance for the Trauma System Advisory Council.
- Enforce trauma rules consistent with statutory authority.

System Leadership

- Formalize communication channels and processes between the Iowa Department of Public Health and the Trauma System Advisory Council.

Lead Agency and Human Resources Within the Lead Agency

- Create a position and hire a state trauma/emergency medical services (EMS) medical director.
- Create a position and hire a full-time state trauma registrar.

Trauma System Plan

- Develop, within 18 months, a new State Trauma System Plan using the Health Resources and Services Administration's (2006) *Model Trauma System Planning and Evaluation* document as a template.

Definitive Care

- Strengthen the hospital verification process for Level I, II, and III trauma care facilities
 - Develop rules and procedures for remediation of trauma care facility deficiencies, such as lowering the level of verification and withdrawal of verification for hospitals not in compliance with standards.
 - Adopt the designation criteria specified in the most recent version of the American College of Surgeons' *Resources for the Optimal Care of the Injured Patient* document.
 - Develop a process to include comprehensive chart review in the verification site visit.
 - Utilize out-of-state reviewers for Level I, II, and III trauma care facility verification visits.
- Change the verification process for Level IV trauma care facilities to focus on technical assistance and facilitation of rapid triage and transfer of seriously injured patients that includes resuscitation protocols, pre-identification of patient and injury types that will be transferred, and pre-selection of destination hospitals.

System Coordination and Patient Flow

- Require each trauma care facility to have an agreement with an emergency medical services agency (or agencies) to facilitate timely ground and air interfacility transport of trauma patients when needed.
- Update the current out-of-hospital trauma triage destination decision protocol.
- Develop specific “transfer out” criteria for Level III and Level IV trauma care facilities that identify the patient injury complexes that should lead to transfer to a higher level facility.

Systemwide Evaluation and Quality Assurance

- Evaluate the current performance improvement (PI) protection statute and revise the rules to specifically include chart reviews within the PI and verifications processes.

Trauma Management Information Systems

- Monitor implementation of the new emergency medical services and trauma registry system to identify and correct potential issues.

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)**
Note: Injury severity should be determined through the consistent and system-wide application of one of the existing injury scoring methods, for example, Injury Severity Score (ISS).
- c. There is comparison of injury mortality using local, regional, statewide, and national data. **(I-101.3)**
- d. Collaboration exists among EMS, public health officials, and trauma system leaders to complete injury risk assessments. **(I-101.4)**
- e. The trauma system works with EMS and public health agencies to identify special at-risk populations. **(I-101.7)**

II. Collected data are used to evaluate system performance and to develop public policy. **(B-205)**

- a. Injury prevention programs use trauma management information system data to develop intervention strategies. **(I-205.4)**

III. The trauma, public health, and emergency preparedness systems are closely linked. **(B-208)**

- a. The trauma system and the public health system have established linkages, including programs with an emphasis on population based public

health surveillance and evaluation for acute and chronic traumatic injury and injury prevention. **(I-208.1)**

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

- a. The lead agency, along with partner organizations, prepares annual reports on the status on injury prevention and trauma care in the state, regional, or local areas. **(I-304.1)**
- b. The trauma system management information system database is available for routine public health surveillance. There is concurrent access to the databases (ED, trauma, prehospital, medical examiner, and public health epidemiology) for the purpose of routine surveillance and monitoring of health status that occurs regularly and is a shared responsibility. **(I-304.2)**

Current Status

The Iowa Department of Public Health (IDPH) and the trauma system program have access to a wide variety of injury data sources. The pattern of injury mortality in Iowa shows a downward trend in motor vehicle deaths while falls, poisoning, and suicide deaths have risen. The section on Injury and Violence in the *Healthy Iowan* tracks falls, interpersonal violence, motor vehicle injuries and deaths, occupational health and safety, and poisonings. These findings are, largely, drawn from national data sources.

A state *Burden of Injury* report was produced in 2008. No more recent edition has been produced despite information in the pre-review questionnaire that reported a planned five-year schedule for updating this report. A more recent report on fall injuries and brain injuries has been produced. Some injury data reports are available on the state website, and some are listed on the trauma system program home page with links. A more current comprehensive report on the problem and impact of injuries in Iowa that can support the need for trauma system enhancements would be helpful.

The IDPH works closely with the University of Iowa's Injury Prevention Research Center (IPRC) to analyze and report injury data from various sources. These include data from vital statistics, the Iowa Uniform Billing (UB-04) Hospital Discharge dataset, emergency medical services (EMS) patient reports, the trauma registry, and motor vehicle crash data. Iowa has an extensive description of injuries from analyses performed by the IPRC. Data linkage is performed with specific identifiers, and EMS and trauma data can be linked. Rehabilitation data are not linked. The IPRC assists the IDPH in monitoring injury patterns and surveillance within the state of Iowa. The IPRC has the epidemiological and statistical resources to create regular and special reports.

Limited epidemiological support exists for the trauma program within the IDPH. State epidemiology support is focused on competing priorities, often related to grant priorities. Due to this limitation and exacerbated by a fragmented performance improvement process, trauma registry data may not be utilized to their full potential.

Recommendations

- Monitor the deployment of the Emergency Medical Services (EMS) Electronic Patient Care Reporting System and the Trauma Registry during the ImageTrend software installation and early trials to ensure that all opportunities for linkage are built into the data system.
- Secure additional funding to enlist the University of Iowa's Injury Prevention Research Center for epidemiologic support and analysis of EMS and Trauma Registry data.
- Develop an efficient process for the dissemination of injury data analyses and findings to all trauma stakeholders.

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

When queried, the stakeholders were largely unfamiliar with the 2006 Health Resources and Services Administration's *Model Trauma System Planning and Evaluation* document. As such they were also unfamiliar with the Benchmark, Indicator, and Scoring (BIS) criteria included in that document that can be used to assess trauma system development. No previous attempt to complete a trauma system assessment using the BIS criteria has been undertaken.

Recommendations

- **Complete an assessment of the current trauma system performance that can assist in system planning and serve as a baseline for ongoing system benchmarking.**
 - Use a facilitated process to complete the assessment using BIS criteria to serve as the baseline for future trauma system assessment and benchmarking.

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 prescribed set of standards of care. It also refers to the operating procedures necessary to continually improve the care of injured patients from injury prevention and control programs through postinjury rehabilitation. The ability to enforce laws and rules guides the care and treatment of injured patients throughout the continuum of care.

There must be sufficient legal authority to establish a lead trauma agency and to plan, develop, maintain, and evaluate the trauma system during all phases of care. In addition, it is essential that as the development of the trauma system progresses, included in the legislative mandate are provisions for collaboration, coordination, and integration with other entities also engaged in providing care, treatment, or surveillance activities related to injured people. A broad approach to policy development should include the building of system infrastructure that can ensure system oversight and future development, enforcement, and routine monitoring of system performance; the updating of laws, regulations or rules, and policies and procedures; and the establishment of best practices across all phases of intervention. The success of the system in reducing morbidity and mortality due to traumatic injury improves when all service providers and system participants consistently comply with the rules, have the ability to evaluate performance in a confidential manner, and work together to improve and enhance the trauma system through defined policies.

Optimal Elements

- I. Comprehensive state statutory authority and administrative rules support trauma system leaders and maintain trauma system infrastructure, planning, oversight, and future development. **(B-201)**
 - a. The legislative authority states that all the trauma system components, emergency medical services (EMS), injury control, incident management, and planning documents work together for the effective implementation of the trauma system (infrastructure is in place). **(I-201.2)**

- b. Administrative rules and regulations direct the development of operational policies and procedures at the state, regional, and local levels. **(I-201.3)**

II. The lead agency acts to protect the public welfare by enforcing various laws, rules, and regulations as they pertain to the trauma system. **(B-311)**

- a. Laws, rules, and regulations are routinely reviewed and revised to continually strengthen and improve the trauma system. **(I-311.4)**

Current Status

The Iowa legislature established the Iowa Trauma Care System Development Act (95 Acts, Chapter 147A, Subchapter II) in 1995. The Act designated the IDPH as the lead agency for development and implementation of a statewide trauma care system. Provisions of Chapter 147A.20 through 147A.28 inclusive provide descriptive language and authority for IDPH to:

- Create trauma care standards, triage and transfer protocols,
- Verify trauma care facilities, and
- Maintain a statewide trauma reporting system.

The IDPH is advised by a Trauma System Advisory Council (TSAC) with membership specified within Code (95 Acts, 147A.24). The TSAC membership is open to representatives of specified organizations and officials.

The Iowa Trauma Care System Development Act, while based on sound intent to improve care of injured patients across Iowa, was passed without provision of dedicated funding to IDPH to support the trauma care system.

95 Acts, Chapter 147A, Subsection II is operationalized in administrative code (641-Chapter 134-137), which details the processes, procedures and enforcement for the IDPH to fulfill its statutory responsibilities.

The stakeholders raised the following concerns about the statutes and supporting administrative rules.

- The section of statute pertaining to the System Evaluation and Quality Improvement Committee was repealed with what was perceived to be little to no direction from TSAC.
- The roles and responsibilities of the TSAC have not been clearly articulated.
- Out-of-hospital triage destination decisions were loosely referred to as “not being strictly enforced and open to modification”. This leads to a more fragmented trauma system with less ability to properly direct injured patients to most appropriate facility.
- Approximately half of the verified Level IV trauma care facilities are not submitting reportable data to properly populate the Trauma Registry as a required condition of classification and verification.

IDPH reports that administrative code is reviewed every 5 years, but no evidence was provided to verify that this schedule has been maintained for the trauma system program.

Recommendations

- **Create a broadly representative ad hoc subcommittee under the authority of the Trauma System Advisory Council (TSAC) to review all statutes and regulations pertaining to trauma with a focus on updating and/or revising sections needing attention.**
 - Develop processes to ensure compliance with the Out-of-Hospital Trauma Triage Destination Decision matrix (ground and air).
 - Develop, implement, and enforce a rule requiring all trauma care facilities to submit a minimum set of data elements to state trauma registry.
- **Codify into administrative rule the scope, function and rules of governance for the Trauma System Advisory Council.**
 - Consider using Chapter 130 Emergency Medical Services Advisory Council (EMSAC) as model language for drafting this section.
 - Include a description of communication channels and responsibilities for all identified groups.
 - Establish terms for TSAC members and officers.
 - Establish a functional executive committee of TSAC
- **Enforce trauma rules consistent with statutory authority.**
 - Consider requiring air ambulance agencies to use Iowa Department of Public Health-approved protocols, similar to the current requirement for ground emergency medical services agencies, when future regulations are drafted.

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 Iowa trauma system was created through the efforts of passionate rural surgeons who directly experienced the injury burden in their local communities. Visionary leaders like Dr. Tom Foley led the development of an inclusive trauma system framed on supporting legislation with a multidisciplinary oversight committee, a statewide trauma registry, an injury control center, and supporting interest groups. The concept that every hospital is a trauma care facility created a backbone for the trauma system that resonates with the Iowa citizens and mind-set that “Iowans take care of Iowans”. This inclusive concept, established over 20 years ago in Iowa, is now known as an *inclusive trauma system*, the model supported by the American College of Surgeons Committee on Trauma (ACS-COT).

Trauma system leadership is clearly identified in the enabling Iowa code as the IDPH with the TSAC as its advisory body. The TSAC composition, as established in code, represents an appropriately broad spectrum of professionals interested in trauma. While this leadership structure is well established in code and rule, the TSAC is not fully functional due in part to poor two-way communication regarding trauma system issues and the perception that IDPH determines what TSAC members will hear at meetings. TSAC members feel they exist only to listen and offer advice, and they have no authority for other actions. Advice provided to the IDPH by the TSAC has not been acted upon, such as the need for an EMS/Trauma medical director, on-site verification and chart reviews, and additional resources for the data collection effort. Stakeholders have disengaged leading to a lack of cohesion within the trauma system and inadequate trauma system oversight by the TSAC.

As established in code, the TSAC should be providing the key leadership and clinical oversight of the trauma system; however, it appears to function in a perfunctory manner only. Although the members of the TSAC represent key stakeholders in the trauma system, and these stakeholders have long-standing commitment to the trauma system, attendance at TSAC meetings is lackluster. TSAC minutes from 2014 indicated that a quorum needed to conduct official business did not exist at the last two meetings. Two members recently resigned.

The scope of TSAC responsibility is appropriately broad as defined in Iowa code, but essential TSAC functions are not being performed. The TSAC should be performing the following:

- Monitoring trauma system function through the assessment of trauma registry-derived metrics,
- Monitoring quality of care through assessment of population-based data
- Monitoring quality of care at the individual case level, and
- Advocating strongly for trauma system resources to the IDPH.

A TSAC executive committee that communicates frequently, identifying priority issues for TSAC action, planning meeting agendas, and monitoring the work of subcommittees would help improve the TSAC functioning.

The TSAC team identified several factors contributing to inadequate trauma system leadership, including lack of transparency between stakeholders, ineffective communication between stakeholders, a history of prior conflicts between stakeholders, and outdated or inadequate rules guiding TSAC functions. Positive change is apparent as evidenced by the recent change of administrative staff within the IDPH leadership and agreement between the IDPH and stakeholders to request this consultation as a means to guide needed change.

In the early 1990's, Iowa had regional EMS advisory councils, but it was hard to maintain them. Individual Level I and II trauma care facilities provide regional leadership as "pockets of excellence." However, these trauma care facilities do not operate as part of a regional system, and no guidelines exist for support or management of a regional trauma system.

Recommendations

- **Formalize communication channels and processes between the Iowa Department of Public Health (IDPH) and the Trauma System Advisory Council (TSAC).**
 - Develop a process to facilitate timely communication between TSAC and IDPH that includes sharing financial information and the submission and response to action requests.

- Identify standing agenda items for TSAC meetings that focus on trauma system function, for example, trauma system-based metrics and performance improvement metrics
- Establish a functional executive committee of the TSAC.
- Establish trauma regions centered around key trauma care facilities that are empowered to perform regional performance improvement and trauma system analysis and to provide periodic reports to TSAC.

Coalition and Community Support

Purpose and Rationale

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

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

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

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

Optimal Element

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

Current Status

Iowa has a history of an active coalition of multidisciplinary stakeholders that rallied around development of the trauma system in 1994. Despite some challenges with the trauma system, several original members of the Iowa TSAC have remained actively engaged.

Membership on the TSAC is multidisciplinary, and individual organizations appoint representatives with term limits set forth by the IDPH. No process exists for recruiting new volunteers to participate on the TSAC or its subcommittees except when term limits are up and organizations are requested to identify new representatives. Participants at the TSC session emphasized that many members of the TSAC are not engaged, and that the last two meetings did not have a quorum to accomplish action items. The Iowa trauma system bylaws indicate that three unexcused absences result in termination, but no evidence was provided that the bylaws have been followed regarding TSAC membership. The lack of engagement was partly attributed to the TSAC lack of authority to act on decisions and recommendations for trauma system improvements. An evaluation of the current TSAC committee members to verify their commitment and engagement, as well as defining the official responsibilities and expectations of TSAC members, would be helpful to move trauma system initiatives forward.

Growth of the trauma system coalition has been relatively stagnant, in large part due to staff turnover within the IDPH Bureau of Emergency and Trauma Services (BETS). The current trauma coordinator started 3 months prior to the TSC visit and has had inadequate time to address this issue. However, this individual is energized to begin building on the state's trauma coalition.

The Iowa Hospital Association is engaged with the TSAC, and it provides a forum for the State Trauma Coordinator meetings and collaboration. The Iowa Falls Prevention Coalition has been very active in identifying fall risks by age and gender and for providing injury prevention resources throughout the state. Other coalitions and councils in the state provide education and sponsor injury prevention initiatives, but no evidence was provided related to their integration with the trauma system. Some local trauma care facilities are collaborating within their regions to provide injury prevention programs and to conduct some performance improvement activities.

The IDPH website offers an opportunity for interested stakeholders to view publications and meeting minutes. The information disseminated is managed by IDPH staff members. Participants did express concerns that communication of important information may not be timely or widely disseminated to stakeholders. Other methods to share information of value to the trauma system stakeholders should be explored, such as social media and web links to other state programs.

Little public education has been provided about the importance of the Iowa trauma system. The participants expressed the opinion that the public is not even

aware that the trauma system exists. The stakeholders reported that legislative champions have been identified, and it is the intent to use the TSC report to educate them on the needs of the Iowa Trauma System.

Recommendations

- Explore opportunities to engage a committed and broad-based constituency for the trauma system.
- Establish a process for succession of TSAC membership and recruitment of new members to ensure gradual turnover of membership.
- Develop a process to create public awareness of the burden of injury and the role of the trauma system.
 - Include public education through various outlets, including social media, websites and broadcast media.
 - Include education to elected officials.
- Establish a link on the IDPH website between the trauma system program and the Office on Disability, Injury, and Violence Prevention (ODIVP) to increase access to information and resources.

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

IDPH is identified in Chapter 147A of Iowa Code as the lead agency for trauma system development and implementation. One full time equivalent (1.0 FTE) state trauma coordinator is the single dedicated position committed to trauma system activities. The IDPH also commits relatively small portions (5% in some cases) of time from other staff to support this individual with specific technical assistance and fiscal management.

The state trauma program coordinator position is established within the BETS based in the Division of Acute Disease Prevention, Emergency Response and Environmental Health. Other BETS staff members and managers have important roles related to trauma system development. The BETS Executive is often referred to as the program manager, however; this individual's has a significant focus on managing the various EMS system development grant funds.

IDPH has extended its limited internal staffing to support the trauma system through non-contractual relationships. The Iowa IPRC has a memorandum of understanding for analysis of trauma registry data. IDPH has been without a physician-level position (State EMS/Trauma Medical Director) for many years. IDPH is making modest investments that appear to be supporting limited components of a trauma system.

Salary support for IDPH trauma system program staff members comes from state appropriations and a "patchwork" of smaller grants that can be leveraged. The lack of dedicated and stable sources of trauma system funding causes challenges for adequate and stable program staffing.

Benchmarking of the trauma system has not been a priority to date. A strong trauma registry is the foundation for measuring trauma system quality. Despite submission of data into a central repository by all Level I, II, and III trauma facilities, the quality of data submissions is questioned. The position of state trauma registrar with the ability to monitor data submissions, provide technical support, and develop timely reports is essential.

Given the trauma system work that needs to be performed, IDPH is substantially understaffed to accomplish it.

Recommendations

- **Create a position and hire a state trauma/emergency medical services (EMS) medical director.** See Appendix D for sample job description.
- **Create a position and hire a full-time state trauma registrar.** See Appendix D for sample job description.

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

In 1994, a multidisciplinary trauma systems development consortium established a strategic plan outlining an inclusive trauma system and proposed legislation for the implementation of the system. The plan identified administrative, operational, and clinical goals for trauma system development along with associated objectives. A majority of the goals and objectives have been accomplished including enabling legislation for the implementation of the Iowa Trauma System.

The trauma system plan has not been revised or updated since 1994. A comprehensive needs assessment for both EMS and hospital-based trauma care has not been conducted since the original plan was developed. Within the past year the IDPH and members of the TSAC have begun to discuss the need to create a new trauma system plan based on the recommendations from the TSC visit. No timelines or strategies have been established for the development of the system plan, and participants at the TSC session indicated that other priorities would take precedence over developing the plan, such as the implementation of the new trauma registry. Many participants were unaware of the Health Resources and Services Administration's (2006) *Model Trauma System Planning and Evaluation* document which should serve as a template during a strategic planning development process.

Overall, the 1994 trauma plan contains the necessary components and legislation to establish and maintain a comprehensive trauma system; however, updates and revisions are needed to enable the plan to meet current standards. Provisions for integration with the disaster planning infrastructure, injury prevention, and the public health infrastructure should be specifically included within the next plan. In addition, provisions should be made for routine review and revision of the plan.

Recommendations

- **Develop, within 18 months, a new State Trauma Plan using the Health Resources and Services Administration's (2006) *Model Trauma System Planning and Evaluation* document as a template**
 - Empower the Trauma Services Advisory Council as the core leadership group to undertake the development of the trauma system plan.
 - Include within the plan specific goals and objectives, timelines, responsible parties, and resources needed.
 - Include a vision and mission statement to guide future development.
- Provide sufficient fiscal and personnel resources to complete the development of the plan as well as the review and approval process.
- Ensure that the revised state trauma system plan creates the overarching climate that supports system integration across the continuum of services.
- Establish a process for the routine review and revision of the Trauma System Plan.

System Integration

Purpose and Rationale

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

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

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

Optimal Elements

I. The state lead agency has a comprehensive written trauma system plan based on national guidelines. The plan integrates the trauma system with EMS, public health, emergency preparedness, and incident management. The written trauma system plan is developed in collaboration with community partners and stakeholders. **(B-203)**

- a. The trauma system plan has established clearly defined methods of integrating the trauma system plan with the EMS, emergency, and public health preparedness plans. **(I-203.7)**

II. The trauma, public health, and emergency preparedness systems are closely linked. **(B-208)**

Current Status

The recent merger of EMS, Trauma, and Emergency Preparedness programs has set the stage for enhanced integration with the trauma system.

The IDPH trauma plan developed in 1994 was based on national guidelines and included a focus on the trauma system's integration with EMS and emergency preparedness. However, the 1994 trauma system plan goals and objectives have not been a focus for several years. The planned integration has not matured to broaden the scope of trauma system integration by actively involving other stakeholder groups.

While Iowa is a rural state, the management of the trauma system does not foster regional problem solving. Prior EMS regional coordination was discontinued. A few years ago 6 regions for disaster preparedness provided support, meetings, and education. The federal disaster preparedness guidance promoted a transition to coalition-based groups that led to dissolution of the regional infrastructure as funds were provided to the local level to develop coalitions. Opportunities for hospitals and other emergency services to work together to plan and sustain a response in case of an event have lost support. Encouraging trauma care facilities within each region to collaborate on a regional trauma system committee could have many benefits such as the following:

- Increased engagement in the trauma system,
- Better articulation of regional trauma system challenges such as destination decisions and interfacility transfer, and
- Improved understanding of how the trauma system performs within the region.

Such information would be valuable to the TSAC as it works to improve the system.

The existing collaboration with IPRC, the Iowa Department of Aging, and the Emergency Medical Services for Children (EMSC) program is an excellent example of integration that may serve as a model for future system integration efforts.

The trauma system program should also recognize the recent development of programs working to improve care for other time-sensitive diseases (e.g., Stroke and ST elevation myocardial infarction [STEMI]). These programs often seek to develop a regional or statewide system, similar in many respects to a state

trauma system. The trauma system could consider seeking opportunities to integrate with these programs for potential synergistic efforts and a potential strategy for obtaining additional resources from the legislature.

Recommendations

- Ensure that a revised state trauma system plan creates the overarching climate supporting integration across the continuum of services (e.g., prevention, EMS, disaster preparedness, other time-sensitive conditions, rehabilitation, etc.).
- Formalize existing grassroots efforts and develop new regional advisory committees to facilitate integration efforts and enhance stakeholder participation.
- Enhance communication and cooperation between the trauma system and other time-sensitive disease programs such as Stroke and ST elevation myocardial infarction.
- Continue collaboration efforts with the Injury Prevention Research Center.

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 BETS reported spending about \$300,000 annually in support of the trauma system. Specific expenditures were not clearly identified. General Fund appropriations account for 50% of the operating budget with additional funds obtained from various grants managed by the BETS in a “patchwork fashion”.

The BETS is to be commended for leveraging funding from the CDC Preventive Health and Health Services Block Grant, Rural Hospital Flexibility program, Assistant Secretary for Preparedness and Response (ASPR) and EMSC for minimal funding to support trauma system-related activities.

IDPH has made no effort to calculate and report the cost of implementing and operating the trauma system to the public. Such costs may include administrative services, support of TSAC, site verifications, development of relationships with trauma care facilities, and technical support and upgrades for the trauma registry. Consequently, no budget or projected cost data exist regarding the funds needed to sustain or improve the trauma system that could be used for public awareness. Individual hospitals track their own trauma care costs, but this information is not reported or collected at the state level. The IPRC has experience analyzing and reporting the cost of injuries (e.g., *Costs of Sexual Violence in Iowa, 2009*) extrapolating from national data sources. Such a report could be valuable for increasing public awareness about the importance of injury and need for financial support for the trauma system.

Iowa Code 147A.23 directs the categorization of all hospitals by resources for trauma care by the IDPH. However, no fee is associated with this categorization despite the staff time and effort for this process. It could be proposed that achieving categorization as a Level I, II or III trauma care facility has inherent advantages to hospitals with relationship to their patient referral patterns. These referral patterns may also be associated with an opportunity for verified trauma care facilities to collect a greater percentage of trauma team activation fees.

Iowa does not have a dedicated revenue source that is stable and reliable to support the trauma system infrastructure. Many other states have sought trauma system funding through a variety of fees, surcharges, fines or other funding sources with trauma relationship. Examples include safety belt fines, motor

vehicle registrations, driver's license fees, moving traffic violation fines, facility verification fees, or similar fees and charges. Implementing a dedicated revenue source usually requires both legislative and administrative champions along with clear and unambiguous information about the need for the funds and how they will be used. All trauma stakeholders (e.g., EMS agencies and providers, and other time-sensitive condition stakeholders) must understand and support this proposal if such an initiative is to succeed. Two essential steps in the process are reaching understanding on what trauma system infrastructure costs should be covered and planning the distribution of funds in a way that benefits all stakeholders who will be asked to support the proposal for trauma system funding.

The membership of TSAC and its subcommittees should communicate the need for sustainable funding into their trauma care facilities and professional associations to promote support for the initiative. IDPH should prepare an annual budget for the trauma system infrastructure with costs tied to each component of the trauma system. The TSAC should receive the budget request with ample time to analyze it for the purpose of advising IDPH on potential changes and to seek stakeholder support.

Recommendations

- Introduce legislation that establishes a fee structure to be used by the trauma system program to support and improve the process for verification and re-verification of trauma care facilities.
 - Impose the fee on Level I, II, and III trauma care facilities.
- Identify and provide sustainable funding to support the activities of a comprehensive state trauma program.
 - Advocate for legislation to create dedicated long-term funding to support the trauma system such as additional fees on moving violations/driving under the influence fines, vehicle licensing, or other activities that contribute to traumatic injuries.
 - Refer to the National Conference of State Legislatures document *The Right Patient, The Right Place, The Right Time: A Look at Trauma and Emergency Medical Services Policy in the States* that identifies state financing for trauma systems. Obtain this report from <http://www.ncsl.org/documents/health/NCSLTraumaReport812.pdf>
- Assure that financial information pertaining to the trauma system is analyzed and shared with the Trauma System Advisory Council (TSAC) and trauma care facilities.

- Provide reports to the TSAC in a format that clearly articulates revenues, expenditures, and encumbered funds.

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

Iowa is to be commended for implementing several injury prevention programs throughout the state. The Office on Disability, Injury and Violence Prevention (ODIVP) within the IDPH is funded through general and federal funds. Federal funding sources for prevention programs include the Centers for Disease Control and Prevention (CDC), National Highway Traffic Safety Administration (NHTSA), Substance Abuse and Mental Health Services Administration (SAMHSA) and Maternal and Child Health (MCH) grants. Additional funds are provided by local and state foundations to support injury prevention activities and research.

Minimal integration occurs between the trauma system and injury prevention. An Injury Prevention subcommittee of the TSAC serves as the advisory committee to the Office on Disability, Injury and Violence Prevention. The subcommittee is staffed by the IDPH injury prevention coordinator who is also a member of the TSAC. However, when reviewing the TSAC meeting agenda items, injury prevention is not a topic listed for discussion.

No statewide injury prevention coalition exists. Several injury prevention interest groups exist within the state, including the Advisory Council on Brain Injuries, the Iowa Falls Prevention Coalition, Domestic/Sexual Violence Prevention Advisory Council, Domestic Abuse Death Review Team, Child Death Review Team, and Suicide Prevention. Several state agencies have a prevention focus and provide resources, such as the state's Department of Transportation Zero Fatalities and Texting and Driving campaigns, Department of Mental Health and Department of Aging.

Iowa is also to be commended for its strong EMSC program. This program coordinates and offers many injury prevention and outreach activities in local communities. EMSC also sponsors an annual injury prevention conference with a pediatric focus. The EMSC program also established the "Love Our Kids" license plate program in statute, which provides funding for injury prevention activities. These funds are disbursed to rural communities for injury prevention projects such as all terrain vehicle (ATV) safety, water safety, fire prevention, fall prevention, playground safety, farm safety and bike safety.

Injury prevention and outreach are a significant interest at the state level. Iowa requested a State and Territorial Injury Prevention Directors Association (STIPDA) review in 2007, and statutes exist related to sports concussion, a graduated driver's licensing program, primary seatbelt law, and distracted driving. Evidence of good collaboration between the ODIVP and the IPRC was provided.

The state produced a Fall Injury Report using 2002-2012 data. This report included recommendations and prevention strategies focusing on specific age and gender groups. The Iowa Falls Prevention Coalition within the IDPH has been very active within the state providing fall prevention programs such as Stopping Elderly Accidents, Deaths and Injuries (STEADI), the Stepping On program, as well as fall prevention activities for children. Grants are provided to this coalition by the Iowa Department of Aging.

No comprehensive state injury prevention plan is in place, and no coordinated statewide approach or guidance for injury prevention interventions is available related to the key findings outlined in the *Burden of Injury* report. It was reported that the majority of prevention programs coordinated by the counties and trauma facilities are based on interest and trauma registry data.

Many prevention activities are conducted across the state by counties and local trauma facilities, and organizations such as Safe Kids, Safe Communities, and Mothers Against Drunk Driving (MADD). Injury prevention activities range from car seat safety checks, ATV safety, fall prevention, senior driving safety, school and playground safety, senior fall prevention, motorcycle safety, water safety and bicycle safety. National ad campaigns and billboards are occasionally used to promote awareness of key injury prevention events or important safety concerns.

No evaluation of these prevention programs for efficacy was reported to occur at the state or local level.

No central location or website is available for trauma facilities, counties, and organizations to search for evidence-based prevention programs or to share their resources. Considering the amount of injury prevention activity conducted in Iowa, such a central site would be beneficial to reduce duplication of efforts and for creative strategy sharing. The IDPH ODIVP does have a website that contains resources for injury prevention. When TSC participants were asked if they knew about this resource, very few indicated awareness of its existence.

Recommendations

- Develop and implement a statewide Injury Prevention Plan based upon a current *Burden of Injury* Report.
 - Include trauma stakeholders as partners in the planning and implementation process
- Establish a web-based resource to enhance communication and collaboration among all stakeholders and promote the use of evidence-based injury prevention strategies.
- Establish an injury prevention coalition to address priority injuries, implement recommended evidence-based injury interventions, and evaluate outcomes.
- Educate policy makers and the public about the burden of injury and the value of an inclusive trauma system as part of an overall injury prevention and control strategy.

Emergency Medical Services

Purpose and Rationale

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

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

Ideally, a system should have some means of ensuring whether resources meet the needs of the population. To achieve this end, a resource and needs assessment evaluating the availability and geographic distribution of EMS personnel and physical resources is important to ensure a rapid and appropriate response. This assessment includes a detailed description of the distribution of ground ambulance and aeromedical locations across the region. Resource allocations must be assessed on a periodic basis as needs dictate a redistribution of resources. In communities with full-time paid EMS agencies, ambulances should be positioned according to predictable geographic or temporal demands to optimize response efficiencies. Such positioning schemes require strong prehospital data collection systems that can track the location of occurrences over time. Periodic assessment of dispatch and transport times will also provide insight into whether resources are consistent with needs. Each region should have objective criteria dictating the level of response (advanced life support [ALS], basic life support [BLS]), the mode of transport, and the disposition of the patient based on the location of the incident and the severity of injury. A mechanism for case-based review of trauma patients that involves prehospital and hospital providers allows bidirectional information sharing and continuing education, ensuring that expectations are met at both ends. Ongoing review of triage and treatment decisions allows for continuing quality improvement of the triage and prehospital care protocols. A more detailed

discussion of in-field (primary) triage criteria is provided in the section titled: System Coordination and Patient Flow (p 20) (White Book).

Human Resources

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

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

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

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

Integration of EMS Within the Trauma System

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

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

Optimal Elements

I. The trauma system is supported by an EMS system that includes communications, medical oversight, prehospital triage, and transportation; the trauma system, EMS system, and public health agency are well integrated.

(B-302)

- a. There is well-defined trauma system medical oversight integrating the specialty needs of the trauma system with the medical oversight for the overall EMS system. **(I-302.1)**
- b. There is a clearly defined, cooperative, and ongoing relationship between the trauma specialty physician leaders (for example, trauma medical

director within each trauma center) and the EMS system medical director. **(I-302.2)**

- c. There is clear-cut legal authority and responsibility for the EMS system medical director, including the authority to adopt protocols, to implement a performance improvement system, to restrict the practice of prehospital care providers, and to generally ensure medical appropriateness of the EMS system. **(I-302.3)**
- d. The trauma system medical director is actively involved with the development, implementation, and ongoing evaluation of system dispatch protocols to ensure they are congruent with the trauma system design. These protocols include, but are not limited to, which resources to dispatch, for example, ALS versus BLS, airground coordination, early notification of the trauma care facility, prearrival instructions, and other procedures necessary to ensure that resources dispatched are consistent with the needs of injured patients. **(I-302.4)**
- e. The retrospective medical oversight of the EMS system for trauma triage, communications, treatment, and transport is closely coordinated with the established performance improvement processes of the trauma system. **(I-302.5)**
- f. There is a universal access number for citizens to access the EMS/trauma system, with dispatch of appropriate medical resources. There is a central communication system for the EMS/trauma system to ensure field- to-facility bidirectional communications, interfacility dialogue, and all-hazards response communications among all system participants. **(I-302.7)**
- g. There are sufficient and well-coordinated transportation resources to ensure that EMS providers arrive at the scene promptly and expeditiously transport the patient to the correct hospital by the correct transportation mode. **(I-302.8)**

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

- a. In cooperation with the prehospital certification and licensure authority, set guidelines for prehospital personnel for initial and ongoing trauma training, including trauma-specific courses and courses that are readily available throughout the state. **(I-310.1)**
- b. In cooperation with the prehospital certification and licensure authority, ensure that prehospital personnel who routinely provide care to trauma patients have a current trauma training certificate, for example, Prehospital Trauma Life Support or Basic Trauma Life Support and others, or that trauma training needs are driven by the performance improvement process. **(I-310.2)**

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

III. The lead agency acts to protect the public welfare by enforcing various laws, rules, and regulations as they pertain to the trauma system. **(B-311)**

- a. Incentives are provided to individual agencies and institutions to seek state or nationally recognized accreditation in areas that will contribute to overall improvement across the trauma system, for example, Commission on Accreditation of Ambulance Services for prehospital agencies, Council on Allied Health Education Accreditation for training programs, and American College of Surgeons (ACS) verification for trauma facilities. **(I-311.6)**

Current Status

Iowa's EMS system has large number of EMS agencies and personnel assets. IDPH does not regulate how many services can be in an area; their distribution is largely determined by local jurisdictions. Enhanced- 911 is available statewide.

The IDPH has a robust EMS agency licensing program that includes on-site inspections for both initial and renewal cycles. IDPH currently accommodates external accreditation programs as partial fulfillment of agency licensure requirements. Air medical program authorization requires application, review, and approval. National accreditation programs may be recognized in lieu of the Iowa application processes.

EMS personnel are certified in accordance with national curricula and training standards. Personnel are certified at the Emergency Medical Responder (EMR), Emergency Medical Technician (EMT), Advanced Emergency Medical Technician (AEMT), and Paramedical levels. Additional recognition is available for a Law Enforcement Emergency Care Provider and Critical Care Paramedic, among others.

EMR, EMT, AEMT, and Paramedic personnel are required to successfully complete National Registry of Emergency Medical Technicians (NREMT) assessment for initial certification. However, recertification processes are Iowa-based and require fewer hours of continuing education than NREMT standards. Within the Iowa-based recertification criteria limited emphasis is placed on continuing trauma and pediatric training.

Iowa has sample state EMS protocols, but local medical directors have the authority to enhance or modify these protocols. Revised protocols go back to the IDPH for review. It is estimated that 90% of EMS agencies use the state protocols, and 20% of agencies use the protocols with enhancements. Any issues with protocols are reviewed by the EMSAC. The Quality Assurance,

Standards and Protocol Subcommittee of EMSAC is responsible for protocol changes and quality improvement.

The last NHTSA EMS Assessment was performed in 1991. Some recommendations with regard to the trauma system were never implemented. Many participants were unaware of this prior report. The TSC team and participants were informed that funding has been secured for a repeat NHTSA assessment of the EMS system and planned for the spring of 2015.

Recommendations

- Continue to seek a NHTSA EMS assessment.
 - Implement the recommendations from the NHTSA EMS assessment.
- Require the National Registry of Emergency Medical Technicians recertification process for EMS provider recertification.
- Require continuing education for recertification that includes sufficient representation of trauma and pediatric training.

Definitive Care Facilities

Purpose and Rationale

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

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

Trauma receiving facilities providing definitive care to patients with other than minor injuries must be specifically designated by the state or regional lead agency and equipped and qualified to do so at a level commensurate with injury severity. To assess and ensure that injury type and severity are matched to the qualifications of the facilities and personnel providing definitive care, the lead agency should have a process in place that reviews and verifies the qualifications of a particular facility according to a specific set of resource and quality standards. This criteria-based process for review and verification should be consistent with national standards and be conducted on a periodic cycle as determined by the lead agency. When centers do not meet set standards, there should be a process for suspension, probation, revocation, or dedesignation.

Designation by the lead agency should be restricted to facilities meeting criteria or statewide resource and quality standards and based on patient care needs of the regional trauma system. There should be a well-defined regulatory relationship between the lead agency and designated trauma facilities in the form of a contract, guidelines, or memorandum of understanding. This legally binding document should define the relationships, roles, and responsibilities between the lead agency and the medical leadership from each designated trauma facility. The number of trauma centers by level of designation and location of acute care facilities must be periodically assessed by the lead agency with respect to patient care needs and timely access to definitive trauma care. There should be a process in place for augmenting and restricting, if necessary, the number and/or level of acute care facilities based on these periodic assessments. The trauma system plan should address means for improving acute care facility participation in the trauma system, particularly in systems in which there has been difficulty addressing needs.

Human Resources

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

Integration of Designated Trauma Facilities Within the Trauma System

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

Each designated acute care facility should participate, through its trauma program leadership, in all aspects of trauma system design, evaluation, and operation. This participation should include policy and legislative development,

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

Optimal Elements

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

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

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

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

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

- a. As part of the established standards, set appropriate levels of trauma training for nursing personnel who routinely care for trauma patients in acute care facilities. **(I-310.3)**
- b. Ensure that appropriate, approved trauma training courses are provided for nursing personnel on a regular basis. **(I-310.4)**
- c. In cooperation with the nursing licensure authority, ensure that all nursing personnel who routinely provide care to trauma patients have a trauma training certificate (for example, Advanced Trauma Care for Nurses, Trauma Nursing Core Course, or any national or state trauma nurse verification course). As an alternative after initial trauma course completion, training can be driven by the performance improvement process. **(I-310.5)**

- d. In cooperation with the physician licensure authority, ensure that physicians who routinely provide care to trauma patients have a current trauma training certificate of completion, for example, Advanced Trauma Life Support® (ATLS®) and others. As an alternative, physicians may maintain trauma competence through continuing medical education programs after initial ATLS completion. **(I-310.8)**
- e. Conduct at least 1 multidisciplinary trauma conference annually that encourages system and team approaches to trauma care. **(I-310.9)**
- f. As new protocols and treatment approaches are instituted within the system, structured mechanisms are in place to inform all personnel about the changes in a timely manner. **(I-310-10)**

Current Status

The Iowa trauma system has been based on an inclusive model since its inception in 1995. By statute, all acute care facilities are required to categorize themselves at one of four levels. This self-categorization is subsequently verified by the IDPH on a 3-year cycle. All facilities are also required to submit data to the state trauma registry.

The IDPH website lists a total of 118 hospitals categorized:

- Two Level I trauma care facilities,
- Four Level II trauma care facilities,
- 19 Level III trauma care facilities, and
- 93 Level IV trauma care facilities.

These facilities are widely distributed. Only nine of 99 counties do not have at least a Level IV trauma care facility. The Level I and II trauma care facilities are located centrally in the major population areas. Other high-level trauma care facilities are located near the state border in adjoining states and receive Iowa patients.

Trauma center coverage maps generated by the University of Pennsylvania, using data collected jointly by the ACS and the American Trauma Society (accessible at www.traumamaps.org) show that 61% of Iowa's land area and 80% of the population are within 1 hour of a Level I or Level II trauma care facility. This compares with 35% of the land area and 90% of the population for the country as a whole. Improving access to high-level trauma care in these rural regions remains both a challenge and a priority for the Iowa system, which was founded with the specific provision that trauma system development would "meet the unique needs of the rural residents of the state" (Iowa Code 147A.22, paragraph 4).

Because of Iowa's rural aspect and the manner in which the current trauma system was designed, Level III and level IV trauma care facilities play a major role in the initial treatment of injured patients. The trauma system places a high reliance on interfacility transfers to ensure optimal care for the most seriously injured. The higher-level trauma care facilities in adjoining states are primary destinations for injured patients in some regions.

Data presented by the IDPH and the TSAC suggest that in 2013 approximately 50% of injured patients were seen at Level III and IV facilities. For the most part triage within the trauma system appeared to be working, with Level III and IV trauma care facilities providing care for a higher proportion of patients with lower severity injury when compared to Level I and II trauma care facilities. This analysis did not include patients cared for by out-of-state facilities. The data are also potentially skewed by the inclusion of a large number of patients over the age of 70 years with isolated hip fracture resulting from same level falls. Further, the trauma registry data set does not allow for in-depth analysis of the timing and appropriateness of interfacility transfers. In addition, a significant number of Level IV facilities are not in compliance with data submission requirements. As a result, the true magnitude of potential undertriage (severely injured patients inappropriately cared for at Level III and IV facilities) cannot be accurately determined. Overtriage (the unnecessary transfer of less severely injured patients to high-level centers) is more reliably measured, and it does not appear to be outside of the range commonly seen on a national basis. Participants expressed no large-scale problems of systematic overtriage or undertriage, despite the lack of strong guidelines for field triage and interfacility transfer.

The Level IV trauma care facility categorization represents the minimum standard that all hospitals must meet, and 79% of hospitals are verified at this level. The verification process usually consists of a document review without a site visit. The criteria for Level IV verification are comprehensive and include requirements for personnel, training, and equipment, as well as robust requirements for trauma-based performance improvement (PI). An additional set of requirements become active if a general surgeon or an orthopedic surgeon "participates routinely" in the care of trauma patients. These additional requirements represent a partial application of Level III trauma care facility standards around presence of a general surgeon at resuscitations and operating room availability. Because of the default nature of Level IV categorization this group encompasses both hospitals that could be categorized at Level III as well as those with extremely limited resources. The criteria were designed to reflect this reality; however, the expectations are believed to be set too high for those hospitals with the least available resources and commitment to trauma care. Given the critical role that Level IV facilities have in rural areas of the state and the limited resources available at many of these smaller hospitals, changing and expanding the focus of Level IV verification reviews with the intent to enhance local capacity rather than review compliance with standards has the potential to improve their functioning.

The process for verification of a hospital's trauma categorization level is administered by the IDPH. The trauma center verification program of the ACS-COT is used for Level I trauma care facilities, and it is optional for Level II trauma care facilities; however, this is not specified in rules. Two of the four Level II trauma care facilities use the ACS verification program. The ACS-COT verification program evaluates trauma care facilities against a set of nationally accepted standards. External reviewers are used and a comprehensive chart review is performed, both aimed at evaluating overall pathways of patient care and the effectiveness of the PI process.

Level III and IV trauma care facilities, along with Level II trauma care facilities not using the ACS-COT program undergo an in-state verification process. The in-state process involves a review of documentary evidence submitted by the hospital, and may include an on-site visit by reviewers selected from within Iowa. The in-state process does not include chart review, and the standards are less rigorous than those set by the ACS-COT.

The daily operation of the entire verification process is largely the responsibility of the Trauma Coordinator, budgeted for 1.0 FTE. This level of staffing is likely insufficient to provide a detailed evaluation of each individual facility given that 118 facilities must be evaluated every 3 years, or approximately 40 evaluations per year. Reliance on a single FTE puts the verification program at risk of major disruption should the Trauma Coordinator position become vacant. This occurred for a significant period of time immediately prior to the TSC visit. The IDPH reported a backlog of about 40 facilities waiting for review at the time of TSC visit. Overall, management of the verification process consumes much of the energy and attention of the trauma staff at IDPH, to the detriment of other initiatives.

At an operational level, the participants reported that the current verification process has become "exonerative" and "lacks teeth." In-state reviewers reported that facilities may be re-verified even though repetitive and long-standing deficiencies were identified on serial visits. Broad administrative rules exist that describe the process for addressing the problem of a hospital that fails a verification review or is found to be out of compliance with verification standards. However, from a functional standpoint no established process exists within the IDPH to address such a problem. This has resulted in significant conflict between stakeholders and the IDPH in at least one recent case.

In summary, Iowa was among the first states to adopt an inclusive model of trauma system design, and has been successful in categorizing all acute care facilities with respect to their level of trauma capability. Administration of the verification program consumes a significant percentage of the trauma resources within IDPH, and over the years appears to have lost some of its rigor, especially in application to Level I, II and III trauma care facilities. Level IV trauma care

facilities present a challenge, as many are small and poorly resourced, but geography and current approaches to field triage combine to deliver a significant proportion of patients to these facilities. The criteria for Level IV categorization are fairly rigorous, and do not fully address the need for active efforts to improve capabilities as opposed to maintenance of standards. Additionally, trauma system design has focused most heavily on the underlying network of trauma care facilities, without as much focus on elements of patient flow within the system, both in terms of field triage and inter-facility transfer. The de-facto participation of trauma care facilities in neighboring states is not included in data analysis, and these hospitals are not routinely involved with system performance improvement efforts. The subjective impression is that patients are being moved appropriately through the system, but data systems and data analysis are currently insufficient to monitor the process in an objective fashion. Requirements for maintenance of verification standards and data submission have not been enforced, and circumstances where hospitals are out of compliance with verification standards or data reporting standards have not been addressed.

Recommendations

- **Strengthen the hospital verification process for Level I, II, and III trauma care facilities**
 - **Develop rules and procedures for remediation of trauma care facility deficiencies, such as lowering the level of verification and withdrawal of verification for hospitals not in compliance with standards.**
 - **Adopt the designation criteria specified in the most recent version of the American College of Surgeons' *Resources for the Optimal Care of the Injured Patient* document.**
 - **Develop a process to include comprehensive chart review in the verification site visit.**
 - **Utilize out-of-state reviewers for Level I, II, and III trauma care facility verification visits.**
- **Change the verification process for Level IV trauma care facilities to focus on technical assistance and facilitation of rapid triage and transfer of seriously injured patients that includes resuscitation protocols, pre-identification of patient and injury types that will be transferred, and pre-selection of destination hospitals.**
 - Use reviewers from within the region, ideally from trauma care facilities that receive patients in transfer from the index hospital

- Consider utilization of the American College of Surgeons Committee on Trauma (ACS-COT) trauma center verification process, especially for Level I, II, and III trauma care facilities to standardize the approach and to free up resources within the Iowa Department of Public Health.
- Include an analysis of community need in decisions regarding verification and designation of new Level I and II trauma care facilities.
 - Analyze the interaction between definitive care facilities on a regular basis, including the following: primary (field to initial hospital) and secondary (inter-facility transfer) overtriage and undertriage, delays in transfer, multi-step transfers, and trauma patient mortality occurring in facilities other than Level I and II trauma care facilities
- Develop a process to recognize and engage trauma care facilities from bordering states that are functioning as part of the Iowa system.
 - Identify the extent of their contribution and function in the Iowa trauma system.
 - Request data related to Iowa patients treated.
 - Seek a performance improvement interface.

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

A statewide out-of-hospital trauma triage destination decision protocol, for both adult and pediatric patients, is included in the statewide protocols. These protocols are generally consistent with the most recent CDC Field Triage Guidelines; however the Iowa protocols are vague with regard to describing specific destinations for many groups of patients. The triage destination protocols can be changed by the EMS agency medical director, and the protocols do not apply to air ambulances by regulation as they do for ground EMS agencies. The pediatric protocol does not specify the age range covered by the protocol, and it does not specify when a pediatric patient should be transported to one of the few pediatric trauma care facilities in the state when geographically able.

Available data show that the Level I and II trauma care facilities receive a larger percentage of patients with high injury severity scores than the Level III and IV trauma care facilities. However, improvement and enforcement of the statewide out-of-hospital trauma triage destination decision protocols may further improve the percentage of patients with severe injuries who get transported to higher level trauma care facilities for definitive care directly from the scene.

The trauma registry includes a large number of patients with same level fall hip fractures, an injury often excluded from other state registries. Inclusion of these injuries has implications regarding overall trauma numbers and trauma services at Level IV trauma care facilities. Possible improvements in the trauma triage destination scheme could be achieved if the destinations for isolated hip fractures are specifically addressed.

Participants expressed concern that some lower level trauma care facilities admit some patients with high injury severity scores (ISS), or additional injuries are found later that result in a higher ISS. The state PI indicator for interfacility transfer of a patient requiring higher level trauma care is six hours. Evidence needed to determine how well this indicator is met requires every lower level trauma care facility to perform PI on every high ISS patient that is admitted at the facility or has a delay in transfer. The quality of the interfacility decisions is not currently available.

Several participants referred to the out-of-hospital trauma triage destination decision protocol as the guideline that they use when determining if a patient that arrives at a lower level trauma care facility requires transfer to a higher level care. The state has no guidelines or policies for injury complexity criteria that should prompt a lower level trauma care facility to transfer to a Level I or II trauma facility. Most facilities follow customary referral patterns when coordinating patient transfers.

When interfacility transfer is required, participants stated that a delay often occurs due to EMS agency unavailability or unwillingness to accept the transfer. These delays are not tracked as part of the statewide PI process. Each lower

level trauma care facility must have an agreement with a higher level trauma facility to facilitate the transfer of patients that are beyond the facility's capabilities. However, no requirement for a similar agreement between lower level trauma care facilities and EMS agencies exists to facilitate the interfacility transfer of these patients.

The state has a statewide 800 MHz radio system and bed tracking system that can be used to facilitate communication when coordinating patient flow.

Recommendations

- **Require each trauma care facility to have an agreement with an emergency medical services (EMS) agency (or agencies) to facilitate timely ground and air interfacility transport of trauma patients when needed.**
- **Update the current out-of-hospital trauma triage destination decision protocol.**
 - Extend the acceptable ground transport time for patients that meet physiologic and anatomic triage criteria would increase the number of patients with a high injury severity score that get transported to a Level I or II trauma care facility as their initial destination.
 - Specify the maximum ground transport time for patients that should be taken to a Level III trauma care facility rather than a closer Level IV facility to ensure a higher level of care for patients who meet criteria for mechanism of injury or co-morbidities
 - Develop a separate trauma patient destination protocol that addresses which trauma patients should be transported by air and where they should be transported.
 - Study the compliance with this protocol by EMS agencies across the state during performance improvement.
 - Enforce the out-of-hospital trauma triage destination decision protocol.
- **Develop specific “transfer out” criteria for Level III and Level IV trauma care facilities that identify the patient injury complexes that should lead to transfer to a higher level facility.** See Appendix E for draft sample guidelines recently developed by the American College of Surgeons Committee on Trauma.

- Ensure that this list is used during performance improvement activities when reviewing patient's admitted to Level III or IV facilities and studying compliance with "transfer out" criteria.
- Require EMS agencies to recognize and accept responsibilities for interfacility transfers as part of the conditions of agency licensure.
 - Ensure that at least one agency is available for interfacility transport within each county at all times.

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

The inclusion of a rehabilitation representative on the TSAC indicates value that the state places on rehabilitation as part of the trauma system. It is not known how engaged this representative is with the trauma system and TSAC.

Iowa has at least 24 rehabilitation centers, 19 of which are accredited by the Commission on Accreditation of Rehabilitation Facilities (CARF) International. The TSC team believes this number of rehabilitation facilities with accreditation is higher than in some states with larger populations. The Iowa rehabilitation centers include several with pediatric, spinal cord injury, and traumatic brain injury capabilities. Despite this, admission to these facilities can take several weeks for some patients, such as some individuals with private health insurance and the elderly who do not have the capacity to participate in required three hours of rehabilitation per day.

Some trauma care facilities include early integration of rehabilitation medicine in the care of trauma patients, including rehabilitation team members that round with the inpatient team and provide early assessments prior to discharge. In other cases rehabilitation is not integrated until later in the patient care process.

The trauma system does not have access to data from rehabilitation facilities to monitor patient outcomes. It is also not known if rehabilitation facilities have data systems that could make data sharing possible. Patients who go to a skilled nursing facility (SNF) before going to a rehabilitation facility are not currently tracked, but this capability could potentially be included in the new trauma registry.

Recommendations

- Complete a needs assessment and gap analysis of rehabilitation capabilities and capacity across the state.
- Publish and regularly update a list of trauma rehabilitation facilities on the trauma system program website or otherwise distribute this list regularly to the trauma care facilities.

- Inventory rehabilitation centers to determine which ones treat patients with serious injuries and any subspecialty capabilities for pediatrics, spinal cord injury, burns, and traumatic brain injury.
- Incorporate outcome data from rehabilitation facilities into the state trauma data base.
- Implement a statewide performance improvement project to define the magnitude of the problem related to delays in access to rehabilitation.
 - Audit avoidable length of stay for the trauma care facilities to quantify delays in transfer to a rehabilitation facility.
 - Complete a focused audit of the findings at 12 months.
 - Present results to trauma and rehabilitation leadership.
 - Identify corrective strategies, implement, and re-evaluate.
- Review state verification criteria to ensure early involvement of rehabilitation personnel in the care of patients admitted to the trauma facility.
 - Require specific plans for utilization of rehabilitation facilities for patients admitted to that facility.

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

Facilities generally have disaster plans in place and evidence was provided that many of these facilities exercise these plans regularly. Facilities are required to use Hospital Incident Command System (HICS), and their employees have been educated and have used HICS during drills and real emergencies. The facilities also require Incident Command Structure (ICS) and National Incident Management System (NIMS) education.

The bed availability system is tested quarterly and it integrates with Hospital Available Bed for Emergencies and Disasters (HAvBED) for real-time bed

tracking during disasters. The Health Alert Network (HAN) is used to communicate with healthcare providers, including EMS, and the IDPH has a duty officer assigned at all times to activate the HAN if needed.

Post 9/11 disaster preparedness funds have led to better preparedness resources, but these funds have also narrowed the geographic focus of the groups that collaborate for disaster preparedness. Stakeholders felt that education and exercises that used to occur in an area of broad regionalization are now more focal. Some grassroots attempts at larger regionalization (Region 6) for disaster preparedness have occurred, and participants expressed the benefit of the larger regional focus with regard to exercising these preparedness activities within groups that work together already due to the natural referral patterns for patients.

Recommendations

- Develop a large-scale regional structure for disaster preparedness that coincides with trauma regions, mirroring existing patterns of patient referral.
 - Exercise these regions with regular region-wide drills.
 - Have larger referral facilities participate in planning, drills, and operations.
- Develop a statewide method of tracking patients during disaster and mass casualty events.

Systemwide 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

Iowa has key components in place to evaluate patient care, system effectiveness and outcomes. A systemwide PI plan is in place with identified hospital and out-of-hospital indicators and evaluation processes. PI activities are protected by statute.

The System Evaluation Quality Improvement Subcommittee (SEQIS) of the TSAC, formally known at the System Evaluation Quality Improvement Committee (SEQIC), is tasked with trauma system PI activities. Meetings are held quarterly. Volunteers (emergency and family practice physicians, trauma coordinators from all level facilities, and others interested) have been recruited to participate on SEQIS in addition to TSAC organization representatives. Participants stated that attendance and engagement by the SEQIS-appointed members is sparse at best, however interested members have good attendance.

A *2014 Trauma Registry Report* developed by IPRC for the IDPH includes data on the specific indicators within the PI plan and areas identified for improvements. SEQIS minutes provided to the TSC team revealed no evidence that SEQIS discussed this report or made recommendations that identified the outlying indicators within the report. Participants expressed that some PI activities have been implemented by the SEQIS based on data analyzed from the trauma registry, such as letters to all trauma care facilities about computed

tomography scans delaying interfacility transfers. Discontent was expressed about the amount of time it takes to get recommendations implemented as they must be approved by the TSAC and IDPH before executed. This process can take 6 to 12 months.

Frustration was also expressed by the IDPH, TSAC and SEQIS with the inability to conduct patient case reviews. Participants stated that chart reviews are not allowed during verification visits except when ACS verification is sought. An initiative carried by the Iowa Hospital Association claims that the PI statute is too vague to assure confidentiality and discoverability. Two major barriers have resulted from this action:

- The trauma system is unable to learn and understand the overall picture of trauma care within the state, and
- It is not possible to be assured that evidence-based practices are being consistently practiced within the trauma care facilities.

Some PI activities do occur at the local level by EMS and hospitals. For example the Central Iowa EMS Directors are developing an online Health Insurance Portability and Accountability Act (HIPAA) compliant PI system that enables a liaison to be present for addressing issues and providing follow-up.

Participants stated that over- and under-triage is a priority for state PI assessment when data are available. No efforts have been made modify to the triage and destination protocols to address the under-triage of high risk trauma patients going to Level III and IV trauma care facilities.

All hospitals are required to submit data to the trauma registry. Validation tools are in place and validation is conducted by the IDPH. Concerns were expressed that not all Level IV trauma care facilities are submitting data to the trauma registry and no enforcement has been initiated. The IDPH reported that approximately 50 Level IV trauma care facilities have not submitted their data, and timely submission by all hospitals has been a challenge. It is hoped that the new trauma registry being implemented in July will overcome some of these issues.

Recommendations

- **Evaluate the current performance improvement (PI) protection statute and revise the rules to specifically include chart reviews within the PI and verifications processes.**
 - Engage stakeholders, including the Iowa Hospital Association, in the revision process.
- Establish guidelines that describe the expectations of the Trauma System Advisory Committee and its System Evaluation Quality Improvement Subcommittee (SEQIS) for peer review and system and patient outcomes.

- Evaluate the current membership of the SEQIS.
- Organize meetings to review specific measures and de-identified cases to find opportunities to improve care, implement action plans, and ensure loop closure.
- Establish a process so that issues identified and recommendations made are addressed and corrected in a timely fashion.
- Disseminate reports and aggregated PI statistics to all trauma system stakeholders.

Trauma Management Information Systems

Purpose and Rationale

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

The lead agency should maintain oversight of the information system. In doing so, it must define the roles and responsibilities for agencies and institutions regarding data collection and outline processes to evaluate the quality, timeliness, and completeness of data. There must be some means to ensure patient and provider confidentiality is in keeping with federal regulations. The agency must also develop policies and procedures to facilitate and encourage injury surveillance and trauma care research using data derived from the trauma MIS. There are key features of regional trauma MISs that enhance their usefulness as a means to evaluate the quality of care provided within a system. Patient information collected within the management system must be standardized to ensure that noted variations in care can be characterized in a similar manner across differing geographic regions, facilities, and EMS agencies. The composition of patients and injuries included in local registries (inclusion criteria) should be consistent across centers, allowing for the evaluation of processes and outcomes among similar patient groups. Many regions limit their information systems to trauma centers. However, the optimal approach is to collect data from all acute care facilities within the region. Limiting required data submission to hospitals designated as trauma centers allows one to evaluate systems issues only among patients transported to appropriate facilities. It is also important to have protocols in place to ensure a uniform approach to data abstraction and collection. Research suggests that if the process of case abstraction is not routinely calibrated, practices used by abstractors begin to drift.

Finally, every effort should be made to conform to national standards defining processes for case acquisition, case definition (that is, inclusion criteria), and

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

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

Optimal Elements

I. There is an established trauma MIS for ongoing injury surveillance and system performance assessment. **(B-102)**

- a. There is an established injury surveillance process that can, in part, be used as an MIS performance measure. **(I-102.1)**
- b. Injury surveillance is coordinated with statewide and local community health surveillance. **(I-102.2)**
- c. There is a process to evaluate the quality, timeliness, completeness, and confidentiality of data. **(I-102.4)**
- d. There is an established method of collecting trauma financial data from all health care facilities and trauma agencies, including patient charges and administrative and system costs. **(I-102.5)**

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

- a. The lead trauma authority ensures that each member hospital of the trauma system collects and uses patient data, as well as provider data, to assess system performance and to improve quality of care. Assessment data are routinely submitted to the lead trauma authority. **(I-301.1)**
- b. Prehospital care providers collect patient care and administrative data for each episode of care and not only provide these data to the hospital, but also have a mechanism to evaluate the data within their own agency, including monitoring trends and identifying outliers. **(I-301.2)**

- c. Trauma registry, ED, prehospital, rehabilitation, and other databases are linked or combined to create a trauma system registry. **(I-301.3)**
- d. The lead agency has available for use the latest in computer/technology advances and analytic tools for monitoring injury prevention and control components of the trauma system. There is reporting on the outcome of implemented strategies for injury prevention and control programs within the trauma system. **(I-301.4)**

Current Status

The Iowa trauma system is undergoing a transition period as the new trauma registry and EMS data collection systems are being implemented. The current trauma registry system is built on the Digital Innovations Collector Software. The current EMS data repository uses a MedMedia platform, making it difficult to link data. It was also determined that the Collector software was not designed to handle the transition to *International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM)* in a smooth and timely manner. The IDPH decided to solicit proposals for a combined EMS and trauma registry solution. Stakeholders did have an opportunity to identify key components needed in the registry, but they did not select the new software. The contract was awarded to ImageTrend. The expected “go live” date is July 1, 2015 with training to occur between now and that date.

Data linkage currently occurs when the initial trauma care facility imports the EMS record into an individual patient record, and then submits the linked record to the trauma registry. The combined record can be forwarded to a receiving trauma care facility in the event of a transfer.

It was unclear how easily the EMS and trauma registry data can be linked at a higher level.

Data being received by IDPH were felt to be well protected.

Recommendations

- **Monitor implementation of the new emergency medical services and trauma registry systems to identify and correct potential issues.**
 - Ensure sufficient staff and vendor support to resolve all issues quickly (keep users happy)
- Hire a full-time trauma registrar to manage operations and maximize utility of new data system.
- Explore opportunities for data integration (EMS/Trauma) with vendor

- Consider a unique trauma patient identifier
- Consider a probabilistic matching scheme

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

The original trauma system enabling legislation established the SEQIC, which had the charge to “develop, implement, and conduct trauma care system evaluation, quality assessment, and quality improvement.” Over the subsequent years, the SEQIC conducted overview-level system evaluations and generated a

wide variety of reports with the intent of analyzing and improving the Iowa trauma system. SEQIC was not created with a specific infrastructure and data analysis resources, and no specific funding was appropriated for trauma system research and PI activity. At a practical level, SEQIC collaborated with the IPRC for data analysis and production of reports. The majority of IPRC funding is through the CDC.

The IPRC used statewide trauma registry data from the majority of trauma care facilities, EMS registry data, hospital discharge data sets, and vital records to generate a population-based set for analysis. Creation of this dataset has enabled Iowa to evaluate a broad dataset; however, the complexities of data linkage and the timing for availability of the various datasets has presented significant challenges with the timeliness of analysis and reporting. Participants reported that the entire process takes about two years before research analysis and quality reporting is completed for a given year. These delays, compounded by confidentiality concerns have kept nearly all reporting at an aggregate level. As such they have limited the impact and usefulness for the SEQIC's PI efforts, but they are a valuable research dataset.

No provision exists to establish a trauma system research agenda within the state trauma plan or the trauma system's operational structure. As a result, the research effort lacks a consistent focus. Participants reported that research and PI projects are either "driven by the epidemiology" and availability of funding, or by the choice of reports requested by SEQIC for evaluation of current practices. The ability to generate actionable data has been limited by the timing and confidentiality issues described above, as well as the nature of the underlying data, which constrains some avenues of investigation. Participants reported that IPRC has worked on whatever SEQIC, and now SEQIS needed, but it has not always been productive.

The state has infrastructure for research oversight, through data use agreements with IPRC and the research infrastructure within IDPH. It was reported that these resources have not been used in recent years. State trauma registry data is available for analysis under the aegis of SEQIS.

A significant amount of trauma-related research is conducted at a local and regional level through the efforts of individual facilities (universities, trauma care facilities, local coalitions, and the IPRC). Examples include past participation in the Resuscitation Outcomes Consortium, regional projects assessing the effect of traffic cameras on injury rates, and research efforts required for trauma care facilities to maintain Level I verification.

In summary, Iowa has a good basic data infrastructure with wide participation of trauma care facilities and EMS agencies, paired with a demonstrated ability to link to uniform hospital discharge data and other independent sources. If plans for integration of the new state EMS and trauma registry data are successful, this

underlying data set will become stronger. The IPRC collaboration is strong and it has proven success in data analysis and report generation, albeit with significant lag times. Perceived lack of confidentiality protection and the limited willingness to share data between trauma care facilities have clearly limited the degree to which effective trauma systems research has been possible. In addition, lack of a trauma system research focus outside of the SEQIC/SEQIS has prevented the development of a consistent research agenda that could help prioritize energy and resources. Individual trauma care facilities continue to produce good work, but no forum is present to share ideas and foster systemwide collaboration.

Recommendations

- Establish a research subcommittee of the TSAC to promote, coordinate and monitor collaborative trauma system research based upon priorities established in the trauma plan.
- Develop a systemwide research agenda to guide and facilitate focused, prioritized research at the state, regional, and local levels.
- Compile, maintain, and distribute a list of active trauma research projects being conducted out by Iowa trauma care facilities, with the goal of fostering cooperation and collaboration.
- Prioritize data linkage and optimal functionality of the new ImageTrend registry system to maximize its utility for research.
- Establish a policy and procedure for review and approval of research data requests from the state trauma registry.

Focus Questions

Focus Question 1: How can Iowa strengthen integration and relationships across the trauma system?

- a. Relationships between trauma centers**
 - i. PI feedback**
- b. Prehospital destination decision making-suggestions for improvement**
 - i. Metro vs. rural**
 - ii. Coordination of transfer and better utilization of resources**
- c. Rehabilitation**

Trauma systems that integrate all the services involved in care of the injured patient represent the best opportunity to reduce death and disability. A first step in developing an integrated trauma system is to recognize the breadth and scope of the resources needed and then to identify those individuals, agencies, state programs, and organizations in the state that can contribute some of those resources and energy to foster system enhancements. The public health approach is strongly recommended because the language is understood by leadership and program directors within the IDPH and other state agencies. Currently engaged stakeholders can take the lead to invite other key groups to participate in the trauma system coalition, including mental health, social services, child protection, public safety, injury prevention, and elected officials. Bringing such a diverse group together can be as challenging as it is rewarding.

These key groups and individuals should be invited during development of a new trauma system plan so that their roles within the trauma system are clearly articulated. Having an understanding about what their group or special interest can contribute and evidence of its importance in the trauma system plan is more likely to foster their engagement for the long term. Once these groups begin participating, ensure that their voice or special interest is heard during meetings. This may occur by having standing topics on the agenda for TSAC or its subcommittees, or by developing subcommittees to address important issues, such as injury prevention and rehabilitation.

Highly functioning systems may have a group of highly functioning individuals who focus their energy, intensity, and passion to improve a problem of social importance, such as the trauma system. When these types of individuals are engaged in trauma system development, creative ideas and solutions to problems emerge. The leaders of the TSAC and BETS should facilitate this energy and intensity for the good of the trauma system, keeping in mind the objectives that have been established for system development. At the same time it should be made clear to all stakeholders that this is a team effort that does not lead to competitive advantages for organizations or individuals. It is important for leadership to maintain transparency and open communications to foster consensus regarding system development and priority actions.

The Iowa trauma system was founded on the principle of inclusivity, the model advocated by the ACS-COT. The trauma system is now challenged to improve the engagement of all trauma care facilities and to ensure that all function as expected for their role in the system. Establishing regional trauma divisions should be considered as a potential strategy. Several states have formed regional advisory committees (RACs), often using regional borders established for health department programs, such as emergency preparedness. In some cases regions evolve around patient referral patterns when there is a larger hospital that sponsors the regional coordination.

Establishing RACs can serve many purposes. First, an opportunity exists to increase the number of health professionals engaged in trauma system management. For example, rehabilitation representatives may more likely accept an invitation to participate if received from a major referral hospital. EMS providers may attend and share their concerns about destination guidelines. Collaboration among interested trauma care facilities, EMS, and law enforcement representatives may lead to agreement on an injury prevention focus and program strategy for the year. Developing RACs may foster a sense of leadership, ownership and pride in providing tangible solutions related to trauma care for the communities in which the members live. This sense of personal engagement and accomplishment may be too easily lost at the state level. The importance of reviewing the patient experience for the population in their communities becomes self-evident at the regional level. Individuals and agencies may be more open to sharing concerns within the RAC rather than report an issue to the TSAC. Discussions and joint problem solving may result in ideas for modification of protocols or destination guidelines. These revised guidelines may be more easily evaluated in a region when members participate in the process and become more vested in following new guidelines specific to their region. Feedback to the state may lead to statewide changes or the recognition that some guidelines should be specific to the trauma care facilities and resources within a region.

Regional meetings offer opportunities to provide a focus on a blinded case review that highlights a trauma system challenge. An effective case review should facilitate discussion of important system issues such as triage and destination decisions, patient transport times, transfer decisions, and interfacility transportation issues that can be framed within the context of patient outcome.

Recommendations

- Explore opportunities to engage a committed and broad-based constituency for the trauma system.
- Identify engaged volunteers to serve as subcommittee leaders and clearly identify objectives and timelines for subcommittee work.

- Identify a mechanism to provide frequent communications with council and subcommittee members, as well as stakeholders regarding trauma system development, including plans, timelines, challenges, and help needed.
- Give recognition to volunteer leaders and celebrate accomplishments.

Focus Question 2: How can Iowa more adequately involve rehabilitation experts in the trauma system?

The inclusion of a Rehabilitation Services representative on the TSAC is evidence that rehabilitation was considered to be an important element of the trauma system during its early development. However, the TSC team perceived that rehabilitation appears to have received very little attention within the trauma community.

Twenty-four rehabilitation facilities, most of which are CARF-accredited, is a substantial number, but the list provided to the TSC team did not address the capacity of the rehabilitation centers or their capabilities for the rehabilitation of trauma patients as compared to stroke patient for example. Information provided during the review suggests that wait time for placement into rehabilitation can be two days to two weeks.

The inclusion of an overwhelming number of elderly patients and patients with hip fractures in the state’s trauma numbers makes it difficult to review the overall trauma rehabilitation needs of patients with more severe injuries. The rehabilitation requirements for individuals with hip fractures are very different than those for multiple trauma, traumatic brain injury, or spinal cord injury. It may be best to categorize the rehabilitation needs for patients with hip fractures separately from the rest of the trauma patient population.

The survey team heard that in some of the trauma care facilities, rehabilitation medicine team members join the trauma team during rounds to help assess a patient’s rehabilitation needs and to assist with post-discharge planning. It was apparent to the TSC team that early consultation by rehabilitation medicine is not the norm. The TSC team also heard that the trauma system has access to subspecialized rehabilitation expertise, like pediatric physiatrists, in some areas of the state.

Rehabilitation should be integrated into the next trauma system plan and any revised criteria for trauma care facility verification. Evidence that such integration has been accomplished will include the following:

- A well-integrated program of rehabilitation is available for all trauma patients.
- Rehabilitation programs are included in the trauma system plan.

- Trauma centers work closely with rehabilitation centers and services to ensure quality outcomes for trauma patients.
- Rehabilitation services are included throughout the continuum of care at trauma care facilities.
- Data regarding rehabilitation patient outcomes are entered into the trauma registry.

Recommendations

- Incorporate rehabilitation services into the next trauma system plan and the requirements for trauma care facilities.
- Complete a needs assessment and gap analysis of rehabilitation capabilities and capacity for trauma patients across the state.
- Implement a statewide performance improvement project to define the magnitude of the problem regarding delays in access to rehabilitation.
 - Survey trauma care facilities to determine whether issues with access to rehabilitation exist and the extent of these access issues.
 - Determine how many trauma care facilities have the capability of obtaining inpatient rehabilitation medicine consultation.
 - Determine how often a transfer delay to rehabilitation occurs when a patient is ready for this level of care.
 - Determine whether issues related to obtaining interfacility ambulance transportation to rehabilitation facilities exists.
 - Use this information to assess for regional variation regarding access to rehabilitation.
 - Subcategorize this information to analyze rehabilitation resources and access delays for various trauma conditions, including hip fractures, multiple trauma, traumatic brain injury, spinal cord injury, burns, and pediatric patients.
- Publish and regularly update a list of trauma rehabilitation facilities on the trauma program's website or otherwise distribute this list regularly to the trauma care facilities.
 - Inventory rehabilitation centers to determine which ones treat patients with serious injuries and any subspecialty capabilities for pediatrics, spinal cord injury, burns, and traumatic brain injury.

- Incorporate outcome data from rehabilitation into the state trauma registry.
- Review state trauma care facility designation criteria to ensure early involvement of rehabilitation personnel in the care of patients admitted to the facility and to require specific plans for utilization of rehabilitation facilities for patients admitted to that facility.

Focus Question 3: Help us to understand ways Iowa could measure outcomes related to the trauma system through benchmarking and system indicators. What guidance or recommendations can the Trauma System Consultation committee provide for improving system PI initiatives or method of loop closure?

A trauma system performance improvement (PI) process is the most efficient way to reduce death and disability by the following:

- Evaluating the standards of trauma care,
- Identifying causes of injury and promoting activities to prevent injury from occurring, and
- Assuring that the resources are available and accessible throughout the state to expedite care to the trauma injured patient.

The development of a statewide trauma system must include a method to measure, evaluate, and improve the process of care and system outcomes. The process must be a continuous, multidisciplinary evaluation of all trauma system components including prehospital care (dispatch, medical control, triage, and transport), hospital care, interfacility transfer and management, and rehabilitative care.

To establish an effective system PI process, enabling legislation must be in place to provide confidentiality and non-discoverability for PI activities conducted within the trauma system. A system PI plan is needed to identify the mission, objectives and process to be used. Formalized committees should be established within regulation at the regional and state level to provide authority over PI activities.

Iowa has completed many of foundational steps to begin systemwide evaluation of trauma care in the state. A comprehensive State PI Plan was developed in 2012 outlining the committee, goals, responsibilities, and indicators to begin a formal PI process. Although the current plan still references the SEQIC committee which has since been restructured to SEQIS, the functionality of the document and its contents have not changed, and it is still currently referenced and used.

A functioning trauma registry is a key component for system evaluation. Data reports from the Iowa trauma registry were reviewed by the TSC team, and they were felt to be adequate for implementing the PI process. It is not known, however, how the new trauma registry system will function and affect current data analysis. It is imperative that a trauma registrar be hired within the IDPH to monitor and manage the new trauma system for data quality and timely submissions.

Established indicators and benchmarks must be selected to effectively measure trauma system outcomes. The trauma care facility and out-of-hospital indicators currently monitored within the PI process, were reviewed by the TSC team and felt to be adequate for evaluating trauma system performance and outcomes. It was noted that mortality rates and the cost of trauma were not included, and these are key indicators for any trauma system evaluation. A periodic review of the selected indicators is recommended to guarantee that they are matching up with best practices and evidence-based models of trauma system care.

A couple of barriers currently inhibit effective trauma system PI implementation. One barrier is the inability to conduct trauma case reviews. Such reviews are essential for a trauma system to evaluate the quality of care at the local, regional, and state levels, to ensure that current evidence-based practices are used, and to assess statewide needs for revisions to care protocols and guidelines. The trauma system statute and rules must define clear processes for system PI and ensure that confidentiality and non-discoverability are in place for all PI processes.

Another barrier is the length of time needed to accomplish recommendations and loop closure for issues identified within the PI process. Participants stated that it can take up to 12 months before a SEQIS recommendation is carried out, and often no follow-up is provided back to the TSAC and SEQIS committees. The delay is partially related to having IDPH approval before SEQIS recommendations can be acted upon. Establishing committee guidelines with some authority, and defining timelines for the PI processes would help to overcome these barriers.

To advance the trauma system PI process the State PI Plan should be updated and revised to outline duties and expectations, reporting processes, timelines, and the development of standardized trauma registry reports needed for evaluation of the selected indicators. Additionally, IDPH along with trauma stakeholders should revise the statute and rules to outline PI processes and ensure protection for all trauma system PI activities.

Recommendations

- Update and revise the 2012 State Performance Improvement (PI) Plan outlining duties and expectations, reporting processes, timelines, and the development of standardized trauma registry reports needed for evaluation of the selected indicators.
 - Establish a schedule for review and revisions to the State PI Plan.
- Revise the trauma system statute and rules to outline PI processes and to ensure protection for all trauma system PI activities.
 - Include trauma case review as part of the PI and verification process.
- Hire a trauma registrar to monitor data quality and timely submissions with the new trauma registry.
- Develop standardized trauma registry reports needed for evaluation of the selected trauma indicators.
 - Include mortality rates (broken down by age and injury severity score) and cost of trauma as indicators for evaluation.

Focus Question 4: When the legislation was written for development of the state trauma system appropriate funding was not identified. What recommendations would the TSC Committee have for obtaining funds to support the statewide trauma system?

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. IDPH and the BETS management requires adequate funding for daily operations of the infrastructure and important activities such as TSAC meetings, development of regulations, data collection, PI, and public awareness and education. Trauma care facilities need funding to maintain their state of readiness to care for seriously injured patients within the state or region. The financial health of the trauma system is essential for ensuring its integrity and its improvement over time.

Like most states, the Iowa trauma system is supported by a combination of state and federal funding sources. Some funding sources are unstable and at risk of change from year-to-year.

In 2012, The National Conference of State Legislatures produced a report titled *“The Right Patient, The Right Place, The Right Time”* in which seven components of state trauma systems were examined, including state and federal funding sources. States were surveyed on a number of topics. Excerpts from this report provide excellent information and examples of local, state and federal sources leveraged by other state trauma systems.

- Local support: fifteen states require trauma centers to pay a fee to apply for trauma center designation status. Most trauma centers bill a trauma activation fee to health payers that helps support facility readiness costs.
- State-based support: This consists of funding from several sources. Oklahoma, for example, created the Trauma Care Assistance Revolving Fund, which is supported by a combination of driver’s license fees, criminal fines, moving violation fees and state tobacco tax.
- Federal support: IDPH has been relatively successful in applying selected federal grant funds to the trauma system. In addition to those federal sources already identified, IDPH should explore and develop collaboration with emphasis on this list of common federal funds used to support trauma systems:
 - *Section 402 Highway Safety Grant Program* is available to states for multiple safety initiatives, including data analyses, safety education programs and safety campaigns. Five states tap Section 402 funds to support their state trauma system.
 - *Section 408 Traffic Safety Information System Improvement Grants* are awarded to states to improve the timeliness, accuracy, completeness and uniformity of traffic safety data. Thirteen states have used these funds to support the trauma system. It is common for states to use these funds to develop a statewide trauma registry.
 - The *Department of Homeland Security* distributes billions dollars in grants to states to help bolster disaster preparedness and protect vital infrastructure. Five states use Department of Homeland Security grant funds to support the trauma system.

The following are a few examples of state and federal funding sources that were extracted from the 2012 The National Conference of State Legislatures document (<http://www.ncsl.org/documents/health/NCSLTraumaReport812.pdf>).

The state provides formal funding mechanisms for the trauma system through:

- Fees on moving/motor vehicle violations (CO, FL, IL, MS, OH, OK, TX, WA)
- Fees on criminal penalties (FL, IL, MI, VA)
- Vehicle registration/driver’s license fees (MS, OK, TX, VA, WA)
- Cigarette/tobacco fee (AR, HI, OK, TN, TX)

Federal grants used to support the trauma system:

- Office of Rural Health Policy (DE, FL, IN, KS, KY, MA, MN, MT, NH, NY, ND, OR, PA, SD, TX, UT, WA, WV, WY)
- Section 402 Highway Safety Grant Program (AL, MD, NV, UT, WA)
- Section 408 Traffic Safety Information System Improvement Grants (CA, FL, ID, IN, KY, MD, ND, TN, UT, WA, WY)

Recommendations

- Investigate options for stable funding of the state trauma system that may be supported by stakeholders.
- Review priorities in the new State Trauma Plan and identify potential state programs that may offer partnerships and funding for aspects of the trauma system.

Focus Question 5: After analyzing Iowa's trauma system infrastructure, please describe a sample model for developing regionalized trauma systems.

The key benefit of a regional infrastructure is its ability to establish minimum standards at the state level, while allowing for adaptation and modification to fit local circumstance. Even in Iowa, substantial differences exist in resource availability, transport distances, and injury pattern across the state. In addition, keeping the primary operational leadership and responsibility for trauma system PI at the regional level allows for the development of stronger working partnerships among stakeholders. In states with strong regional structures for EMS and disaster preparedness, it is logical to consider aligning trauma regions with this existing structure, though often the optimal regional divisions may be quite different for these three functions. Iowa currently lacks a strong regional infrastructure for either EMS or disaster, so trauma regions could be established in the most efficient manner without considering these external factors.

The primary elements that fall under trauma regional governance tend to center around patient flow and PI. It is logical that each functional region be based on a single Level I or II trauma care facility, or upon a cooperative grouping of Level I and II facilities. These facilities are likely to be the destination for most of the interfacility transfers, as well as a subset of the most seriously injured directly from the field. These facilities are also likely to have the most experience with trauma care and the potential for leadership within the regional. As such these trauma care facilities are ideally positioned to help establish basic criteria for destination selection and interfacility transfer. The Level I and II trauma care facilities are also the logical foci for the collection and analysis of regional PI data.

Beyond the key regional trauma care facilities, some fixed regional infrastructure must be developed to ensure that basic operational functions are performed, such as communication and record keeping, meeting coordination, data collection and analysis, and distribution of findings. Regional advisory councils should be established, but subcommittees focused on specific activities could engage more regional stakeholders in trauma system development. The relationship between regional advisory councils and the TSAC, as with the IDPH state trauma system program needs to be clarified and patterns of information flow and communication specified.

The leadership of the trauma regions could be partially supported (financially) or entirely volunteer, but some stable personnel dedicated to regional functions are essential. Important roles of dedicated personnel include scheduling meetings, keeping minutes, tracking injury prevention and PI projects and reporting results both upstream to the state and downstream to the partners in the effort.

Given Iowa's natural distribution of Level I and Level II trauma care facilities, the best architecture is likely one based initially on natural patterns of patient flow, but balanced to minimize transport distances and to distribute patient volume. Considering the geographic distribution of Level I and Level II trauma care facilities that might serve as the hub of a trauma region, and the state size and its population distribution, it appears that 3, 4, or 5 regions would be practical. The final decision should be based on the willingness and ability of Level I and II trauma care facilities to assume a leadership role, the nature of current referral patterns, and the availability of longer distance transport resources.

Once regional boundaries are established, specific destination protocols should be developed based upon a single minimum standard established at the state level. For any geographical location in the region, the destination facility for patients triaged at each step of the CDC *Guidelines for Field Triage of the Injured Patient* should be positively identified. This will be more sophisticated than simply the "nearest trauma care facility", but it should take into account other factors including trauma care facility resources, capabilities, and finding the best match for severity of injury. Once these destination protocols are established, compliance should be tracked and variances from the protocol analyzed. Criteria for interfacility transfer and destination trauma care facilities should be similarly codified within each region, and compliance tracked. Trauma system issues such as delays in interfacility transfer due to violation of criteria, inaccessibility of ground or air transport, or other factors need to be tracked for intervention and "loop closure". Variances in the utilization of out-of-state air medical resources need to be resolved to ensure that patients receive acceptable care and are transported to appropriate trauma care facilities in Iowa as appropriate.

As the regional system matures, the PI focus can be broadened beyond a focus on trauma system utilization and patient flow to review the functioning of individual trauma care facilities within the region and their interaction with the

system. Regional maturation could also logically include development of cooperative injury prevention programs and focused epidemiological studies looking at areas of particular interest within a specific region, under a broad statewide structure that ensured basic uniformity of approach.

Recommendations

- Review the patient transport and transfer pattern to each Level I and II trauma care facility and identify potential geographic trauma regions.
- Identify Level I and II trauma care facilities that are willing to lead or co-lead regional performance improvement coordination.
- Develop regional destination protocols based on a state minimum standard.
- Establish the guidelines for membership on regional advisory councils.
- Identify strategies for financial support of the regional infrastructure.
 - Identify specific contractual expectations for trauma region financial support provided.
- Develop a plan for communication and information exchange between regional trauma councils and the state trauma system.

Appendix A: Acronyms

ACS – American College of Surgeons
AEMT – advanced emergency medical technician
ASPR – Assistant Secretary for Preparedness and Response
ATV – all terrain vehicle

BETS – Bureau of Emergency and Trauma Services
BIS – Benchmarks, Indicators, and Scoring

CARF – Commission on Accreditation of Rehabilitation Facilities
CDC – Centers for Disease Control and Prevention

EMT – emergency medical responder
EMS – emergency medical services
EMSAC – Emergency Medical Services Advisory Council
EMSC – Emergency Medical Services for Children
EMT – emergency medical technician

FTE – full time equivalent

HAN – Health Alert Network
HAVBED – Hospital Available Bed for Emergencies and Disasters
HICS – Hospital Incident Command System
HIPAA – Health Insurance Portability and Accountability Act

ICD-10-CM – International Classification of Diseases, Tenth Revision, Clinical Modification
ICS – Incident Command Structure
IDPH – Iowa Department of Public Health
IPRC – Injury Prevention Research Center
ISS – injury severity score

MADD – Mothers Against Drunk Driving
MCH – maternal and child health

NHTSA – National Highway Traffic Safety Administration
NIMS – National Incident Management System
NREMT – National Registry of Emergency Medical Technicians

ODIVP – Office on Disability, Injury and Violence Prevention

PI – performance improvement

RACs – regional advisory councils

SAMHSA – Substance Abuse and Mental Health Services Administration
SEQIC – System Evaluation Quality Improvement Committee
SEQIS – System Evaluation Quality Improvement Subcommittee
STEADI – Stopping Elderly Accidents, Deaths and Injuries
STEMI – ST elevation myocardial infarction
STIPDA – State and Territorial Injury Prevention Directors Association

TSAC – Trauma System Advisory Council
TSC – trauma system consultation

Appendix B: Methodology

The Iowa Department of Public Health (IDPH) requested this trauma system consultation, which was conducted under the auspices of the American College of Surgeons (ACS), Trauma System Consultation (TSC) program. The multidisciplinary trauma system consultation team 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. Biographical sketches for team members are included as Appendix C of this report.

The primary objective of this ACS trauma system consultation was 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 Iowa. 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 TSC team reviewed the ACS Pre-Review Questionnaire (PRQ) submitted by IDPH, along with a number of related supporting documents provided by IDPH and information available on government websites.

The TSC team convened in Des Moines Iowa on February 2-5, 2015, to review the Iowa trauma system. The meetings during the four-day visit consisted of plenary sessions during which the TSC team 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 TSC team also met in sequestered sessions for more detailed reviews and discussion, and for the purpose of developing team consensus on the various issues, preparing a report of their findings, and developing recommendations for future development of the trauma system in Iowa. This report was developed independently of any other trauma system consultations or assessments.

Appendix C: Review Team Biographical Information

STEPHEN FLAHERTY, MD, FACS- TEAM LEADER

Dr. Stephen Flaherty is a trauma surgeon at Del Sol Medical Center in El Paso, Texas and Regional Medical Director in the Acute Care Surgery division of EmCare, Inc. where he provides clinical and administrative oversight to numerous trauma centers in all stages of development. He graduated from the Tufts University School of Medicine and completed his general surgery residency at Eisenhower Army Medical Center in Augusta, GA. After working for a year as a general surgeon, he returned to training as a fellow in trauma and surgical critical care at Boston City Hospital. He is board certified with added qualifications in Surgical Critical Care.

Dr. Flaherty served on active duty with the United States Army for 22 years during which he established a Level I trauma center in San Antonio, TX and a Level II trauma center in Landstuhl, Germany, the first ACS Verified trauma center outside the United States. His Army experience brought him a broad experience across all levels of the trauma system including oversight of the trauma system in Iraq and Afghanistan as the Director of the Joint Theater Trauma System for nine months.

Dr. Flaherty is a member of the American College of Surgeons Committee on Trauma where he participates on the Trauma Systems Evaluation and Planning Committee as well as the Performance Improvement and Patient Safety Committee. He is a member of the American Association for the Surgery of Trauma, the Eastern Association for the Surgery of Trauma, the Society of Critical Care Medicine, and the American College of Surgeons. He has numerous publications and presentations on topics in trauma and critical care.

JANE W. BALL, RN, DRPH

Dr. Jane W. Ball has served as a technical advisor to the Trauma Systems Evaluation and Planning Committee of the American College of Surgeons Committee on Trauma since 2006. As such, she has participated on more than 20 state and regional trauma system consultations. She was 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 participated in the development of the HRSA *Model Trauma Systems Evaluation and Planning* document. She also provided technical assistance to states regarding 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* (8 editions), *Child Health Nursing* (3 editions), *Pediatric Nursing: Caring for Children* (6 editions), *Maternal and Child Nursing Care* (4 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.

AMY EBERLE, RN, BSN, EMT

Amy Eberle is currently the Trauma Program Manager at Sanford Health – Bismarck, an ACS Level II verified Trauma Center. Prior to her current position she was the North Dakota State Trauma Coordinator with the Division of Emergency Medical Services, North Dakota Department of Health for seven years. Amy also worked at St. Alexius Medical Center in Bismarck, ND for 8 years with experience in Neuro, Ortho, and General Surgery.

Amy is a member of the ND COT, ND EMSC advisory committee, ND EMS advisory committee, Society of Trauma Nurses, and the ND ENA. She is also a part of the planning committee for the annual ND State Trauma Conferences.

Amy has been a strong advocate for an all inclusive trauma system within ND. She has been involved in many legislative activities in regards to enhancing the ND trauma system and as a result has been very successful in getting the legislature to provide appropriations for the trauma system. Amy has also been very active in regional and state system performance improvement.

Amy is a Registered Nurse with a Bachelor in Science degree. She graduated from the University of Mary, Bismarck ND. She was certified as an EMT-Basic in 2006. She also obtained certification as a TNCC instructor and has attended numerous conferences, courses, and workshops on EMS, Trauma and disaster planning and response.

DOUGLAS F. KUPAS, MD, EMT-P, FACEP

Douglas F. Kupas, MD began his career in emergency medical services (EMS) in the early 1980's as an EMT and paramedic in western Pennsylvania. He then completed medical school at Jefferson Medical College of Thomas Jefferson University in Philadelphia, followed by residency training in Emergency Medicine at Geisinger Medical Center in central Pennsylvania – Geisinger is a Level I Trauma Center and a Pediatric Trauma Center serving 31, mostly rural, counties in northcentral/ northeastern Pennsylvania. During his residency, he flew on over 80 air medical transports as a flight physician for Geisinger LifeFlight. After residency, he stayed at Geisinger Medical Center as a faculty member where he served as the program director of the emergency medicine residency from 1998 through 2008. Previous roles at Geisinger included Director of EMS Programs, establishment of the Emergency Medicine Resuscitation Simulation Lab, Chairman of the Disaster Committee, and Chairman of the five-county Inter-facility Disaster Committee. He currently holds the position of Associate Chief Academic Officer for Simulation and Medical Education for Geisinger Health System. In 2013, Dr. Kupas became one of the first 200 physicians to become board-certified by the ABMS in Emergency Medical Services.

Dr. Kupas has many clinical interests in emergency medicine, including emergency airway management, cardiac arrest care, therapeutic hypothermia and care of accidental hypothermia, simulation in healthcare education, wilderness EMS, and emergency ultrasound. His scholarly interests include prehospital airway management and EMS provider and patient safety. He has been a worksheet author for airway care components of the International Liaison Committee on Resuscitation 2005 and 2010 guidelines.

Dr. Kupas has served as the Commonwealth EMS Medical Director for the state of Pennsylvania since 2000. In this role, among many other projects, he has overseen the development and implementation of statewide BLS and ALS protocols in Pennsylvania, developed a state online EMS safety and error reporting system, served as Chairman for the Life Sustaining Wishes Committee that developed the Pennsylvania POLST form, and provides consultation to the Director of the Bureau of EMS. He also serves as the ALS Service Medical Director for Danville Ambulance Service.

He has a special interest in rural EMS and trauma systems. He served as chair of the National Association of EMS Physicians (NAEMSP) Rural Committee, Standards and Practices Committee, and most recently, Mobile Integrated

Healthcare/Community Paramedicine Committee. He has also served as an advisory council member of the Rural EMS and Trauma Technical Assistance Center and is a past chair of the National Association of State EMS Officials Council of Medical Directors.

FERGUS LAUGHRIDGE, AEMT, CPM

Fergus Laughridge has a diverse professional background as a police officer, firefighter, paramedic, and manager of EMS systems and operations. Mr. Laughridge has served as the Director of Nevada State Health Division, Emergency Medical Systems and Trauma program where he was responsible for assuring the quality of pre-hospital emergency medical and trauma services throughout Nevada. As State EMS Director, he was involved with numerous federal, state, and community activities relating to emergency preparedness and response.

Mr. Laughridge is currently employed by Humboldt General Hospital EMS and Rescue in Winnemucca, Nevada. Mr. Laughridge has the responsibilities of professional services development, community outreach, and serves as Hospital Preparedness Coordinator.

Mr. Laughridge is continually requested to serve on various committees centered on quality patient care, trauma systems, emergency preparedness, and credentialing of EMS systems.

HOLLY MICHAELS, MPH

Holly Michaels has served as the American College of Surgeons (ACS) Trauma Systems Consultation Program Administrator since 2007. In this role, Ms. Michaels has facilitated over 20 state and regional consultations and managed several Trauma System Evaluation and Planning Committee projects related to trauma systems development and evaluation.

Ms. Michaels graduated from the University of South Florida in 2001, with a Bachelor of Arts degree in English. She began her career in public health as a health education coordinator at 2-1-1 Tampa Bay Cares, a non-profit organization in Clearwater, Florida connecting the community with health and social service resources. Ms. Michaels received a Master's in Public Health from the University of Illinois at Chicago in August 2014.

NELS D. SANDDAL, PHD, MS, REMT

Dr. Sanddal is currently the Manager of the American College of Surgeons (ACS) Trauma Systems and Verification Programs. Prior to his current position, he served as President of the Critical Illness and Trauma Foundation (CIT), in Bozeman, Montana for 25 years. He worked as the training coordinator for the

EMS and Injury Prevention Section of the Montana Department of Public Health and Human Services in the late 1970's. He served as the Chairperson of the National Council of State EMS Training Coordinators and as the lead staff member for that organization, and similarly for the National Association of EMT.

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

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

ROBERT J. WINCHELL, MD, FACS

Robert J. Winchell, MD, FACS is currently Professor of Surgery and Chief of Trauma at the University of Texas Health Science Center at Houston and Memorial Hermann, Texas Medical Center. He received his undergraduate degree from the California Institute of Technology, his M.D. from Yale University, and did his internship, General Surgery residency, and Trauma and Critical Care Fellowship at the University of California, San Diego, where he remained on the faculty as Associate Professor of Clinical Surgery in the Division of Trauma through 1999. After leaving the University of California, Dr. Winchell established and subsequently directed the Tacoma Trauma Center in Tacoma, Washington. The trauma center continues to operate successfully as a joint venture between two previously competing hospitals. In 2001, Dr. Winchell moved to the Maine Medical Center and assumed the role of Head of the Division of Trauma and Burn Surgery in 2004. He remained in that position for 10 years, also serving as an Associate Professor of Surgery at the Tufts University School of Medicine. Under his direction, Maine Medical Center became a verified Level I trauma center in 2007.

Dr. Winchell has been involved in trauma center and trauma system design and operation in a wide variety of settings covering the spectrum of system development. He was instrumentally involved with both the day-to-day operations and ongoing development of the San Diego County trauma system for over ten years and served as chair of the San Diego and Imperial County Committee on Trauma. He participated in the operation and ongoing development of the Washington state trauma system, serving on the state advisory board, and as chair of the Southwest EMS region. During Dr. Winchell's

tenure in Maine, he worked to develop the Maine state system, serving as a member of the state advisory board and as a chairman of the Maine State Committee on Trauma. Dr. Winchell is Chair of the Trauma Systems Evaluation and Planning Committee of the American College of Surgeons and also serves as a senior site reviewer for the trauma center verification program of the College. He has led 11 state trauma system consultations. Dr. Winchell has been involved in international trauma systems development and was a founding representative to the World Health Organization's Global Alliance for the Care of the Injured.

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

Appendix D: Sample Job Descriptions

EMS/Trauma Medical Director

The EMS/Trauma Medical Director should optimally be a general trauma surgeon or emergency physician who is an active member of the Trauma System Advisory Council. He or she should have at least five years experience. Previous service as a Trauma or EMS Medical Director is highly desirable.

Responsibilities might include but not be limited to:

- Attend all Trauma System Advisory Council meetings
- Attend all verification/designation visits
- Oversee systemwide PI and clinical activities
- Provide systemwide EMS medical oversight in collaboration with individual agency EMS medical directors
- Lead a systemwide EMS/trauma medical directors work group
- Support and facilitate development of individual Trauma Medical Directors and Trauma Programs
- Adjudicate operational issues within the state trauma system
- Oversee and direct development and modification of clinical pathways, guidelines and protocols
- Approve all clinical pathways, guidelines and protocols
- Participate in setting the research agenda
- Will be active in national trauma professional organizations
- Contribute to financial and development decisions regarding trauma at the state level
- Serve as a designated expert on all trauma system and EMS issues

State Trauma Registrar

The Trauma Registrar should optimally hold a bachelor's degree in a behavioral, social, or health science or health-related field with emphasis in statistics or biostatistics and research methods. This position requires a minimum of two years experience in research methods/statistical analysis and application, and conducting health or health care delivery research. A master's degree will substitute two years practical experience.

Responsibilities might include, but are not limited to:

- Validate data submitted to the IDPH
 - Develop and implement a system or methodology to statistically validate data that is submitted for every ambulance run and every major trauma patient admission to Iowa hospitals.
 - Provide feedback to ambulance and hospital personnel on appropriate submission of data.
 - Maintain the trauma registry database
 - Respond to requests by management for special studies and data analysis.
- Provide educational support for end users of the trauma registry database.
 - Provide quarterly, regional training in data submission and quality assurance to ambulance services and hospitals.
 - Develop and continually refine a best practices guide for data submission and use for ambulance services and hospitals.
 - Make presentations at state and regional conferences to explain best practices for data submission and use.
 - Assist EMS agencies with benchmarking EMS performance measures. These benchmarks can drive local allocation of EMS resources to better serve the public.
- Produce statistical reports
 - Research, analyze, and draft monthly and annual reports.
 - Design report formats and content.
 - Final report editing and preparation before printing and distributing reports.
 - Make presentations to departmental, state, and regional groups describing data driven conclusions about emergency health care within Iowa.
 - Provide ad hoc statistical reports to Division of Health staff upon request.
 - Work with external customer's requests for data.
- Act as a liaison between the IDPH, contracted software vendors, and national and state data repositories.
 - Work with software vendors to resolve any technical issues identified with the trauma registry database.

- Ensure the data dictionary of the trauma registry is compliant with the National Trauma Data Bank project.
- Submit validated raw data to national data repositories while remaining in compliance with privacy laws and regulations.
- Work with Departments of Health in bordering states on trauma registry data sharing.

Appendix E: Rapid Triage and Transfer Guidelines

Draft Document

These Rapid Triage and Transfer Guidelines were developed by the Rural Trauma Committee of the American College of Surgeons Committee on Trauma. They were developed in two forms: Level III and Level IV. Level III trauma centers in the United States have General Surgery capabilities, and Level IV or V centers do not. This is reflected in the example guidelines. These guidelines are presented in template form so that each facility can assess their own resources and modify the guidelines commensurate with their facility. These guidelines are not static and should be reviewed and updated periodically to reflect changes in medical staff and/or abilities, issues identified in their ongoing PI process, and input from their regional trauma system. They are distributed in Word format to encourage customization.

DRAFT Document
“Level III Trauma Center Example”
Rapid Triage and Transfer Guideline

Transfer

Mechanism:

Consider

Primary Survey:

Airway and C-Spine protection

Breathing

Circulation/Control hemorrhage

Disability: Brief neurologic evaluation

Yes

Exposure: Undress, but keep warm

Yes

Positive Findings

Head Injury: Severe, Open

Neuro deficits, GCS \leq 8

GCS < 8, Intubate

Resuscitation:

Oxygen, 2 large bore IV's or Rapid Infusion System

Manage Life Threatening Injuries:

- Chest Tubes

ABG, EKG, Pulse Oximetry, NG, Foley

X-Rays:

- Lateral C-Spine

Yes

Fx/Subluxation

- Chest

Yes

Widened Mediastinum

- Pelvis

Yes

Open Book, Sacral, Acetabulum Fx

- Deformed extremities

Discuss with Ortho may need transfer

DPL or FAST Exam

+/- to OR for Trauma Lap

Consider

(See Crash to OR Policy) after Lap if needed

Secondary Survey:

Head and Skull

Yes

Depressed Skull Fx, +CT head

Maxillofacial

Neck

Tender/Deformity - Expedite CT

Consider

If + consult Spine/ Ortho

Chest

Abdomen

Perineum/Rectum/Vagina

Musculoskeletal

Complete Neurological Exam

Yes

Deficits - expedite CT

LOG ROLL - Back

**Tender/Deformity - Expedite CT
(+) - consult Spine Ortho**

Consider

***Evaluation and decision to transfer to a higher level Trauma Center should be made within the first 30 minutes of Trauma Team Leader arrival**

DRAFT Document
“Level 4 Trauma Center Example”
Rapid Triage and Transfer Guideline

Transfer

Mechanism:

Consider

Primary Survey:

Airway and C-Spine protection

Yes

Breathing

Yes

Circulation/Control hemorrhage

Yes

Disability: Brief neurologic evaluation

Yes

Exposure: Undress, but keep warm

Yes

Intoxicated and Can't Evaluate

Yes

Positive Findings

MVC: High Speed, Head-on, ejected
 Fall >15ft, Penetrating torso

Intubated

Multiple rib Fx, Chest Tube

SBP <80 on adult, age specific peds.

Neuro deficits

GCS < 13

Signs of Traumatic injury

Resuscitation:

Oxygen, 2 large bore IV's or Rapid Infusion System

Manage Life Threatening Injuries:

- Chest Tubes

Yes

ABG, EKG, Pulse Oximetry, NG, Foley

X-Rays:

- Lateral C-Spine

Yes

- Chest

Yes

- Pelvis

Yes

- Deformed extremities

Yes

Fracture/Subluxation

Widened Mediastinum, Multiple rib Fx

Open Book, Sacral, Acetabulum Fx

Splint, Traction splint,

FAST Ultrasound (if available)

Yes

+

Secondary Survey:

Head and Skull

Yes

Depressed Skull Fx

Maxillofacial

Significant injury, diplopia,

Consider

Neck	Deformity
Yes	
Chest	Bony Crepitance, Flail
Yes	
Abdomen	Peritoneal signs
Yes	
Perineum/Rectum/Vagina	Ecchymosis, bloody drainage
Yes	
Musculoskeletal	Open fractures, Dislocations
Yes	
Complete Neurological Exam	Neuro Deficits
Yes	
LOG ROLL - Back	Deformity
Yes	

***Evaluation and decision to transfer to a higher level Trauma Center should be made within the first 15 minutes of Trauma Team Leader arrival.**

Appendix F: Participant List

Rosemary Adam	Harsha Jayawardena
Katrina Altenhofen	Teresa Jennings
Rachel Anderson	Hannah Jepson
Katie Aronow	Jack Johnson
Jeri Babb	Karen Jones
Thomas Benzoni	Yasser Karim
Beth Berg	Gerald Kealey
Kayla Bevins	Evan Kellis
Andrea Bladel	Holly Kjergaard
Philip Caropreso	Fred Klingbeil
Kari Catron	John Kraemer
Kent Choi	Binnie LeHew
Clark Christensen	Michele Lilienthal
Sherri Church	Joseph Lohmuller
Gerd Clabaugh	Amanda Luick
Mary Clark	Mary Malcom
Thomas Craighton	Judy Malget
David Cronin	Laura Malone
Rebecca Curtiss	Laura Manwarren
Leigh Davis	Christine Matthies
Jesse DeWaard	Willie McClairen
Jared Dumermuth	Sara McIntosh
David Edgar	Randy Meecoty
Charity Fecht	Merrill Meese
Joe Ferrell	Tammi Miller
Sharisse Fiori	Michael Miller
Michelle Fischer	Maria Nelson
Linda Frederiksen	Jim Noble
Elizabeth Fuchsen	Jennifer Nutt
Steve Gelder	Sherry Olson
Jeff Gilchrist	Heather Osterbrink
Julia Goodin	Cindy Peeler
Mary Groves	Carlos Pelaez
Raian Hanson	Tish Phillipps
Michael Hartley	Katie Pierce
John Hartman	Kristin Platz
Brian Helland	Jeanette Riniker
Gary Hemann	Clint Robinson
Katherine Hill	Nora Royer
Jeff Jarding	Robert Savereide

Gregory Schmunk
Stacia Schulze
Ken Sharp
Richard Sidwell
Barb Siefker
Dionne Skeete
Terry Smith
Brent Spear
Robert Stapleton
Wendy Stuhr
James Swegle
Mark Taylor
Angie Taylor
Diane Thenhaus
David Thomas
Anthony Thomsen
James Torner
Rose VanderPol
Richard Vermeer
Larry Volz
Rebecca Walters
Christina Welsh
Mandy Wessels
Kristel Wetjen
Lynn Whisler
Diane Williams
Evelyn Wolfe
Ellen Woods
Staci Worley
Ericha Worple
Carol Yapple