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

Trauma System Consultation Report

State of Ohio

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AMERICAN COLLEGE OF SURGEONS
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Highest Standards, Better Outcomes

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Executive Summary

Overview

The State of Ohio currently has 178 acute care hospitals serving a population of approximately 11.5 million people. Of these facilities, 43 are trauma centers verified by the American College of Surgeons Committee on Trauma (ACS-COT), and 3 others have provisional trauma center status. This network of trauma centers provides access within one hour for 99% of the population and 98% of the state's geographic area. The trauma system was created following an exclusive design, and while all facilities must submit data on injured patients to the state registry, state law requires that all severely injured patients be transported to a designated trauma center. Unfortunately, the term "severely injured" is not uniformly defined. However, the statewide prehospital trauma triage guidelines for EMS providers include several frequently-used exemptions, and a significant number of injured patients are actually transported to non-trauma center facilities. Additionally, all acute care facilities must submit data on injured patients to the state trauma registry. In reality, the Ohio trauma system appears to be more like an inclusive model in actual operation.

Limitations within the current structure of the trauma system have prevented it from growing and improving beyond its current state, leading to stakeholder frustration. The enabling legislation passed in 1992 established the Ohio Department of Public Safety (OPDS) as the lead agency for the trauma system, working through the EMS board, but limited the authority of that agency to the pre-hospital phase of care. As a result, no effective oversight of trauma care occurs at the definitive care facilities or during subsequent phases of patient care. No requirements for trauma center designation exist beyond successful verification by the ACS-COT, creating the potential for maldistribution of trauma centers as new acute care facilities seek to join the trauma system. No standards for clinical performance or system participation by trauma centers exist beyond those established by the ACS-COT. Trauma system coordination and patient flow across the entire spectrum of trauma care is disjointed, and effective integration between EMS, the trauma centers, rehabilitation, and other areas such as disaster preparedness is lacking at the state level.

This lack of central leadership and vision has led to the organization of regions in an effort to provide an integrative structure, but the success of these grassroots efforts has been variable. The regions have very different compositions, and they have taken very different approaches to the development of a trauma system. The regions have tended toward isolation rather than large-scale integration, leading to a general lack of confidence in the few statewide resources that do exist, such as the statewide trauma registry database. Large scale integration is also impeded by strong public disclosure laws (Open Meetings Act) which have been interpreted in ways that make it difficult to hold statewide meetings and to utilize teleconferencing to reduce travel.

Despite these frustrations, Ohio has a strong coalition of trauma stakeholders. Examples of recent successful endeavors include a system assessment facilitated by

the Ohio Society of Trauma Nurse Leaders (OSTNL) and a trauma system performance evaluation tool developed by the Trauma Visionary Committee. Regional trauma systems such as the Central Ohio Trauma System (COTS) and the Tri-State Trauma Coalition (TSTC) have been successful in developing integrated and data-driven processes of trauma care, and can serve as models for a statewide system. A more collaborative effort at the state level produced the recent "Framework for Improving Ohio's Trauma System," included as one of the goals of the Ohio *EMS 2015 Strategic Plan*. A rejuvenated enthusiasm to further trauma system development exists within the stakeholder community, along with a willingness on the part of the lead agency and the state government to find a way forward.

The site visit team identified the need to establish a clear, functional leadership model within the lead agency that addresses all aspects of trauma care, from prehospital through definitive care to rehabilitation and restoration of the injured patient into their community. While this will ultimately require significant changes to existing statute, buy-in from stakeholders in all areas appears to be sufficient to enable the lead agency to make substantial progress with system integration on a voluntary basis until statutory change occurs. Such efforts that could proceed most easily include completing the trauma plan and needs assessment, formalizing cooperation and uniformity between trauma regions, developing more standardized destination protocols for EMS transports with elimination of exemptions, establishing a process to designate trauma centers based upon system need, and working to improve data sharing and analysis.

The site visit team identified the following characteristics of the Ohio system:

Advantages and Assets

- Ohio has a long history of dedicated participation by trauma system stakeholders.
- Awareness exists regarding the burden of injury based on injury data analysis and reports.
- A recent trauma system assessment was performed using the Health Resources and Services Administration (HRSA) Model Trauma System Planning and Evaluation (MTSPE) process.
- The lead agency for the trauma program has some staff dedicated to trauma.
- An active trauma advisory committee is present.
- The *EMS 2015 Strategic Plan* includes the Trauma Framework, and subcommittees have been identified to work on each goal.
- Legislative support and champions have been identified.
- The consensus among stakeholders is that change is necessary.
- The trauma system has some limited and fragile funding, including a grant program for research.
- Injury prevention is part of the Trauma Framework, and the Ohio Injury Prevention Partnership exists to help promote prevention programs.
- EMS education has been strong historically.
- The merger of the EMS Board and Medical Transportation Board will be beneficial.

- Trauma centers are externally validated.
- Trauma triage guidelines exist with pediatric and geriatric modifications.
- Rehabilitation is represented on the trauma advisory committee.
- Interagency collaboration exists for disaster preparedness.
- Performance improvement activities occur within some regions that have regional trauma registries.
- A scorecard for trauma system evaluation was developed.
- The Trauma Acute Care Registry (TACR), Trauma Rehabilitation Registry (TRR), and Emergency Medical Services Incident Reporting System (EMSIRS) exist. The TACR is undergoing a software update and becoming compliant with the National Trauma Data Standard. The EMSIRS is becoming compliant with the National EMS Information System.

Challenges and Opportunities

- The trauma system's statutory authority is limited and restrictive as the entire spectrum of trauma care is not addressed.
- Ohio has no trauma center designation process, and the provisional trauma center process is flawed.
- The Open Meetings Act requires face-to-face meetings for all trauma system development work.
- Staffing for the trauma system is limited to data analysis. No trauma program manager, performance improvement coordinator, or trauma medical director positions exist to support trauma system development.
- There has been limited implementation of the Trauma Framework to date.
- Minimal system integration occurs, such as between the trauma system within the Ohio Department of Public Safety and the Violence and Injury Prevention Program within the Ohio Department of Health. Additionally the state trauma system has minimal integration with disaster preparedness.
- Funding is at risk and no trauma specific funding is appropriated.
- The EMS grant program is not necessarily needs based and has no formal relationship to the trauma committee.
- The EMS Board has no oversight of EMS agencies. Limited EMS performance improvement initiatives have been implemented.
- No knowledge exists regarding over- and under-triage rates and issues.
- The trauma triage guidelines have no destination protocols. Monitoring for compliance with these guidelines does not occur.
- Resources for trauma rehabilitation are largely unknown.
- No trauma performance improvement plan exists.
- The Public Records Act requires risk adjusted data reporting requirements that create challenges for state performance improvement activities.

General Themes

- Functional leadership is needed for the trauma system. This may require statutory change for a trauma specific lead agency.
- The trauma system will benefit from the establishment of more formal collaborative relationships with other organizations such as the Ohio Committee on Trauma, Ohio Society of Trauma Nurse Leaders, the Ohio Violence and Injury Prevention Program, and the Ohio Injury Prevention Partnership.
- Continue to develop and refine the trauma plan as a component of the EMS 2015 Strategic Plan.
- A trauma system vision and structure is needed. The presence of trauma centers does not equate with a trauma system. An inclusive trauma system does not mean it is unregulated.
- Trauma center designation should be based on need using consistent and objective data.
- The state trauma system program should improve coordination with regional trauma systems, and disseminate successful models to all regions.
- Reliable funding mechanisms for the trauma system need to be established.

The site visit team put forward a total of 76 recommendations, including the following 16 priority recommendations. Additional feedback and recommendations were provided in the response to focus questions.

Priority Recommendations

Statutory Authority and Administrative Rules

- Seek executive and legislative support to pass enabling legislation for a Trauma System Program with appropriate funding to serve as the lead trauma agency within the Ohio Department of Health.
- Ensure that enabling legislation provides the authority to set standards and enforce rules for the statewide trauma system including:
    - Designation and de-designation of trauma centers,
    - Requirements for non-trauma hospitals,
    - Establishment and oversight of specific trauma regions,
    - Establishment of a multi-disciplinary trauma advisory committee that has representation from the trauma regions and each segment of the injury continuum of care,
    - Management of the State Trauma Acute Care Registry and Trauma Rehabilitation Registry, and
    - Protection for peer review and similar performance improvement activities (addressing open meeting and public records laws).

System Leadership

- Improve collaboration between the EMS Board and the State Trauma System Program (or Trauma Committee).
    - Conduct joint meetings to enhance two-way communication and exchange of productive ideas related to issues such as triage and transportation protocols, EMS training, data collection and analysis, and performance improvement.
- Reconstitute and empower the state trauma advisory committee to provide input to the lead agency.
- Establish and fill the position of Trauma Medical Director to provide clinical expertise and oversight.
- Explore opportunities to more fully engage existing groups (e.g. the Ohio State Trauma Nurse Leaders, the state Committee on Trauma, the Ohio Injury Prevention Partnership, and the trauma regions) in specific aspects of trauma system development, such as performance improvement activities.

Trauma System Plan

- Complete the development of the *Ohio Trauma Framework: 2010* into a fully developed trauma system plan with specific objectives, timelines, responsible parties, and resources needed:
    - One to use if legislation for a separate Trauma System Program (or program for time critical diagnoses) passes, and
    - One as an alternate strategy to move each goal forward in case the legislative effort is delayed or unsuccessful.

Financing

- Provide funding for fulltime staff positions to support the Trauma System Program (minimally including a trauma program manager, performance improvement coordinator, and trauma registry support positions), as well as a contracted trauma medical director.
- Establish a stable source of funding to support the Trauma System Program activities.

Emergency Medical Services

- Ensure that ALL agencies that provide transport for out-of-hospital care (including ground, air medical, and mobile intensive care) are reviewed and compliant with national guidelines.
    - Require agency accreditation, such as Ohio licensure, Commission on Accreditation of Ambulance Services (CAAS), Commission on Accreditation of Medical Transport Services (CAMTS), Commission on Fire Accreditation

International (CFAI), or International Fire Service Accreditation Congress (IFSAC).
    - Perform systemwide monitoring and oversight.

- Ensure competent emergency medical dispatch functions

    - Require pre-arrival instructions
    - Accredit dispatch centers and certify dispatch personnel
    - Perform systemwide monitoring and oversight

Definitive Care

- Establish a transparent, broadly accepted process for future provisional trauma center designation based upon both facility capacity and trauma system need.
    - Work with stakeholder advisory groups to establish criteria for the needs assessment.
    - Use findings from the needs assessment when considering a facility application for provisional trauma center designation.
- Establish a transparent, broadly accepted review process for initial full designation of trauma centers and ongoing re-designation based upon trauma system participation, trauma center performance, and participation in performance improvement programs.
    - Work with stakeholder advisory groups to establish criteria for the initial and ongoing trauma center designation review process.

System Coordination and Patient Flow

- Monitor compliance with EMS trauma triage guidelines and destination protocols and adjust as indicated.
    - Review the existing trauma triage guidelines for currency and limit exceptions.
    - Conduct performance improvement on all triage guideline exceptions. See appendix E to review another state's approach.

- Establish regional destination protocols that specify the appropriate facility, in terms of trauma center level and geographic proximity.

Rehabilitation

- Develop a set of systemwide policies and guidelines related to trauma rehabilitation, including:
    - Inventory of facility resources and capabilities
    - Transfer guidelines

- Treatment guidelines
- Continuity of the unique trauma identifier for data linkage
- Increased compliance with data submission to the Trauma Rehabilitation Registry, and
- Monitored rehabilitation utilization and patient outcomes

Systemwide Evaluation and Quality Assurance

- Implement the performance improvement (PI) process immediately with the existing data available in the Ohio Trauma Registry while seeking additional protection for the PI process and improved data quality.

- Establish enabling legislation that authorizes trauma system PI activities to include: non-discoverability, confidentiality, removal of risk-adjusted data restrictions, and open meeting requirements.

Trauma Management Information Systems

- Remove barriers to trauma data collection and analysis:

    - Modify inclusion criteria for the Trauma Acute Care Registry (TACR) from greater than 48 hours to greater than 24 hours to facilitate greater understanding of over-under-triage rates.

    - Identify a logical and legal vehicle for the examination of nonrisk-adjusted data contained in the EMS Incident Reporting System (EMSIRS), the TACR, and Trauma Rehabilitation Registry (TRR) and other data sources to support system evaluation and performance improvement processes.

    - Continue to create a mechanism for deterministic linkage of the EMSIRS, TACR, and TRR, such as the trauma band currently being evaluated by one trauma region.

Trauma System Assessment
Injury Epidemiology

Purpose and Rationale

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

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

The epidemiology of injury is obtained by analyzing data from multiple sources. These sources might include vital statistics, hospital administrative discharge databases, and data from emergency medical services (EMS), emergency departments (EDs), and trauma registries. Motor-vehicle crash data might also prove useful, as would data from the criminal justice system focusing on interpersonal conflict. It is important to assess the burden of injury across specific population groups (for example, children, elderly people and ethnic groups) to ensure that specific needs or risk factors are identified. It is critical to assess rates of injury appropriately and, thus, to identify the appropriate denominator (for example, admissions per 100,000 population). Without such a measure, it becomes difficult to provide valid comparisons across geographic regions and over time.

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

An ongoing part of injury epidemiology is public health surveillance. In the case of injury surveillance, the trauma system provides routine and systematic data collection and, along with its partners in public health, uses the data to complete injury analysis, interpretation, and dissemination of the injury information. Public health officials and trauma leaders should use injury surveillance data to describe and monitor injury events

and emerging injury trends in their jurisdictions; to identify emerging threats that will call for a reassessment of priorities and/or reallocation of resources; and to assist in the planning, implementation, and evaluation of public health interventions and programs.

Optimal Elements

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

a. There is a through description of the epidemiology of injury mortality in the system jurisdiction using population-based data. **(I-101.1)**

b. There is a description of injuries within the trauma system jurisdiction, including the distribution by geographic area, high-risk populations (pediatric, elderly, distinct cultural/ethnic, rural, and others), incidence, prevalence, mechanism, manner, intent, mortality, contributing factors, determinants, morbidity, injury severity (including death), and patient distribution using any or all the following: vital statistics, ED data, EMS data, hospital discharge data, state police data (data from law enforcement agencies), medical examiner data, trauma registry, and other data sources. The description is updated at regular intervals. **(I-101.2)**
Note: Injury severity should be determined through the consistent and system-wide application of one of the existing injury scoring methods, for example, Injury Severity Score (ISS).

c. There is comparison of injury mortality using local, regional, statewide, and national data. **(I-101.3)**

d. Collaboration exists among EMS, public health officials, and trauma system leaders to complete injury risk assessments. **(I-101.4)**

e. The trauma system works with EMS and public health agencies to identify special at-risk populations. **(I-101.7)**

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

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

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

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

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

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

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

Current Status

The Ohio Department of Health (ODH) is the lead agency for the state's Violence and Injury Prevention Program (VIPP). The state has a Centers for Disease Control and Prevention (CDC) Core Injury Grant which funds the majority of injury surveillance efforts.

The VIPP has an injury epidemiologist who is quite skilled at using the numerous databases (e.g., vital statistics, Fatality Analysis Reports System [FARS], hospital discharge data, emergency department discharge data, Violent Deaths Reporting System, Behavioral Risk Factor Surveillance System, Youth Risk Behavior Survey, traffic crash reports, occupational injury data, crime reporting system, and child welfare information system) to develop reports. The most recent comprehensive injury report for the state was published in 2012, titled the *Burden of Injury 2000 – 2010*.

The VIPP also publishes specialized reports regarding specific injury mechanisms (e.g., motor vehicle crashes, falls, and teen driving), as well as injuries in special populations (e.g. children and the elderly). These reports provide a detailed description of the injury issue, trends over time, risk by location in the state, and the economic impact. Additionally, detailed county-specific injury data are published on the VIPP website.

The Office of Research and Analysis (ORA) in the EMS Division of the Ohio Department of Public Safety (ODPS) is the home of the Ohio Trauma Registry (OTR) that includes the Trauma Acute Care Registry (TACR), the Trauma Rehabilitation Registry (TRR), and the Emergency Medical Services Incident Reporting System (EMSIRS). Data from the trauma registry were used in the *Acute Care Registry Annual Report* for 2009 and 2010, but more current annual reports have not yet been published. The annual reports describe the pattern of injuries, injury severity, and hospital length of stay for individuals admitted to trauma centers for at least 48 hours. Financial data, including uncompensated care, regarding injuries treated in trauma centers, are not routinely reported by the hospitals. County data are published. These data systems are transitioning to software and data dictionaries that conform to current national standards (National Trauma Data Standard [NTDS] and National Emergency Medical Services Information System [NEMSIS] compliance).

At the present time data from the TACR, TRR, and EMSIRS have not been used by the VIPP in its reports. The ORA trauma epidemiologist is relatively inexperienced and still

learning about injury analysis. The ORA has purchased the software for probabilistic data linkage, but it was reported to be a labor intensive process to use. The ORA also has GIS mapping capabilities.

No working relationship or collaboration between the VIPP and ORA injury epidemiologists was noted by the Trauma System Consultation (TSC) team. The ORA trauma epidemiologist would benefit from establishing a relationship with the VIPP epidemiologist for mentoring in the specialized area of injury data analysis, and as a consultant to help problem solve future analysis challenges. Involvement with the National Association of EMS Officials (NASEMSO) Data Manager Council would also provide a peer group and opportunities for learning and problem solving as the EMSIRS and Trauma Registry transition to the national standard software programs and data dictionaries.

At the present time, neither the VIPP nor the ORA reported an ability to use the International Classification of Disease-9 Injury Severity Score (ICISS) mapping software to estimate the injury severity score within the hospital discharge database. An additional problem is that the state does not mandate E-coding on the hospital discharge database, so it is possible that injuries are under-reported in this database. An advantage of the hospital discharge database is that it is population-based, and could potentially be used to help determine if the trauma registry is capturing all injuries. The database can also potentially provide information about patients with serious injuries not transferred to a trauma center or who languished too long in a non-trauma center prior to transfer.

Recommendations

- Identify opportunities for the trauma epidemiologist to take advanced specialized data analysis courses to enhance his understanding of special data reports and appropriate data elements for analysis that will be useful for trauma system performance improvement.
- Mobilize the Ohio Injury Prevention Partnership (OIPP) to inform and encourage state policy-makers to mandate E-coding on all hospital and emergency department uniform billing (UB-04) data entries for patients with injuries.
- Encourage the Violence and Injury Prevention Program epidemiologist to meet with and develop a mentoring relationship with the trauma epidemiologist.
- Provide opportunities for the trauma epidemiologist to participate on the NASEMSO Data Manager Council.
- Produce an annual report from the Trauma Acute Care Registry data using the template of the 2010 report.

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

Ohio is to be commended for performing a Benchmarks, Indicators, and Scoring (BIS) assessment using all 113 indicators of the Health Resources and Services Administration (HRSA) *Model Trauma Systems Evaluation and Planning* document in 2008. A total of 44 individuals representing governmental agencies and Ohio Trauma Committee members participated in the process. The invited stakeholders were multidisciplinary and included key partner organizations for the trauma system.

The Ohio Society of Trauma Nurse Leaders (OSTNL) facilitated the BIS assessment. In preparation for the consensus conference, the OSTNL assessed and scored each of the indicators. During the meeting of all invited stakeholders the participants were asked to discuss the preliminary score, and a consensus on the final score was achieved. All 113 indicators were reviewed during the full day meeting.

Information from the BIS assessment was then discussed by the Trauma Committee which organized an ad-hoc subcommittee to establish priorities for the trauma system. This effort resulted in the development of the *Ohio Trauma Framework: 2010*, which subsequently was integrated into the *Ohio EMS 2015 Strategic Plan*.

Interest was expressed in repeating the BIS assessment in 2015.

Recommendations

- Repeat the Benchmarks, Indicators, and Scoring assessment at regular intervals (every 3 to 5 years) using a multidisciplinary group and facilitated process.
    - Compare findings over time to measure progress and to identify barriers in trauma system development.

Trauma System Policy Development
Statutory Authority and Administrative Rules

Purpose and Rationale

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

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

Optimal Elements

I. Comprehensive state statutory authority and administrative rules support trauma system leaders and maintain trauma system infrastructure, planning, oversight, and future development. **(B-201)**

a. The legislative authority states that all the trauma system components, emergency medical services (EMS), injury control, incident management, and planning documents work together for the effective implementation of the trauma system (infrastructure is in place). **(I-201.2)**

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

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

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

Current Status

The 1992 Ohio statute (ORC §4765.06) created the Emergency Medical Services (EMS) Division in the ODPS, moving the program from the Ohio Department of Education. This statute established the Emergency Medical Services Board, providing it with the authority to oversee the Emergency Medical Services (EMS) system, as well as the certification and training of EMS and fire personnel in Ohio. The statute also provided for the establishment of a trauma care advisory group, formation of a trauma registry and the EMSIRS, and the development of regional physician advisory boards.

Legislation introduced in 1997 for an organized trauma system was unsuccessful. In 2000, legislation was successful in establishing several elements of a statewide trauma system. Rules to implement this legislation required hospitals to successfully achieve verification by the American Colleges of Surgeons (ACS) before representing themselves as Trauma Centers. The legislation also mandated that EMS and all hospitals develop protocols for triage and treatment of seriously injured patients. It broadened the membership of the EMS Board and formally established the Ohio Trauma Committee to support the EMS Board. Additional confidentiality protection was provided for the trauma registry. Funding for the EMS and trauma program was enhanced from 50% to 54% of collected seat belt fines. The legislation called for special studies through the ODPS and for two commissions (Injury Prevention and Post Critical Care) through the ODH to provide information for further development of the trauma system.

In 2002 revised statute (ORC §3727.09 – 3727.102 and ORC chapter 4765) created a mechanism for hospitals to receive and treat trauma patients as provisional trauma centers before completing the ACS verification process. To attain provisional designation a hospital is required to have a consultative or re-verification visit by the ACS Trauma Center Verification Program. Status as a provisional trauma center is terminated if the hospital withdraws its application, the ACS terminates or suspends the application, or the hospital is not an ACS verified trauma center within 18 months after initial application (or after 12 months if the hospital is being re-verified). Hospitals can voluntarily become trauma centers under this system, if they meet the statutory requirements.

By statute, all hospitals must notify the Director of the ODH regarding any changes of their trauma center status. It is unclear if this statutory requirement is enforced or even widely known. However, the ODH has no statutory authority to administer a provisional trauma center designation system, and no funding exists to support trauma center and provisional trauma center designation. Statutes do not address the role of nontrauma

center hospitals within the trauma system, with exception of the requirement to submit data to the trauma registry.

Although the statute established the EMS Board as the principle trauma agency in Ohio, it has no clear statutory authority once the injured patient arrives at the hospital. The EMS Board responsibilities are limited to the prehospital phase of trauma care. The Ohio Trauma Committee also has no authority as it is advisory to the EMS Board.

The EMS Board and the EMS Division staff within the ODPS have authority over the training and certification of EMS providers and credentialing of training programs while the Ohio Medical Transportation Board (OMTB) has responsibility for licensure of private ambulance services, critical care transportation services, and air medical services. Legislation passed in 2013 requires the merger of the OMTB with the EMS Board as of July 1, 2013. The EMS Board will assume oversight of private EMS transportation organizations, but it still will have no licensure authority of public agency ambulances.

Rules for trauma triage (OAC §4765-14) require that trauma patients be transported to an adult or pediatric trauma center that is able to provide appropriate care; however rules do not provide specific destination criteria (e.g., level of trauma center by severity of injury). The rules are substantially weakened with the following five exceptions:

- it is medically necessary to transport the victim to another hospital for initial assessment and stabilization before transfer to an adult or pediatric trauma center;
- it is unsafe or medically inappropriate to transport the victim directly to an adult or pediatric trauma center due to adverse weather or ground condition or excessive transport time;
- transporting the victim to an adult or pediatric trauma center would cause a shortage of local EMS resources;
- no appropriate trauma center is able to receive and provide care to the victim without undue delay; and
- the patient or the patient's guardian requests that the patient be taken to a hospital that is not a trauma center.

All hospitals are required to submit trauma registry data to the ODPS Division of EMS, but the Public Records Act (ORC §149.43) requires that trauma system outcomes be reported as "risk adjusted". Reports with the potential for or actual identification of patients, providers and hospitals cannot be released. This requirement has inhibited public reporting of data and outcomes. No system for single patient identification is currently permitted that would enable tracking patients through the EMS, trauma, and rehabilitation databases. Additionally, no statute provides for the EMS and trauma program to establish a Trauma Registry Review Committee to analyze the data and evaluate the trauma system in a confidential manner.

Another law that impacts Ohio governmental agencies, including the ODPS Division of EMS, is the Open Meetings Act (ORC §122.22). A detailed Attorney General

interpretation requires public agency Board and committee meetings to be face-to-face with advance notification. Teleconference meetings are not permitted; however, one exception to this Open Meetings Act was identified (see the Coalition Building section).

Recommendations

- **Seek executive and legislative support to pass enabling legislation for a Trauma System Program with appropriate funding to serve as the lead trauma agency within the Ohio Department of Health.**
- **Ensure that enabling legislation provides the authority to set standards and enforce rules for the statewide trauma system including:**
  - **Designation and de-designation of trauma centers,**
  - **Requirements for nontrauma hospitals,**
  - **Establishment and oversight of specific trauma regions,**
  - **Establishment of a multidisciplinary trauma advisory committee that has representation from the trauma regions and each segment of the injury continuum of care,**
  - **Management of the state's Trauma Acute Care Registry and Trauma Rehabilitation Registry, and**
  - **Protection for peer review and similar performance improvement activities (addressing open meeting and public records laws).**

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

Leadership for Ohio's trauma system resides in the ODPS. The EMS Board is the lead agency with statutory oversight of the trauma system. The members of the EMS Board are appointed by the Governor. Membership includes representation from EMS (including the state EMS medical director), several firefighter associations, the Ohio Hospital Association (OHA), the Ohio Nurses Association, as well as emergency medicine, pediatric, and trauma surgery physicians. The EMS Board chairperson is accountable to the ODPS Director. EMS Board meetings are held in Columbus every two months.

A subcommittee of the EMS Board, the Ohio Trauma Committee, serves in an advisory capacity, but lacks direct administrative authority. Membership of this committee is appointed by the ODPS Director. Members include several physicians representing various trauma surgery specialties, as well as burns, rehabilitation, emergency medicine, and pediatrics. Additional committee members represent nursing, hospital administration, nontrauma center hospitals, and EMS. Meetings are held in Columbus every two months, alternating months with the EMS Board meetings.

The EMS Division performs the administrative tasks of the EMS Board. The Executive Director of the EMS Division is a member of the EMS Board, and he is accountable to both the EMS Board chairperson and the ODPS Director.

The ORA, based in the EMS Division, has five staff members including the Chief of Trauma Systems and Research, an epidemiologist, a biostatistician (vacant position), and two data managers. The state's OTR is managed by this office.

The current leadership has made significant progress during the past few years in the development of a trauma system, including the following:

- Ohio has very committed stakeholders, including the Ohio Trauma Committee, leaders from many of the trauma centers, and other organizations such as the Ohio Chapter of the ACS COT, OSTNL, the OHA, as well as ODH's VIPP and OIPP.

- Stakeholders have reached consensus on the need for change to further develop the trauma system and on the *Ohio Trauma Framework: 2010* that has been integrated into the *Ohio EMS 2015 Strategic Plan*.
- Grassroots support appears to have successfully identified legislative champions, as well as support from the Governor's office for new legislation.

Unfortunately the current leadership structure has several limitations, which have hampered progress in trauma system development including:

- The EMS Board has statutory oversight of the state trauma system encompassing only the prehospital care phase. No statutory oversight of the entire spectrum of trauma care exists including acute care and rehabilitation. As important as prehospital care is for injured patients, it represents only a part of the entire trauma system. Other aspects of the trauma system are managed by other agencies. For example, the ODH has responsibility for injury surveillance, injury prevention, and public health preparedness.
- The EMS Board is charged with several significant tasks, including oversight of a large and sophisticated EMS system. The trauma system is one of several responsibilities, and historically, it has not been a high priority. Trauma representation on the EMS Board is limited to one trauma surgeon and one nurse.
- The Ohio Trauma Committee has an advisory role to the EMS Board, and as such it struggles to implement changes to the current trauma system. Its membership appointments are open-ended, providing little opportunity for turnover. Additionally, attendance at meetings over the past six years has been as low as 0-15% for some of the membership seats.
- Although the EMS Division has five staff members in the ORA, reportedly only 40% of the time is dedicated to the trauma system. Further, these staff members represent the only trauma-specific administrative infrastructure, and none of the staff members have extensive clinical background or experience in trauma system operations. As a result, no focused group within the Division of EMS has either the time or the responsibility for day-to-day operations of the trauma system, and no group has the responsibility to oversee implementation of long-term plans. For example, the ORA has been unable to publish meeting minutes and update subcommittee dashboards in a timely manner.
- No clinical leadership exists at the physician level to oversee the trauma system. Ohio has a state EMS medical director, but no state trauma medical director.
- Stakeholders expressed a lack confidence in the quality of data within the TACR.

The current lead agency is not able to effectively oversee the further development and maturation of the Ohio trauma system. Its statutory authority is limited to the prehospital phase of trauma care, trauma triage, and the trauma registry. Functionally the lead agency has competing priorities that interfere with the needed attention to the trauma system. The advisory capacity of the Ohio Trauma Committee also limits its ability to operationalize productive concepts. For example, an excellent metrics scorecard

template developed by the Trauma Visionary Subcommittee has not been implemented. Stakeholders expressed their perception that ideas flow from “bottom up” and get stalled, and that a minimal flow of ideas from “top down” occurs.

The stakeholder frustration with this lack of leadership has resulted in the growth of regional grassroots efforts, and in many cases these efforts should be overseen by a central authority. While these grassroots regional efforts have had some success, extreme variability exists between the regions. Further, even within a successful region, not all hospitals or agencies participate. The current regional efforts are not integrated, do not share data, and thus they are unable to compensate for the lack of an overarching state trauma system structure.

Recommendations

- **Improve collaboration between the EMS Board and the State Trauma System Program (or Trauma Committee).**
    - **Conduct joint meetings to enhance two-way communication and exchange of productive ideas related to issues such as triage and transportation protocols, EMS training, data collection and analysis, and performance improvement.**
- **Reconstitute and empower the state trauma advisory committee to provide input to the lead agency.**
- **Establish and fill the position of Trauma Medical Director to provide clinical expertise and oversight.**
- **Explore opportunities to more fully engage existing groups (e.g. the Ohio State Trauma Nurse Leaders, the state Committee on Trauma, the Ohio Injury Prevention Partnership, and the trauma regions) in specific aspects of trauma system development, such as performance improvement activities.**

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

Ohio has an extensive network of stakeholders who are engaged in the trauma system. Many stakeholders have been long term active participants in the trauma system, in some cases for decades. Despite some challenges with trauma system development

several members of the Ohio Trauma Committee have remained actively engaged. The VIPP also has an extensive statewide coalition, the OIPP that is staffed by the ODH.

Membership on the Ohio Trauma Committee is an appointment without term limits. Opportunities for new energy on the committee occur only when a member chooses to resign. It was not possible to determine if stakeholders who are not committee members have any concerns about the lack of term limits for trauma committee members. A notable member of the trauma committee is the individual filling the role of Victim Advocate. This individual has extensive ties to the disability community, and has helped trauma committee members recognize and consider issues related to the care of individuals with functional limitations.

The Ohio Open Meetings Act creates challenges to developing committees with a geographically varied representation due to the onerous travel requirements for all to meet face-to-face. This act is especially discriminatory toward individuals with disabilities who need assistance to travel. Legislative exceptions to the Ohio Open Meetings Act have occurred [see ORC §3316.05 for the Financial Planning and Supervision Committee related to Ohio Revised Code §121.22 (C)]. Legislation should be sought to permit the use of technologies that would enable public notice of meetings and electronic communication for open meeting participation, and thus meet the intent of the statute. A more diverse and extensive group of stakeholders could potentially become engaged in trauma system development.

Opportunities for stakeholders to be engaged in trauma system planning do occur through other processes. For example, the OSTNL and the Alliance of Ohio Trauma Registrars (AOTR) often have the opportunity to explore issues and provide information to the Ohio Trauma Committee. The Ohio Trauma Committee created subcommittees to address each of the goals in the *Ohio Trauma Framework: 2010* to help develop the objectives and strategies for goal achievement. The OHA is engaged with the Ohio Trauma Committee, and it facilitates one of the subcommittees addressing a goal of the Ohio Trauma Framework. Some stakeholders have developed regional trauma system groups and are actively engaged in problem solving and performance improvement within their specific region.

The EMS Board website offers an opportunity for any interested stakeholder to sign up for various notifications related to areas such as the trauma system, EMS, and Emergency Medical Services for Children (EMSC). It was reported that the trauma “listserv” is used primarily to send announcements and meeting notices. The information disseminated is managed by ORA staff in the EMS Division. The frequency with which information is shared is not known. 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 web links to other state programs, such as ODH’s injury prevention program.

The *Siren* newsletter was reported to be another form of communication for the trauma program, and it is published 3 to 4 times a year. While most participants present knew about the newsletter, they reported that little content was focused on trauma system concerns. The two most recent *Siren* newsletters reviewed by a TSC team member had no trauma system content.

Public education is important, especially since the trauma system stakeholders would like to seek legislation for a lead agency with authority to manage the trauma system. To support this process, a survey of Ohio adult residents was conducted in 2012 at the Ohio State Fair. A total of 886 surveys were completed, and respondents came from most counties in the state. Following this survey, the workgroup for Goal 9 in the Ohio Trauma Framework (public education) proactively contacted the Ohio State Business College marketing program for assistance. Several creative marketing strategies were developed as projects by undergraduate students for consideration by the Ohio Trauma Committee. It was reported that these marketing strategies will be adapted for a trauma system program public education program.

The stakeholders reported that legislative champions have been identified in both the Ohio House and Senate, and language has been requested for trauma system enabling legislation. To date no efforts have been made to form a coalition with the stakeholders of other time critical diagnoses (Stroke, STEMI, and burns). Stakeholders of these time critical diagnoses could potentially support or oppose the trauma system legislation. For example, these stakeholders may be interested in expanding the breadth of the legislation to include their diagnoses and oppose the legislation. Alternatively, these stakeholders might support passage of model legislation that could guide their program's future system development.

Recommendations

- Consider term limits for future trauma committee members, with a potential for reappointment for a limited number of terms.
- Seek legislation for an exception to the Open Meetings Act that would permit electronic communication participation during official meetings.
    - Explore economical electronic communication technologies available through state government programs to increase participation during open meetings.
- Adapt one or more of the marketing strategies created by students at the Ohio State Business College and develop a public education program about the trauma system to gather support for trauma system legislation and funding.
    - Disseminate the public education widely through various methods, including social media, as well as the print and broadcast media.
- Develop a link on the EMS website to the Violence and Injury Prevention Program (VIPP) to ensure that emergency medical services and trauma system stakeholders have access to VIPP data and resources.

- Initiate discussions with stakeholders and state organizations focused on time critical diagnoses to develop a coalition that is supportive of the trauma system legislation.

Lead Agency and Human Resources Within the Lead Agency

Purpose and Rationale

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

The lead agency works through a variety of groups to accomplish the goals of trauma system planning, implementation, and evaluation. The ability to bring multidisciplinary, multiagency advisory groups together to accomplish trauma system goals is essential in developing and maintaining the trauma system and is part of providing leadership to evolving and mature systems.

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

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

Optimal Elements

I. Comprehensive state statutory authority and administrative rules support trauma system leaders and maintain trauma system infrastructure, planning, oversight, and future development. **(B-201)**

a. The legislative authority (statutes and regulations) plans, develops, implements, manages, and evaluates the trauma system and its component parts, including the identification of the lead agency and the designation of trauma facilities. **(I-201.1)**

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

II. Sufficient resources, including financial and infrastructure-related, support system planning, implementation, and maintenance. **(B-204)**

Current Status

The EMS Board is the lead agency for the state trauma system, and statutory authority for this role was described in prior sections of the report. Staff support for the EMS Board is provided by the EMS Division of the ODPS. The Executive Director of the EMS Division reports to the ODPS Director and to the EMS Board. A state EMS Medical Director is contracted to advise the EMS Division and the EMS Board.

The EMS Division has four sections, including Compliance and Enforcement, Operations, Special Programs, and the ORA. The ORA manages the Ohio Trauma Registry that includes the TACR, the TRR, and the EMSIRS. The ORA personnel also provide support to the Ohio Trauma Committee, EMS Board, and the Trauma Registry Advisory Committee.

The EMS Division has a total of 32 full time personnel. Currently, the ORA has five full time equivalent (FTE) positions, including the Chief of Trauma Systems and Research, an epidemiologist, a biostatistician, an EMS data entry manager, and a trauma data manager. The EMS Division Executive Director reported that 3.2 FTE positions are dedicated to the trauma program.

No personnel in the EMS Division have clinical expertise to manage or support the trauma program or its performance improvement process. While Ohio has a state EMS medical director, it has no state trauma medical director, no trauma program manager, and no performance improvement coordinator. Both a trauma program manager and performance improvement coordinator are common personnel positions supporting the trauma program in other states.

Recommendations

- Create new Trauma Medical Director, Trauma Program Manager, Performance Improvement Coordinator positions to support the activities of the Trauma Program.
    - Transfer or create sufficient staff positions to effectively manage the trauma registry and associated datasets.

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

Under the leadership of the OSTNL and the Trauma System Planning Subcommittee of the Ohio Trauma Committee, stakeholders contributed to the development of a draft plan titled *A Framework for Improving Ohio's Trauma System*. This framework was approved by the EMS Board in October, 2010. Although the framework remains an incomplete document, in 2012 it was formally incorporated into the EMS Board's *EMS 2015 Strategic Plan*.

The framework comprises 10 goals, including: leadership, injury prevention, emergency/ disaster preparedness plan, prehospital care, definitive care – acute care hospitals and trauma centers, definitive care – rehabilitation, evaluation – quality management – performance improvement, trauma system registry infrastructure, professional education and public information, and people with functional needs. Workgroups were constituted for each of these goals, and a leader was identified. Additional members for each workgroup were recruited, and workgroup meetings have begun to add the details missing in the draft framework. A web-based document repository was created for each of the workgroups, but it was acknowledged that individual workgroup documents are not up-to-date.

As each workgroup completes the build-out process its proposed plan will be submitted to the Ohio Trauma Committee for final review and approval. Concerns were expressed by participants that because of the existing oversight structure the completed plan may not gain much traction because the authority of the EMS Board is limited to prehospital care, trauma triage, and the trauma registry.

Recommendations

- **Complete the development of the *Ohio Trauma Framework: 2010* into a fully developed trauma system plan with specific objectives, timelines, responsible parties, and resources needed.**
    - **Develop two separate but parallel strategic plans for each goal and objective**

  - **one to use if legislation for a separate Trauma System Program (or program for time critical diagnoses) passes, and**
  - **one as an alternate strategy to move each goal forward in case the legislative effort is delayed or unsuccessful.**
- Adopt the trauma system plan formally through a broad trauma stakeholders group, the Ohio Trauma Committee, and the Ohio Department of Public Safety (or legislated lead agency).
  - Establish a set schedule and process for the trauma system plan revision.

System Integration

Purpose and Rationale

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

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

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

Optimal Elements

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

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

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

Current Status

The existing administrative infrastructure and statutory framework for the Ohio trauma system are housed within the ODPS and are almost exclusively focused on EMS operations. EMS-related trauma system functions are integrated with other entities also under the public safety umbrella, but beyond this limited scope the trauma system has little integration with other entities associated with the trauma care continuum. This situation appears to have occurred due to a combination of factors, beginning with an Ohio governmental home rule tradition that underlies the entire regulatory approach. This is reinforced by a set of governing statutes that do not establish clear regulatory authority over aspects of the trauma system outside of EMS operations. As a result, the state has no real vision for an integrated trauma system and no administrative framework to support it.

Isolated areas of collaboration have developed at the grassroots level. Some are involved with the independently established regional trauma systems, and others have evolved at the level of individual programs and groups of stakeholders. For example, integration of EMS and Homeland Security/Emergency Preparedness functions occurs at the level of local EMS agencies for the most part. Integration at the regional and state level is hampered by inconsistent regional boundaries for different programs and the lack of a guiding central vision. Similarly, several local and regional efforts integrate injury surveillance and injury prevention efforts with the trauma system function, but these efforts operate in isolation from one another. Very limited integration was noted between the trauma system and other components of the public health system.

The limited integration that currently exists within the trauma system itself creates significant challenges to the synthesis of the trauma system with other state programs. Nevertheless, clear areas of strength, beginning in the domains of EMS and injury surveillance and prevention, can be built upon. A strong history of collaboration and coalition building exists among stakeholder groups and can provide a foundation for growth and development. These areas were identified in the 2010 Framework document, along with the need to establish clear system leadership to guide integration efforts.

Recommendations

- Broaden the scope of the lead agency's charge and authority to focus on trauma system integration that encompasses the entire spectrum of trauma care and includes a specific focus on disaster preparedness and injury surveillance and prevention.

- Re-evaluate current regional boundaries for the Ohio Department of Public Safety (EMS and Homeland Security), the Ohio Department of Health, and the present

trauma regions. Reconfigure these regions to achieve maximal boundary congruence to facilitate regional integration.

- Develop a statewide template for trauma system integration that can be adapted at a regional level.

- Monitor integration efforts through an equally integrated performance improvement program.

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 governor's fiscal year (FY) 2014 proposed budget for the Ohio Division of EMS within ODPS is $6,236,069. This includes $2,711,069 of State funds for operations of the EMS Division, $3,300,000 for EMS grants, and $225,000 in federal funds. Under current law, the Division of EMS receives financing from seat belt violation fines and a portion of a $5.00 fee from driver records and vehicle certificates of abstract. The funding associated with seat belt violations was initially appropriated prior to 2002 when the level of funding increased from 50% to 54% of fines. The funding associated with fees for driver records and vehicle certificate of abstracts were added more recently. No fee is currently charged for initial certification or re-certification of EMS providers, but a $75 fee is charged for reinstatement of lapsed certifications. Fines are also charged for EMS disciplinary actions. It is unclear how much revenue is generated from these fees and fines.

The EMS Trauma Grant Fund was expanded by legislation in 2000 and amended again in 2012. The legislation defines categories for funding priority in descending order to include:

- EMS training and equipment
- Trauma procedures
- Injury Prevention
- Trauma rehabilitation
- EMS Board research
- Paramedic assistance

The EMS Board has the authority to establish priorities for grant projects within each of the categories and to determine the portion of grant funds allocated to each category within the statutory guidelines. Currently, the EMS Board has determined that all eligible EMS grant applicants will receive at least some portion of the EMS training and equipment grant funding, with minimum amounts starting at $2,500 per agency. During the current grant year, 733 grants were given to EMS agencies, totaling $2,588,581. The average grant award for 2013 was about $3,500 per agency. This process does not provide for a needs-based priority system for prehospital EMS agencies. Funds awarded for other grant categories appear to be based on application merit. No state general funds are appropriated to the EMS Division.

External grant funding to support EMS and trauma are limited to the National Highway Traffic Safety Administration (NHTSA) 408 funds being used to upgrade the software for the Ohio Trauma Registry (OTR). The EMS Division did not report any funding from the

Health Resources and Services Administration (HRSA) Office of Rural Health Policy Rural Hospital Flexibility Program or Assistant Secretary for Preparedness and Response (ASPR) emergency preparedness funding.

As safety belt use has increased the amount of funds generated from seat belt fines has decreased over the last several years. Consequently, the EMS/Trauma Grant Program funding has decreased from a high of $5.8 million to $3.3 million this year. However, the Executive Director stated that funding for the EMS Division is stable at this time. Limited funding is available to support the state's Trauma System. During the current fiscal year $143,760 was designated for trauma procedures, $142,976 was designated for injury prevention, and $129,100 was designated for trauma rehabilitation from the EMS/Trauma grant fund. In addition, 3.2 FTE positions were funded in the EMS Division for trauma system support, along with funding for monthly Ohio Trauma Committee face-to-face meetings. No other funds for the state trauma system were reported.

While some trauma care cost data are submitted to the TACR, it is not known how complete the data are, and they have not been analyzed. No reports on statewide uncompensated adult and pediatric trauma care were available, and the state has no funding mechanism for uncompensated trauma care.

The 2011 EMS Technical Assistance Team report by the NHTSA recommended that a fund for uncompensated trauma care be established. Potential sources of funding recommended included vehicle licensing, moving violations fines, driving under the influence (DUI) fines, tobacco taxes, and others. No information about recent efforts to pass legislation for trauma system funding was reported.

Ohio has no financial incentives to encourage trauma center participation in the trauma system. A reported disincentive is that trauma centers must pay for the cost of maintaining ongoing trauma programs and an ACS verification review every three years. Some regional trauma systems charge a fee for participation. When participants were asked about charging healthcare payers for trauma team activation fees, an inconsistent response was received. Some hospitals reported that they did not know the criteria for submitting these charges.

The Ohio Open Meetings Act has been interpreted to require all public agency meetings to be held face-to-face. This Act requires costs for participant travel when many meetings could be conducted electronically.

Recommendations

- **Provide funding for full time staff positions to support the Trauma Program (minimally including a trauma program manager, performance improvement coordinator, and trauma registry support positions), as well as a contracted trauma medical director.**
- **Establish a stable source of funding to support the Trauma System Program activities.**

- Consider legislation to create new sources of funding to support the Trauma Program such as fines on driving under the influence or moving violation infractions, vehicle licensing, alcohol taxes, or gambling revenues.
- Transfer the portion of the current EMS Board grant fund earmarked for trauma activities to more directly support trauma system development and evaluation.
- Revise the eligibility criteria of the existing EMS training and equipment category of the EMS Grant Fund to be needs-based so that more money can be provided to EMS services with the greatest needs.
- Provide technical assistance and information to trauma centers to help them establish fees and charge for trauma team activations.
- Collect comprehensive cost data in the trauma registry and produce reports annually.
- Seek other sources of funding to support the Trauma Program, including the Rural Hospital Flexibility Grant program, Emergency Medical Services for Children targeted issues grants, the Assistant Secretary for Preparedness and Response emergency preparedness funding, and the National Highway Traffic and Safety Administration 402 and 408 funding.
- Create a grant program in the new lead agency to support trauma research and development

Additional analysis and recommendations can be found in Focus Question 3 beginning on page 88 of this document.

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

Ohio is to be commended for implementing several injury prevention programs statewide and for including an injury prevention focus within the trauma framework.

The ODH VIPP is primarily funded through grant funds, including a CDC Core Injury Grant, and the HRSA Preventive Health Block grant. In addition funds to support prevention research are provided by the ODPS through the EMS/Trauma Grant Program.

In 2007 the ODH injury program formed the OIPP, a multidisciplinary coalition, to review and analyze Ohio's injury data and to determine injury prevention priorities. The OIPP also makes efforts to reach policy makers through the creation of an advocacy toolkit and an Advocacy Conference. This coalition is a strong and active arm to the VIPP, creating action groups for different priority areas and implementing strategies centered on those priorities.

Injury prevention and outreach are of significant interest in the state, as demonstrated by the requested program review in 2001 by the State and Territorial Injury Prevention Directors Association (STIPDA) and successful prevention legislation regarding issues including sports concussions, graduated driver's license, and primary seatbelt laws. Specific program focus areas include pediatric and older adult injury prevention.

The state's injury prevention program created a very comprehensive plan that identifies 10 injury prevention priorities and strategies to reduce the incidence of injury morbidity and mortality in Ohio. Many prevention activities are conducted throughout the state by the VIPP and OIPP, counties, and local trauma centers. Examples of prevention programs include senior driving safety, prescription drug abuse prevention, all-terrain

vehicle (ATV) safety, Ohio Buckles Buckeyes, school and playground safety, senior fall prevention, motorcycle safety, water safety, bicycle safety, and child abuse prevention. MStar, a program to promote safe driving among teens, is a commendable program. However, it was reported that the majority of prevention programs coordinated by the counties and trauma centers are based on interest and may not match the priority areas identified in the state injury prevention plan. Evaluation of prevention programs is not commonly conducted at either the state or local level.

The state has active chapters of some national safety organizations, such as Mothers Against Driving Drunk (MADD), Substance Abuse Prevention Program (SAPP) and SafeKids. Other coalitions such as the Older Adults Falls Prevention, Suicide Prevention, and the Ohio Teen Driver emphasize safety and prevention. Several state agencies have a prevention focus and provide resources, such as the Department of Transportation, Department of Mental Health, Department of Aging, and Department of Job and Family Services.

Ohio has no central collection of evidence-based prevention programs available for trauma centers, counties, and organizations to search or to share their resources and experiences. Such a resource widely available on a website would be beneficial because of the amount of injury prevention activities conducted throughout the state. It could be potentially reduce duplication of efforts, foster collaboration, and increase sharing of creative strategies. While the VIPP has a website with injury prevention resources, participants expressed concerns that communication is inconsistent among the public and medical communities about available resources.

Recommendations

- Enhance communication and collaboration between the Violence and Injury Prevention Program (VIPP), trauma centers, emergency medical services, and other partnering organizations to select and implement injury prevention initiatives identified as priorities within the state injury prevention plan.

- Provide online resources to educate injury prevention coordinators in trauma centers and Ohio counties about how to select, implement, and evaluate evidence-based injury prevention programs.

- Develop a site on the VIPP website that catalogues evidence-based prevention programs and compiles the list of prevention programs and outcomes by injury priority.

    - Engage the Injury Prevention Research Center at Nationwide Children’s Hospital in evidence-based program selection and prevention program evaluation.

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 Emergency Medical Responder, Emergency Medical Technician (EMT), Advanced EMT, and Paramedic, and other levels of prehospital personnel have an essential orientation to trauma care for all ages. However, trauma care knowledge and skills need to be continuously updated, refined, and expanded through targeted trauma care training such as Prehospital Trauma Life Support®, Basic Trauma Life Support®, and age-specific courses. Mechanisms for the periodic assessment of competence, educational needs, and education availability within the system should be incorporated into the trauma system plan.

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

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

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

Integration of EMS Within the Trauma System

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

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

Optimal Elements

I. The trauma system is supported by an EMS system that includes communications, medical oversight, prehospital triage, and transportation; the trauma system, EMS system, and public health agency are well integrated. **(B-302)**

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

b. There is a clearly defined, cooperative, and ongoing relationship between the trauma specialty physician leaders (for example, trauma medical director within each trauma center) and the EMS system medical director. **(I-302.2)**

c. There is clear-cut legal authority and responsibility for the EMS system medical director, including the authority to adopt protocols, to implement a performance improvement system, to restrict the practice of prehospital care providers, and to generally ensure medical appropriateness of the EMS system. **(I-302.3)**

d. The trauma system medical director is actively involved with the development, implementation, and ongoing evaluation of system dispatch protocols to ensure they are congruent with the trauma system design. These protocols include, but are not limited to, which resources to dispatch, for example, ALS versus BLS, air ground coordination, early notification of the trauma care facility, pre-arrival

instructions, and other procedures necessary to ensure that resources dispatched are consistent with the needs of injured patients. **(I-302.4)**

e. The retrospective medical oversight of the EMS system for trauma triage, communications, treatment, and transport is closely coordinated with the established performance improvement processes of the trauma system. **(I-302.5)**

f. There is a universal access number for citizens to access the EMS/trauma system, with dispatch of appropriate medical resources. There is a central communication system for the EMS/trauma system to ensure field- to- facility bidirectional communications, interfacility dialogue, and all-hazards response communications among all system participants. **(I-302.7)**

g. There are sufficient and well-coordinated transportation resources to ensure that EMS providers arrive at the scene promptly and expeditiously transport the patient to the correct hospital by the correct transportation mode. **(I-302.8)**

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

a. In cooperation with the prehospital certification and licensure authority, set guidelines for prehospital personnel for initial and ongoing trauma training, including trauma-specific courses and courses that are readily available throughout the state. **(I-310.1)**

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

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

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

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

Current Status

The EMS Board utilizes the EMS Scope of Practice and National Standard Curriculum as the basis for assuring a skilled and educated EMS workforce. The importance of education is further emphasized by the requirement of national accreditation for EMS

training programs and certification of EMS instructors. In addition the National Registry for Emergency Medical Technicians (NREMT) certification process is used for all entry level EMS providers and for annual required continuing education. Established national trauma education programs such as Basic Trauma Life Support (BTLS) and PreHospital Trauma Life Support (PHTLS) are encouraged and assure a uniform level of knowledge of trauma care among EMS personnel.

Education and training are required for EMS physician medical directors, and the use of the National EMS Medical Directors Course (offered by the National Association of EMS Physicians [NAEMSP]) is particularly laudatory. However, the TSC team received no information confirming that EMS physicians were monitored for compliance with this requirement. Participants reported that emergency medical dispatchers and the use of prearrival instructions are not addressed by the EMS Board.

Of note, EMS response agencies such as fire departments, ambulance services, air medical services, mobile intensive care agencies, and interfacility transfer services are not tracked, monitored, or overseen by the state. The recent merger of the OMTB will place responsibility for this aspect of EMS under the EMS Board. Included in this responsibility is the need to ensure that EMS agencies and equipment are both tracked and monitored and that issues of licensing and certification are addressed. Until these issues are addressed, the development of an effective and efficient prehospital component to the trauma system is hampered.

Ohio possesses robust, and current statewide EMS Guidelines and Procedures which serve to provide regional and local EMS medical directors with a standardized approach to patient care. Compliance with care guidelines are not monitored at the state level. While common trauma triage guidelines exist, they do not address important issues relative to proximity and the designation level of the destination trauma center.

Recruitment, tracking and retention of the EMS workforce is limited, and it does not include all medical personnel who work in the prehospital environment. Data are notably absent regarding emergency medical dispatchers as well as pre-hospital nurses and physicians.

Recommendations

- **Ensure that ALL agencies that provide transport for out-of-hospital care (including ground, air medical, and mobile intensive care) are reviewed and compliant with national guidelines.**
    - **Require agency accreditation, such as Ohio licensure, Commission on Accreditation of Ambulance Services (CAAS), Commission on Accreditation of Medical Transport Services (CAMTS), Commission on Fire Accreditation International (CFAI), or International Fire Service Accreditation Congress (IFSAC).**
    - **Perform systemwide monitoring and oversight.**

- **Ensure competent emergency medical dispatch functions.**
    - **Require pre-arrival instructions.**
    - **Accredit dispatch centers and certify dispatch personnel.**
    - **Perform systemwide monitoring and oversight.**
- Monitor the emergency medical services (EMS) workforce statistics, including recruitment and retention efforts, and identify EMS workforce deficiencies.
    - Address all personnel categories of the prehospital workforce (dispatchers, EMS instructors, emergency medical responder (EMR), emergency medical technician (EMT), advanced EMT (AEMT), Paramedic, nurses, and physicians).
    - Utilize the databases of the National Registry of Emergency Medical Technicians and other credentialing organizations to assist in workforce planning.

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 de-designation.

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 non-designated 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

Information provided to the TSC team listed 178 Ohio hospitals with emergency departments. Of these, 34 are listed as critical access hospitals as of March 2013. The state has 46 trauma centers verified by the ACS Committee on Trauma (COT): 11 are Level I adult centers, 3 are Level I pediatric centers, 9 are Level II adult centers, 3 are Level II pediatric centers, and 18 are Level III adult centers. In addition, 3 hospitals are operating as provisional centers pending full ACS COT verification: 1 at Level II and 2 at Level III. Two adult Level III trauma centers are also critical access hospitals.

Overall, Ohio appears to have an adequate number of high level trauma centers, with one Level I or Level II adult trauma center per 577,000 people (comparable to national averages which range from about 1 per 250,000 to 1 per 1,000,000 people). These trauma centers have a fairly good geographic distribution and provide good access to a Level I or Level II center — within 60 minutes from 98% of the land area and for 99% of the state's population. This exceeds the national trauma center access averages of 35% of land area and 90% of population.[1] Patient access to the trauma system is even greater when the Level III trauma centers are added to the equation. The number and location of pediatric trauma centers likewise provides coverage for the state that exceeds national averages.

No agency in Ohio has statutory authority to designate trauma centers, and no mechanism exists to determine the number and location of trauma centers based upon system need. Ohio statute requires that all trauma patients be transported to a trauma center unless one of five statutory exemptions is met, but the decisions to seek trauma center status and the level of trauma center status are solely at the discretion of the individual facility. If a facility is successfully verified by the ACS COT, it is automatically a trauma center under Ohio statute. The state conducts no active monitoring of verification status, and no interim performance metrics are requested to monitor compliance during the three year cycle between ACS COT verification reviews. Facilities that fail a review are granted a 1 year provisional status during which they may continue to receive trauma patients while addressing ACS COT verification deficiencies. It is conceivable that a given facility could be out of compliance for almost four years before trauma center status was lost.

A facility wishing to become a trauma center for the first time or seeking to renew trauma center status after a lapse must undergo a consultative visit by the ACS COT. After the ACS COT consultation visit the facility is granted provisional status if the facility presents evidence of facility commitment and an action plan to correct any deficiencies identified. The facility may operate under provision status for up to 18 months, by which time the facility must be verified by ACS COT. No process exists to determine if the facility's remediation plans are appropriate, to ensure that they are followed, or to monitor the quality of care provided during the provisional period. It is

[1] Data collected and presented jointly by the American College of Surgeons, The American Trauma Foundation, and the University of Pennsylvania, accessed at www.traumamaps.org

conceivable that a facility could never be in compliance with verification standards and still maintain provisional trauma center status for up to 18 months.

The ACS COT verification criteria provide a national standard for personnel and training necessary for trauma center operations, and they establish criteria for structures and processes necessary within a trauma center. These criteria also require submission of registry data to national and regional sources, participation in a benchmarking process for outcomes, and participation in regional trauma system planning and operation. The ACS COT verification process does not include any analysis of system need or provide any methodology for ensuring compliance between verification visits. The ACS COT clearly communicates that upon trauma center verification the facility meets ACS COT standards, but this does not equate with trauma center designation within a trauma system.

Ohio's trauma system is outwardly constructed as an exclusive trauma system, but the five exemptions to mandatory transport to a trauma center make the system function as an inclusive system (in other words, all hospitals with emergency departments may receive trauma patients). Additionally, the statutory requirement that all facilities in the state submit data on trauma patients is a major component of an inclusive trauma system, and one which is often difficult for other states and regions to implement. As a result, the 2010 trauma registry report shows that 35% of reported patients were seen at nontrauma center facilities, which is second only to the number of patients treated at Level I trauma centers. In addition, these nontrauma center facilities are represented in the trauma system planning and policy development body. These nontrauma center facilities are in fact trauma system participants, caring for a significant number of injured patients. With appropriate deployment of training, protocols, and guidelines they could easily be an integral part of an inclusive Ohio trauma system. The development of a process for designation of Level IV trauma centers might also improve the speed of higher level trauma center access and improve quality of the care network in more rural areas.

The trauma centers in Ohio generally enjoy a collegial relationship and have a good track record of collaboration in the care of the injured. Nevertheless, the evolving economics of health care in Ohio also place these trauma centers in a competitive relationship, one which has the potential to work against the best interests of the trauma patient. This potential competitive behavior is compounded by the lack of a needs-based methodology for trauma center designation, the lack of clear and mandatory destination protocols, and the lack of established agreements regarding destination for patients requiring interfacility transfer.

Ohio has 6 burn centers that are verified by the American Burn Association and an additional 2 non-verified centers. This provides very good coverage for burn patients within the state, and a well-developed triage and referral network exists to ensure that burn patients reach an appropriate facility. As previously noted, Ohio has a relatively large number of pediatric trauma centers and better than average regional coverage for pediatric patients.

Stakeholders did not report any clear or impending human resource shortages with respect to primary trauma care providers. Some concerns were expressed regarding regional issues with respect to availability of specialty physicians willing to participate in trauma care and the cost to facilities of providing call coverage.

In functional terms, trauma care in Ohio is provided by a loosely connected network of verified trauma centers. The standards for trauma center verification and level are nationally recognized, and a system is in place for regular external review to ensure that trauma centers are meeting those standards. The missing component in the Ohio trauma system is a statewide vision and a lead agency with the administrative capability to oversee that vision. Key components needed to ensure an optimal network of definitive care facilities include the following:

- A process to designate trauma centers based on need and ongoing performance in the trauma system,
- Clear destination protocols for field triage and interfacility transfers, and
- Development of a regional structure that leverages the expertise present in the higher level trauma centers to project high-level trauma care to the more rural parts of the state.

Recommendations

- **Establish a transparent, broadly accepted process for future provisional trauma center designation based upon both facility capacity and trauma system need.**
  - **Work with stakeholder advisory groups to establish criteria for the needs assessment.**
  - **Use findings from the needs assessment when considering a facility application for provisional trauma center designation.**

- **Establish a transparent, broadly accepted review process for initial full designation of trauma centers and ongoing re-designation based upon trauma system participation, trauma center performance, and participation in performance improvement programs.**
  - **Work with stakeholder advisory groups to establish criteria for the initial and ongoing trauma center designation review process.**

- Conduct an assessment of the current trauma system to guide data-driven decisions regarding the location and level of new trauma center designations.
  - Use the existing trauma score card as a starting point.

- Establish clear destination protocols to ensure appropriate triage of injured patients from the field to the appropriate trauma center based on level and proximity.

- Establish clear interfacility destination protocols to ensure appropriate triage of injured patients to the appropriate higher level trauma center.

- Develop teleradiology and telecommunications systems to enable providers at Level I and Level II trauma centers to participate in patient care decision-making at the lower level trauma centers and nontrauma center facilities.

- Develop a regional infrastructure that establishes and supports bilateral relationships between Level I and Level II trauma centers and their referring facilities, especially with regard to education, protocol development, and process improvement.

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 non-designated 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

Ohio has no reliable process for systemwide oversight of the movement of the injured patient though the trauma care system. Comprehensive oversight of trauma system coordination related to care of the trauma patient should encompass the following:

- recognition of the injury event,
- 911 access,
- EMS field care and hospital destination decision,
- hospital transfer guidelines,
- trauma center care,
- rehabilitation, and
- repatriation.

No efforts were reported relative to injury recognition such as education of the public or law enforcement officers that would encourage early injury recognition and early by-stander trauma care. Access to 911 in Ohio is modest with wired and wireless 911 access in all 88 Ohio counties. The stakeholders were unable to identity efforts related to emergency medical dispatch (EMD) to ensure that proper EMS resources are efficiently and effectively utilized during the initial response to an injury event. Similarly the use of pre-arrival instructions is not assured to assist with bystander care.

Statewide EMS trauma triage guidelines exist, but compliance with and utilization of these guidelines is not monitored or overseen. While nontrauma centers are precluded from admitting trauma patients, patient transfer from nontrauma centers to specialized trauma centers may be hampered by the absence of guidelines for the early and expeditious transfer of trauma patients. Transfer agreements between nontrauma centers and trauma centers are not monitored.

For the trauma patient admitted to a trauma center no guidelines exist relative to the initiation of rehabilitative programs and repatriation. Thus, systematic guidance regarding the flow of patients through the trauma system is limited to EMS triage guidelines which assist EMS providers in deciding which patients should be transported to trauma centers. As previously mentioned in this report, this element does not account for geographic proximity or facility designation level. In addition, the use or misuse of the triage guidelines are not monitored or reviewed for compliance and system improvement.

At the local level trauma centers engage in outreach efforts to nontrauma centers relative to transfers by utilizing teleradiology and directed feedback for patients who are transferred. This is done sporadically rather than as a systemwide process. Understanding the movement of all patients though the trauma system is hampered by the inability to accurately track records (registry data), and this prevents the identification of opportunities for system improvement.

Recommendations

- **Monitor compliance with EMS trauma triage guidelines and destination protocols and adjust as indicated.**

    - **Review the existing trauma triage guidelines for currency and limit exceptions.**

    - **Conduct performance improvement on all triage guideline exceptions. See Appendix E for a resource to review another state's approach.**

- **Establish regional destination protocols that specify the appropriate facility, in terms of trauma center level and geographic proximity.**

- Implement a single patient identifier system, e.g. trauma band, so that trauma patients can be tracked within the EMS and trauma databases from prehospital through hospital trauma care to rehabilitation.

- Use the EMS and trauma registry data to quantify and investigate over- and under-triage rates, delays in interfacility transfer, delays in access to rehabilitation, and problems with repatriation.

- Encourage expanded use of telehealth and teleradiology to inform patient flow and transfer from nontrauma centers

- Develop interfacility transfer decision guidelines for nontrauma center personnel.

Rehabilitation

Purpose and Rationale

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

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

Optimal Elements

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

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

b. Rehabilitation centers and outpatient rehabilitation services provide data on trauma patients to the central trauma system registry that include final disposition, functional outcome, and rehabilitation costs and also participate in performance improvement processes. **(I-308.2)**

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

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

Current Status

Ohio does not specifically license or accredit rehabilitation hospitals. One statutory requirement is that the medical director of an inpatient rehabilitation facility must be a physician with appropriate experience and training. The trauma system does not currently have any policies or guidelines with respect to rehabilitation, and it does not designate rehabilitation facilities for trauma in general or for specific injuries such as brain injury or spinal cord injury. As a result, the utilization and monitoring of rehabilitation services is driven by individual trauma centers as necessary to meet the verification requirements of the ACS COT.

No central repository of information on rehabilitation centers and their capabilities was reported to exist, and thus the number of rehabilitation centers involved in the care of trauma patients is unknown. The TSC team was provided with a document created in preparation for the consultation which listed 72 acute care rehabilitation facilities in the state, 36 of which are accredited by the Commission on Accreditation of Rehabilitation Facilities (CARF) International. Of these 24 were reported to be associated with trauma centers. Ten listed facilities had trauma-related CARF specialty programs, including 5 for traumatic brain injury, 4 for spinal cord injury, and 7 for pediatrics. Some facilities have more than one specialty program. Overall a sufficient number of rehabilitation beds exists, but no data were available to permit a true assessment. Stakeholders reported some long waiting times for patient transfer to rehabilitation, often related to the funding source, but a lack of rehabilitation capacity as a trauma system issue was not reported.

Ohio has a statewide trauma rehabilitation registry (TRR) and a statutory requirement for facilities to submit data on trauma patients. Data are inconsistently submitted by 18 facilities, and the TSC team could not determine the percentage of rehabilitation facilities treating trauma patients that actually submit data. The TRR has not been consistently used for reporting systemwide data or for sharing data between acute care facilities and rehabilitation facilities. The trauma system does not monitor parameters of rehabilitation care such as timeliness of transfer, choice of transfer facility, or patient outcomes.

Rehabilitation facilities have representation on the Ohio Trauma Committee, but historically rehabilitation has not been a focus of trauma system operations or planning activity. Improving the integration of rehabilitation services and developing methods to monitor rehabilitation outcomes were identified as specific goals in the 2010 Trauma Framework. A subcommittee was recently created to direct work toward this goal.

Ohio currently has substantial rehabilitation resources and the rehabilitation community appears to be engaged in the care of trauma patients. Although rehabilitation has not been a focus of trauma system development thus far, it has become a goal, and work

has begun. Further, existing resources, including an infrastructure and a process for collection of rehabilitation data, have been largely untapped.

Recommendations

- **Develop a set of systemwide policies and guidelines related to trauma rehabilitation, including:**
  - **Inventory of facility resources and capabilities,**
  - **Transfer guidelines,**
  - **Treatment guidelines,**
  - **Continuity of the unique trauma identifier for data linkage,**
  - **Increased compliance with data submission to the Trauma Rehabilitation Registry (TRR), and**
  - **Monitoring of rehabilitation utilization and patient outcomes.**

- Analyze existing data in the TRR to determine its current status regarding data submission, data quality, and patient outcomes.

- Update the current inventory of rehabilitation centers to determine which ones treat patients with serious injuries.
  - Survey existing trauma centers and known rehabilitation centers
  - Publish and regularly update a list of trauma rehabilitation facilities on the trauma program's website

Disaster Preparedness

Purpose and Rationale

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

For this reason, the trauma system and its trauma centers must conduct a resource assessment of its surge capacity to respond to MCIs. The resource assessment should build on and be coupled to a hazard vulnerability analysis. An assessment of the trauma system's response to simulated incident or tabletop drills must be conducted to determine the trauma system's ability to respond to MCIs. Following these assessments, a gap analysis should be conducted to develop statewide MCI response resource standards. This information is essential for the development of an emergency management plan that includes the trauma system.

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

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

Optimal Elements

I. An assessment of the trauma system's emergency preparedness has been completed, including coordination with the public health agency, EMS system, and the emergency management agency. **(B-104)**

a. There is a resource assessment of the trauma system's ability to expand its capacity to respond to MCIs in an all-hazards approach. **(I-104.1)**

b. There has been a consultation by external experts to assist in identifying current status and needs of the trauma system to be able to respond to MCIs. **(I-104.2)**

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

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

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

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

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

Current Status

The Ohio Emergency Operations Plan (EOP) is based on the US Department of Homeland Security's National Response Framework, and it is coordinated by the Ohio Emergency Management Agency (OEMA) within the ODPS. This plan provides a structure for the actions of both state and non-state agencies in their response to a disaster.

The Ohio agencies involved in disaster planning and management have divided the state into Homeland Security Regions; however, regional borders are not congruent with the EMS regions or the trauma regions. The potential challenges created by these discordant regions were recognized by the EMS Board in February 2012, and a workgroup was established to provide recommendations for improved alignment of EMS regions with Homeland Security regions. To date the workgroup has not reported any recommendations to the EMS Board.

OEMA monitors and coordinates disaster training events to ensure readiness at all levels, although the last formal statewide assessment was performed in 2008. The

absence of a trauma system-specific lead agency contributes to the lack of a trauma surgeon participant in the disaster management process.

Emergency preparedness and response information flow is enhanced through the use of two statewide programs. The first facilitates tactical communication through the use the Multi-Agency Radio Communications System (MARCS) which is an 800 MHZ radio system implemented by the Ohio Office of Information Technology. This communication system is in functional use and tested weekly with reports provided to the OEMA; however, not all EMS agencies or counties are on the MARCS system. The second system, SurgeNet, is a web-based system that hospitals use to communicate their current capability for caring for red, yellow or green level patients, whether an operating room is available in 30 minutes, and whether decontamination is available. This system also provides information about inpatient bed capacity for integration with the National Disaster Medical System (NDMS).

Recommendations

- Encourage concordant regional boundaries by agencies providing leadership and oversight of disaster management (Ohio Department of Public Safety and Ohio Department of Health) and response (EMS and trauma) to mitigate potential adverse effects on coordination and implementation of disaster care.

- Encourage the development of a unified communications system to mitigate against hardware-based gaps as EMS and Public Safety resources cross traditional boundaries in support of disaster operations.

    a. Facilitate the growth and development of the Multi-Agency Radio Communications System (MARCS) 800 MHz program.

- Support the continuous development and routine use of SurgeNet.

- Seek opportunities for trauma stakeholders to participate in formal statewide emergency operations plan (EOP) assessments and encourage scheduled assessments with reporting to involved agencies, including the lead for the Trauma Program.

- Integrate a trauma surgeon representing the Ohio Trauma Committee into the Emergency Operations Plan planning leadership.

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

Currently the state has no systemwide performance improvement (PI) plan or process in place to evaluate patient care, patient outcomes, and trauma system effectiveness. Neither the EMS board nor the Ohio Trauma Committee has the authority to oversee the PI process, and no enabling legislation exists for protection of PI activities. The Ohio Open Meetings Act has created a significant barrier and inhibits meetings during which confidential review of trauma registry data can be performed for trauma system evaluation.

The EMS Board is supportive of trauma system development as evidenced by the inclusion of the *Ohio Trauma Framework: 2010* within the *Ohio EMS 2015 Strategic Plan*. The Ohio Trauma Committee is to be commended for the creation of a PI subcommittee to address the Trauma Framework goal of initiating a process for performance improvement. The frequency of PI subcommittee meetings was not reported, and no minutes were provided to the TSC team to reflect current activities.

The Ohio Metrics Scorecard was developed by the Trauma Visionary Committee for trauma system evaluation. It was approved by the Ohio Trauma Committee and EMS Board. This scorecard is very comprehensive and could potentially be a model for other states to use within their PI processes. However, it has not been implemented because of the lack of legislation protecting the PI process and an inability to link data from the EMSIRS and trauma registries.

Some performance improvement activities were reported to occur at the local level and by the independently developed trauma regions. These groups specifically look at transfer times and over- and under- triage issues. Inclusive participation by all hospitals within these local and regional groups has been limited due to the lack of resources in some of the rural areas. Some regional trauma programs formed to overcome some of the state system challenges, and these regional activities could be used as a model for the state system PI process. Over- and under-triage was expressed as a priority for the

state to assess as part of its PI process. However no efforts to monitor this issue have occurred due to the Ohio Open Meetings Act and Ohio Public Records Act, as well as perceptions that the OTR is inadequate. These Acts should not prohibit this initiative as no patient or hospital identifiers need to be associated with the reports. Data could be reported by trauma center level.

All hospitals within the state are required to submit data to the trauma registry and validation tools are in place and conducted by the ORA. Stakeholders expressed concerns with the validation process and with disparities regarding which hospitals actually submit data to the state. It was reported by the ORA that all but 6 hospitals are current with their 2012 data submissions. Data reports from the OTR were provided to the TSC team. Although all patients may not be captured within the OTR, it provides adequate information to begin a trauma system evaluation process.

Recommendations

- **Implement the performance improvement (PI) process immediately with the existing data available in the Ohio Trauma Registry while seeking additional protection for the PI process and improved data quality.**

- **Establish enabling legislation that authorizes trauma system PI to include: non-discoverability, confidentiality, removal of risk-adjusted data restrictions, and open meeting requirements.**

- Develop a state trauma system PI plan to include mission, objectives, and processes.
  - Integrate the developed Ohio Metrics Scorecard within the plan.

  - Request examples of state PI plans from the National Association of State EMS Officials' Trauma Managers Council.

- Establish guidelines that describe the expectations of state and regional committees for peer review and patient outcomes using existing regional guidelines as potential models.

- Initiate quarterly PI state subcommittee meetings designed to review specific measures and blinded case reviews that will enable identification of opportunities for improving care, implementing action plans, and reassessing to ensure loop closure.

- Establish a reporting process so that issues identified at any level of PI (local, regional, state) are addressed and corrected in the appropriate forum.

  - Disseminate findings to all trauma system stakeholders.

- Adjust policies, procedures, and guidelines as appropriate.

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 management information system that supports the planning and evaluation of the Ohio trauma system is a work in progress. Multiple data sets are available, although some of these are scheduled for replacement within the next year.

The current OTR has existed since 1999. It was developed “in-house” and has undergone a number of iterative updates over time. The TACR and the TRR are modules within the OTR. The EMSIRS became operational in 2002. Data submission to TACR is required by all trauma centers and acute care facilities in Ohio on a quarterly basis. The TSC team was informed that all but 6 acute care facilities submitted data during the most recent data submission period. A report completed by the ORA noted that in calendar year 2010, nearly 37,000 records were submitted to the OTR. Patient admission for at least 48 hours is one inclusion criterion for the current TACR.

Longstanding Ohio legislation requires that data that would allow for patient, provider or institution specific comparisons must be “risk adjusted”. Similarly, this legislation precludes submission of registry data containing identifiable elements by a state sponsored agency. However, registry data are submitted to the National Trauma Data Bank (NTDB) by individual facilities or regional registries in compliance with ACS COT Verification, Review, and Consultation program requirements. Concerns regarding the reliability and validity of the TACR data were noted by some participants.

Each of the trauma regions reported that they maintain a regional trauma registry to facilitate data analysis and reporting within the region. It was reported that inter-rater reliability checks are conducted in those regions and that data were “scrubbed” at a regional level prior to submission to the state. Most regions reported using a newer version of the data dictionary than is currently applied at the state level.

Due to the acknowledged limitations in the existing trauma registry, including challenges associated with producing meaningful results in a timely manner, the EMS Division’s ORA, in collaboration with trauma data stakeholders, has undertaken a process to upgrade the OTR. A well-known vendor with clients in multiple states has received the contract to create the next generation OTR. The new OTR will be NTDB-compliant, and it will have embedded transaction capabilities to facilitate data transfers from individual trauma centers and uploads to the NTDB. The projected implementation start date is July 1, 2013, and the OTR is expected to be fully operational by the end of calendar year 2013. The newest NTDS data dictionary will be used to define elements captured in the updated registry. Individual trauma centers will be responsible for ensuring that data transaction standards are developed to allow for submission to the OTR.

All EMS agencies are required to submit data to EMSIRS, although as many as 30% of agencies (reportedly smaller volunteer or public) are not in compliance. Factors associated with this noncompliance have not been defined. EMSIRS has been available since 2002. The most recent benchmarking report that could be identified on-line at the ODPS website is from 2008. The same vendor that is updating the OTR is scheduled to replace the EMSIRS data collection system beginning in late 2013 with completion anticipated in mid-2014. The software will be NEMSIS compliant, further facilitating data upload to this national data repository.

All rehabilitation centers providing care to patients who have been injured are required to submit data to the TRR. Currently, only a limited number of facilities (reportedly about 18) comply. The denominator (number of rehabilitation centers) is elusive, as described in the Rehabilitation Section. The fact that a rehabilitation database exists in any form is a very positive asset for the Ohio trauma system, potentially providing an ability to link final functional outcomes for injured patients.

No unique identifier exists for patients sustaining injuries in Ohio that would encourage deterministic linkage of the EMSIRS, TACR, and TRR. A “trauma band” pilot project has been undertaken in one trauma region of the state. It was noted that challenges pertaining to cost of the trauma bands would hamper statewide implementation should the pilot project prove successful.

Efforts to link the EMSIRS, TACR, and TRR using probabilistic methodologies have been difficult and time consuming. Recent increases in staff support at the ORA may make such linkage processes more viable in the future.

Recommendations

- **Remove barriers to trauma data collection and analysis:**
    - **Modify inclusion criteria for the Trauma Acute Care Registry (TACR) from greater than 48 hours to greater than 24 hours to facilitate greater understanding of over- under-triage rates.**
    - **Identify a logical and legal vehicle for the examination of nonrisk-adjusted data contained in the EMS Incident Reporting System (EMSIRS), the TACR, and Trauma Rehabilitation Registry (TRR) and other data sources to support system evaluation and performance improvement processes.**
    - **Continue to create a mechanism for deterministic linkage of the EMSIRS, TACR, and TRR, such as the trauma band currently being evaluated by one trauma region.**
- Identify and convene a work group consisting of trauma medical directors, trauma program managers, prehospital care providers, and trauma system planners (under the Ohio Trauma Committee) to develop a list of reports that will be essential for

completion of the Ohio Trauma Framework (e.g., distribution of patients, transfer patterns, time to definitive care (from the field and interfacility transfer).

- Task the Ohio Trauma Committee with the development of a list of standardized reports to be run on a quarterly basis from the EMSIRS and TACR that will assist in ongoing performance monitoring of the trauma system.

- Maintain the same list of reports for at least one full year before adaptation, deletion, or substitution.

- Distribute the reports widely to stakeholders and advisory bodies.

- Continue to work toward the data linkage of the EMSIRS, TACR, TRR, hospital discharge database, highway traffic safety databases, and others to better inform trauma system planning, development, monitoring and evaluation.

- Require all trauma centers in the Ohio to participate in a statewide or national risk-adjusted benchmarking process, such as the Trauma Quality Improvement Program (TQIP).

- Complete and report inter-rater reliability checks between and among hospital trauma registrars.

    - Provide additional training and resources to ensure consistency in data entry.

Research

Purpose and Rationale

Overview of Research Activity

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

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

Trauma Registry–based Research

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

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

Population-based Trauma System Research

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

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

Participation in Research Projects and Primary Data Collection

Multi-institutional research projects are important mechanisms for learning new knowledge that can guide the care of injured patients. Investigators within trauma systems can participate as 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

With the passage of Am. Sub H.B. 138, the 123rd General Assembly tasked the EMS Board with producing seven reports on topics related to EMS and Trauma. The EMS Board contracted with several agencies and organizations with expertise and interest in research to address this mandate. Over $560,000 were earmarked for this purpose and resulted in the completion of seven special studies (reported to the Governor and the 125th Ohio General Assembly in November 2003). These studies examined the following:

- The status of and needs to improve pediatric trauma care,
- The status of and needs to improve geriatric trauma care,
- The feasibility of mobile electronic trauma registry reporting,

- The trauma patient autopsy,
- Trauma education,
- The roles of nontrauma centers in a trauma system, and
- The causes and impact of trauma on minority populations.

It is unclear how these studies or their findings influenced or advanced EMS or trauma care in the State of Ohio.

Since then, the EMS Board has supported trauma research predominantly though the EMS/Trauma Grant Program with funding coming from Ohio seatbelt fines. Over $4.3 million have been awarded over the last decade (2003-2013) to support research in the areas of injury prevention, trauma medical procedures, and trauma rehabilitation. The Ohio Revised Code defines the priority distribution of these funds. It was reported that the funding source for these grants is declining, and it is unclear if the EMS Board is pursuing alternate funding streams to support the grant program.

In Ohio a number of EMS and trauma-related databases exist and are accessible for research purposes (EMSIRS, TACR, and TRR). A standardized process exists to request data from these databases and requests are tracked. Access to data in these registries is in compliance with the Ohio Public Records Act and fulfills confidentiality requirements. While examples of how this research has contributed to changes in EMS system functions were reported, it is not clear if these research outcomes are widely tracked or utilized to improve the Ohio EMS/trauma system or trauma care.

While the trauma research activities in the state are wide-ranging, these efforts emanate from the regional and local level. Hospitals, private agencies, and organizations perform research that is consistent with individualized areas of interest and expertise, but they may or may not coincide with state EMS/trauma system needs or priorities. The state has no overarching research agenda, and the state EMS Board does not take an active role in guiding and promoting trauma research. As a result, disparate research efforts structured and systematic improvements in trauma care identified from research are not effectively translated into improvements to affect the trauma system or benefits in care for the trauma patient.

Research efforts of special significance are found at the University of Cincinnati which is a Resuscitation Outcomes Consortium (ROC) site. The ROC is a National Institutes of Health (NIH) funded network of centers conducting experimental and observational studies of out-of-hospital interventions for cardiac arrest and traumatic injury. This ongoing program supports multiple collaborative trials to aid rapid translation of promising scientific and clinical advances to improve resuscitation outcomes.

Recommendations

- Develop a systemwide research agenda to guide and facilitate focused, prioritized research at the state, regional, and local levels.

    - Base the agenda on findings from analysis of the EMS Incident Reporting System, the Trauma Acute Care Registry, and the Trauma Rehabilitation Registry.

- Leverage regional and local research centers of excellence to mentor and facilitate new stakeholders to engage in trauma research.

    - Engage academic institutions in project design, implementation, and evaluation.

- Seek new and reliable funding streams to ensure sustained and amplified trauma research efforts.

Focus Questions

Focus Question 1

Help us to understand ways Ohio could measure outcomes related to the trauma system without integration of risk-adjusted data and effective registry interfaces. If Ohio were to form a statewide performance improvement collaborative, please explain potential barriers, benefits, and methods.

A trauma system performance improvement (PI) process is the most efficient way to reduce death and disability by evaluating the standards of trauma care, identifying causes of injury and promoting prevention activities, and assuring that the resources are available and accessible throughout the state to expedite care to the trauma 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, inter-facility transfer and management, and rehabilitative care.

In order to establish an effective trauma system PI process, enabling legislation must be in place to provide confidentiality and nondiscoverability for PI activities conducted within the trauma system. A trauma system PI plan is needed to define the mission, objectives and process. Formalized committees should be established within regulation at the regional and state level to provide authority over PI activities so that the confidentiality and nondiscoverability statute applies and protects the process.

A functioning trauma registry is a key component to trauma system evaluation and although integrated nonrisk-adjusted data may be ideal, it is not crucial to the PI process. The idea of having perfect data within the trauma registry before implementing a system PI process is an expectation that often limits and inhibits all PI activities. Data reports from the Ohio trauma registry were reviewed by the TSC team, and they were felt to be adequate for implementing the PI process. In fact most states would be very envious of the amount of data and level of hospital participation that the OTR has. With the use of the new vendor software data submission and its validity submitted data will continuously improve. In addition to the OTR, other sources of data may be used for PI such as EMSIRS, vital statistics, and hospital discharge data. Ohio needs established indicators and benchmarks to effectively measure trauma system outcomes. The Ohio Metrics Scorecard developed by the Trauma Visionary Committee is a great foundation for evaluating trauma system performance and outcomes.

Ohio currently has a couple of barriers that will inhibit effective trauma system PI implementation. The Ohio Open Meetings Act and the Ohio Public Records Act are major barriers. Another barrier is the lack of authority within the lead agency to oversee the hospital component of trauma system care. Enabling legislation for the trauma program with an identified lead agency, authority to conduct PI, and legislation to

protect the PI process from discoverability should address this barrier. Consider exploring statutes in other Ohio agencies, such as the Department of Health, to determine if model legislation exists for another healthcare program. Legislative champions should be educated about the current barriers to evaluating the trauma system and the urgency to pass enabling legislation. Another significant barrier is the lack of an individual with clinical expertise in the trauma system to coordinate the PI process.

The Trauma Program PI process ground work can be established while legislative efforts are taking place. Such ground work could include the development of a State PI Plan, a framework for state and regional PI committees with outlined duties and expectations, reporting processes, and the loop closure process. Trauma stakeholders should develop contingency plans in the event that enabling legislation is delayed or defeated. The state is fortunate to have persons with clinical expertise in some regions who can support forward movement of the state PI process. This may include formalizing regional PI structures and exploring the possibility of using other state organizations such as the Ohio COT to steward and protect statewide PI efforts.

The PI process can and should begin immediately with blinded case reviews that illustrate system processes that work or need improvement. Identify standardized trauma registry reports needed for evaluation of the Ohio Trauma Metrics Scorecard and select one or two reports to run every quarter. Look for cases that illustrate a contrast in system performance and blind them for group discussion or provider education. This can be the first step in identifying system changes that could be integrated into protocols and subsequently evaluated. The main objective is to begin the process immediately and not wait for all the components to be perfectly in place.

Recommendations

- Seek enabling legislation for a trauma program with a lead agency, authority to conduct performance improvement (PI) activities, and protection for the PI process.

- Develop a state trauma system PI plan to include mission, objectives, and process.

    - Select and implement indicators from the Ohio Trauma Metrics Scorecard within the plan.

    - Establish guidelines that describe the expectations and reporting process for state and regional committees overseeing the PI process.

- Implement the PI process with the data currently available in the state trauma registry.

- Develop standardized trauma registry reports needed for evaluation of the trauma system.

- Begin the PI process with blinded case reviews using risk-adjusted data to identify opportunities for trauma system improvement.
    - Seek support from the Ohio State Trauma Nurse Leaders or Ohio Committee on Trauma to coordinate the PI process using blinded case reviews.

Focus Question 2

After analyzing Ohio's trauma system infrastructure, please describe a sample model for integration of regional trauma systems and regional physician advisory boards into the state system.

Consistent with the NHTSA EMS Technical Assistance Team recommendations, it is desirable to unify regional boundaries. As supported by the EMS Board, EMS regions should be aligned with the existing Homeland Security Planning Regions. In resource constrained areas it may be logical to combine more than one Homeland Security region for the purposes of EMS /trauma system development, taking into consideration issues of proximity for destination protocols and trauma center resources. Integrating EMS and trauma regions with the Homeland Security regions may provide an infrastructure already developed by the OEMA to support regional activities and communication.

Physician input, including regional physician advisory boards, should be integrated at the regional level as subcommittees within the regional infrastructures. These regional physician advisory boards may be valuable to emergency management as systems for patient movement and treatment are planned. Additionally, promoting disaster protocol consistency when possible for daily EMS and trauma care response may be beneficial to all groups. Issues discussed and resolutions achieved within the region should be reported to the EMS Board and Ohio Trauma Committee on a regular basis. Sharing issues and resolutions with other regions should then be facilitated so that issues are addressed in a standardized fashion. Underperforming regions should receive directed guidance and assistance from state officials and regions performing exemplary work.

Consider examining the strategies other states have used for integrating regional efforts into the state trauma program. One such example is North Dakota (www.ndhealth.gov/trauma, Trauma System Guidelines Manual). Consider talking with the trauma program managers in other states such as Texas and Colorado for regional structures and activities. Other strategic approaches may be explored with the Trauma Managers Council of the National Association of State Emergency Medical Services Officials (NASEMSO).

Recommendations

- Proceed with the alignment of EMS and trauma regions with the Homeland Security regions.
    - Identify the resources and potential support for regional activities that exist within the Homeland Security regions that could be shared with the EMS and trauma programs.
- Talk with trauma program managers in other states and obtain copies of their resources for regional structure and management.

Focus Question 3

Can you provide idea's for funding sources for Ohio's trauma system based on your experiences with other state trauma systems.

States have used many strategies to fund their trauma system infrastructure and to provide readiness costs to designated trauma centers. For effective trauma system program management, ensure that any funds appropriated are designated for the program infrastructure, personnel, and program management are a priority, before funds are provided to trauma centers for readiness costs.

Thirty states fund the trauma system and the EMS system separately, while 10 provide joint funding for both trauma and EMS. The most common methods of state funding include general fund revenues, fees on motor vehicles and criminal violation fines, and tobacco funds. Some states use multiple state revenues. For example Oklahoma created the Trauma Care Assistance Revolving Fund that is supported by a combination of driver's license fees, criminal fines, moving violation fees, and the state tobacco tax (National Conference of State Legislators, 2012). See http://www.ncsl.org/issues-research/health/trauma-ems-interactive-map.aspx

Potential funding sources that could be considered to fund the trauma system program infrastructure include a small increase in gasoline tax or bridge or highway toll, or an alcohol sales tax. Identify how much a 1¢ gasoline tax or a 5¢ bridge/highway toll, or 1¢ tax on alcohol sales would generate statewide. Additional funding sources might be a fee associated with a driver's license renewal, motor vehicle registration, a tire disposal fee, court costs in motor vehicle and or DUI cases, or moving violation fines.

For any trauma system program appropriation, ensure that the statute establishes that any revenues, "excess" revenues, and any appropriation from a reserve or unspent funds shall not revert to the state's general fund at the end of the fiscal year. Especially during start-up periods, it is often not possible to spend all funds by the end of the fiscal year, especially if funds are accumulated over the year, such as with fees and fines. It is important to retain unused funds to support the program at the beginning of the next fiscal year while more funds are accumulating.

If funds are appropriated for trauma centers, ensure that they are used for readiness costs rather than applied to uncompensated care. In this manner funding is tied to specific trauma center deliverables such as services and participation in the trauma system (e.g., participation in regional or state PI activities and complete data submission). Arkansas is one state that has a model.

In addition to state funds, many states use federal grant funds to support state trauma system activities. The trauma program should take advantage of opportunities to collaborate with other state programs and to enhance the trauma program.

- The Office of Rural Health Policy Rural Hospital Flexibility Grants may be used to help support development of trauma care resources in critical access hospitals.

- National Highway Traffic Safety Administration (NHTSA) Sections 408 and 402 funds Traffic Safety Information System Improvement Grants may be used to develop or enhance the statewide trauma registry or to potentially support data linkage activities.

- The Department of Homeland Security and the Office of the Assistant Secretary for Preparedness and Response distribute billions of dollars in grants to states for emergency preparedness and disaster response. Consider approaching agencies funded by these programs to gain support for a trauma care initiative that also supports emergency preparedness and response. An example would be funds to purchase the patient tracking bands that are beneficial for data linkage as well as for tracking patients during a disaster. Arkansas uses the bands routinely and orders 200 cases of bands (500 each at a cost of $46.20 per case) for a cost of less than $10,000 per year. ASPR funding could potentially be sought as daily use of the trauma bands means they are more likely to be used effectively during a disaster. Another suggestion is application of the SurgeNet system for hospitals, already paid for by federal grants. The system could be used to update bed capacity and resources on a daily basis to help inform interfacility transfer decisions by lower level trauma centers.
  -
- Other federal grants and private foundation funding could also be a source of funding for trauma system research.

Recommendations

- Review the various state trauma program funding sources and work with legislative champions to identify a funding source that might be acceptable.

- Make funding of the trauma program infrastructure, personnel, and program management a priority.

- Seek opportunities to collaborate with other state programs and seek funding for special projects that would be of benefit to both programs.

Focus Question 4

Ohio does not have a trauma medical director who is dedicated solely towards trauma system development. Explain what impact this position may have on the system. Can a statewide system be effective without a trauma medical director who is not a surgeon? What benefits can be realized by the addition of a trauma medical director to Ohio's trauma system?

A lead agency for trauma should have subject matter experts who develop policy, serve as liaisons to other agencies, and provide general guidance on matters related to the care of injured patients, as well as a core staff who execute the business of the agency. This is articulated in the ACS COT document *Regional Trauma Systems: Optimal Elements, Integration and Assessment*. Codifying the role of the trauma system medical director is a critical step in establishing an effective lead agency. The trauma medical director should be an established physician leader with a broad scope of clinical experience in the management of injured patients and an extensive understanding of the nature and operations of both trauma centers and trauma systems. While physicians with the qualifications to be a successful trauma medical director are likely to be surgeons involved in the care of trauma patients, other physicians may potentially perform successfully in this position as well. The knowledge and experience of the trauma medical director and commitment to the trauma system are ultimately more important than specialty training.

The key roles of the trauma medical director are as follows:

- to provide stable, consistent oversight of the day-to-day operations of the trauma system from a medical perspective,
- to function as a liaison between the multidisciplinary policy development body (trauma advisory committee) and the lead agency, and
- to provide consistent leadership and stewardship of the vision for system development outlined in the trauma plan.

These roles are essential to allow the system to function optimally and to continue its development according to the trauma system plan. The majority of the energy involved in setting policy and protocol for a trauma system derives from collective volunteer efforts during meetings that convene infrequently. The primary challenges faced arise not in the development of policy and protocol, but in the practical implementation those decisions. The trauma medical director in collaboration with the lead agency personnel who also have clinical expertise provide the constant and consistent force necessary to move new ideas forward and to monitor compliance with existing standards.

In the short term, establishing a trauma medical director position will pave the way for a better working relationship between the trauma committee and the EMS board, and create an advocacy role to ensure that trauma-related issues remain a visible priority. Additionally, the trauma medical director can provide the authority to encourage implementation of trauma system policy on a voluntary basis, even though strict statutory authority is lacking. Most importantly, the trauma medical director will provide a consistent focus on trauma system issues, a critical element needed to move projects

forward in the current environment where trauma system resources are distributed and program personnel are involved with more than one project. With the addition of a trauma medical director, a great deal of progress can be made in the Ohio trauma system even in the absence of sweeping statutory change.

On a long term basis, if new enabling legislation is established, the trauma medical director will have a critical role as the liaison between the policy making stakeholder group and the administrative team for the trauma system program, providing consistency, day-to-day executive decisions related to medical issues, and overall stewardship of system development.

Recommendations

- Identify funding for a contracted trauma medical director position, and fill the position.

- Task the trauma medical director with oversight of the trauma system, provision of leadership and stewardship of the trauma system's development, and liaison between the trauma advisory committee and the lead agency.

Appendix A: Acronyms

ACS – American College of Surgeons
AEMT – advanced emergency medical technician
AOTR – Alliance of Ohio Trauma Registrars
ASPR – Assistant Secretary for Preparedness and Response
ATLS – Advanced Trauma Life Support
ATV – all-terrain vehicles

BIS – Benchmarks, Indicators, and Scoring
BTLS – Basic Trauma Life Support

CAAS – Commission on Accreditation of Ambulance Services
CAMTS – Commission on Accreditation of Medical Transport Services
CARF – Commission on Accreditation of Rehabilitation Facilities
CDC – Centers for Disease Control and Prevention
CFAI – Commission on Fire Accreditation International
COT – Committee on Trauma

DWI – driving while impaired

EMR – emergency medical responder
EMS – Emergency Medical Services
EMSC – Emergency Medical Services for Children
EMSIRS – Emergency Medical Services Incident Reporting System
EMT – emergency medical technician
EOP – Emergency Operations Plan

FARS – Fatality Analysis Reports System
FTE – full time equivalent
FY – fiscal year

GIS – Geographic Information System

HRSA – Health Resources and Services Administration

ICISS – International Classification of Disease-9 Injury Severity Score
IFSAC – International Fire Service Accreditation Congress

MADD – Mothers Against Driving Drunk

MARCS – Multi-Agency Radio Communications System

NAEMSP – National Association of EMS Physicians
NASEMSO – National Association of EMS Officials
NDMS – National Disaster Medical System
NEMSIS – National Emergency Medical Services Information System
NHTSA – National Highway Traffic Safety Administration
NIH – National Institutes of Health
NREMT – National Registry for Emergency Medical Technicians
NTDB – National Trauma Data Bank
NTDS – National Trauma Data Standard

ODH – Ohio Department of Health
ODPS – Ohio Department of Public Safety
OEMA – Ohio Emergency Management Agency
OHA – Ohio Hospital Association
OIPP – Ohio Injury Prevention Partnership
OMTB – Ohio Medical Transportation Board
ORA – Office of Research and Analysis
OSTNL – Ohio Society of Trauma Nurse Leaders
OTR – Ohio Trauma Registry

PHTLS – PreHospital Trauma Life Support
PI – performance improvement

ROC – Research Outcomes Consortium

STIPDA – State and Territorial Injury Prevention Directors Association
SAPP – Substance Abuse Prevention Program

TACR – Trauma Acute Care Registry
TRR – Trauma Rehabilitation Registry
TSC – Trauma System Consultation

VIPP – Violence and Injury Prevention Program

Appendix B: Methodology

Cincinnati Children's Hospital Medical Center 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 (TSC) team consisted of: three trauma/general surgeons, one emergency physician, a state EMS/trauma director, a trauma program manager, a rural trauma and prehospital specialist, and a public health and injury specialist. Biographical sketches for team members are included as Appendix 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 Ohio. 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 Cincinnati Children's Hospital Medical Center, along with a number of related supporting documents provided by the DOH and information available on government websites.

The TSC team convened in Columbus, Ohio on May 5-8, 2013, to review the Ohio 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 a team consensus on the various issues, preparing a report of their findings, and developing recommendations for future development of the trauma system in Ohio. This report was developed independently of any other trauma system consultations or assessments.

Appendix C: Review Team Biographical Sketches

RAJAN GUPTA, MD, FACS, FCCP- TEAM LEADER

Dr. Rajan Gupta is an Associate Professor of Surgery at Dartmouth Medical School and Chief of the Division of Trauma and Acute Surgical Care at Dartmouth Hitchcock Medical Center. He earned his medical degree at Boston University, and did his general surgical residency at Dartmouth Hitchcock Medical Center. He subsequently did a fellowship in traumatology and surgical critical care at the Hospital of the University of Pennsylvania. He is board certified in Surgery with added qualifications in Surgical Critical Care.

Dr. Gupta is the State Chair for NH for the American College of Surgeons Committee on Trauma, and serves on the Rural Trauma Committee as well as the Trauma Systems Evaluation and Planning Committee for this organization. He is also Chair of the New Hampshire Trauma Medical Review Committee (the state trauma center designating committee), and was actively involved with a recent revision of the NH State Trauma System Plan.

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

JANE W. BALL, RN, DRPH

Dr. Jane W. Ball has served as a technical consultant to the American College of Surgeons Trauma Systems Evaluation and Planning Committee since 2006. In this role, she has participated in more than 20 state and regional trauma system consultations and supported many other activities of the committee.

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

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

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

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

AMY EBERLE, RN, BSN, EMT

Amy Eberle is currently the Trauma Program Manager at Sanford Health – Bismarck, an ACS verified Level II 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 North Dakota COT, North Dakota EMSC advisory committee, North Dakota EMS advisory committee, Society of Trauma Nurses, and the North Dakota Emergency Nurses Association. She is also a part of the planning committee for the annual North Dakota State Trauma Conferences.

Amy has been a strong advocate for an all inclusive trauma system within North Dakota. She has been involved in many legislative activities in regards to enhancing the state's trauma system and as a result has been very successful in getting 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 Trauma Nurse Core Curriculum instructor and has

attended numerous conferences, courses, and workshops on EMS, Trauma and disaster planning and response.

STEPHEN FLAHERTY, MD, FACS

Dr. Stephen Flaherty is the trauma medical director at the Cape Fear Valley Medical Center in Fayetteville, NC. 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 the Joint Theater Trauma System for nine months.

Dr. Flaherty is a member of the ACS COT where he participates on the Trauma 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, Eastern Association for the Surgery of Trauma, Society of Critical Care Medicine and American College of Surgeons. He has numerous publications and presentations on topics in trauma and critical care.

MARK JOHNSON, MPA

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

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

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

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

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

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

KATHY J. RINNERT, MD, MPH, FACEP

Kathy J. Rinnert, MD, M.P.H., FACEP, began her career in emergency medicine and emergency medical services (EMS) in the early 1980's as a Nationally Registered Paramedic in a five-county, rural EMS agency in the Allegheny Mountains of Southeast Ohio. She completed medical school at the Ohio State University, followed by an internship in Internal Medicine at Loyola University, and residency training in Emergency Medicine at the University of Chicago. Following residency, Dr. Rinnert completed a two-year fellowship in Emergency Medical Services (EMS) at the University of Pittsburgh. She simultaneously obtained a Master's in Public Health at the Graduate School during her tenure in Pittsburgh.

Dr. Rinnert is currently a Professor of Emergency Medicine at the University of Texas Southwestern Medical Center at Dallas (UTSWMC). She is the Associate Medical Director for the UTSW/BioTel EMS system, encompassing sixteen municipalities and their fire-based EMS and Public Safety agencies. In this capacity, she oversees the out-of-hospital practice of over 1700 paramedics operating in urban, suburban, and rural environments. Dr. Rinnert directs the Center for Government Emergency Medical Security Services (GEMSS) at the UTSWMC, which provides academic and clinical tactical support to government agencies. At the Center she directs both the EMS and GEMSS fellowship programs, which provide post-doctoral training in these subspecialty areas of emergency medicine.

Dr. Rinnert has special interest and expertise in trauma, injury prevention and control, air medical transport, tactical EMS, urban search and rescue, and domestic preparedness for weapons of mass effect (WME) and counterterrorism. She is a member of the Board of Directors for the Commission on Accreditation of Ambulance Services (CAAS), the national body for accreditation of EMS agencies in the United States and Canada. Dr. Rinnert is an active grant reviewer for the Centers for Disease Control and Prevention-National Institute for Occupational Safety and Health (CDC-NIOSH) and trauma systems consultant to the American College of Surgeons Committee on Trauma (ACS-COT).

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

Dr. Sanddal is currently the Manager of the American College of Surgeons (ACS) Trauma Systems and Verification Programs. Prior to his current position, he served as

President of the Critical Illness and Trauma Foundation (CIT), in Bozeman, Montana for 25 years. He worked as the training coordinator for the EMS and Injury Prevention Section of the Montana Department of Public Health and Human Services in the late 1970's. He has served as the Chairperson of the National Council of State EMS Training Coordinators and as the lead staff member for that organization, and similarly for the National Association of EMT.

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

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

ROBERT J. WINCHELL, MD, FACS

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

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

Committee of the American College of Surgeons and also serves as a senior site reviewer for the trauma center verification program of the College.

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

Appendix D: Needs Assessment Process and Tools

American College of Surgeons – Committee on Trauma

Trauma Systems Evaluation and Planning Committee

Trauma Center Needs Assessment Process and Tools

Version 1
May 1, 2013

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

Trauma System Needs Assessment

Overarching Concept

Individual states ensure optimal care of injured persons in their State by establishing criteria through their executive and legislative branches that define a trauma system within the state's geographic boundaries. The state agency responsible for the trauma system translates the statutes by developing rules or regulations, policies, and procedures which are then implemented by the regional or state trauma system within the constraints of funding.

The American College of Surgeons Committee on Trauma (ACS-COT) represents surgeons with expertise in the optimal care of injured patients, inclusive of trauma system development, prehospital care, trauma center development, direct patient care, research, and injury prevention. The ACS-COT has established the guidelines that define the essential elements that identify a hospital as a trauma center, as well as trauma care within a system.

The ACS-COT has now proposed a strategy to help states to assess and consider the needed distribution of trauma centers within its boundaries, using an inclusive care model for the trauma system. Such an effort is important because of the need to prevent excessive duplication of Level I and Level II trauma centers that have high costs in which it is important to maintain adequate patient volume to promote optimal quality of care, cost-effectiveness of care, and the training mission. Equally important is ensuring that patients have access to trauma centers that are matched to their level of injury severity. Patients with mild and moderate injuries can have high quality care at a designated lower level trauma center that is closer to their community. Patients with severe injuries may be served by timely access to high level trauma centers, many times by transfer from a lower level trauma center that performs the initial resuscitation and stabilization.

Guidance for Trauma System Needs Assessment

Many factors are important to consider when determining an optimal geographic distribution (the number and location) of trauma centers within a state or region. Important considerations are terrain, the transportation infrastructure, local weather patterns, the mass casualty assessment (terror threat, industrial risk), and population (absolute count, dispersal). Capability (level of trauma care) includes important considerations such as population, the medical infrastructures in a region (trauma surgeons, surgeon subspecialists, availability for the call schedule, intensive care resources), transportation assets for interfacility transfer, and the communication systems.

The attached document provides individual assessment parameters that can be used to help a state or regional trauma system to conduct a needs assessment and estimate the number and location of trauma centers required for its population and visitors. Since this is the first version of the document, it is possible that more assessment parameters will be identified and developed in the future.

These assessment parameters fall into several categories such as patient access, discovery/ dispatch, training mission, education, EMS response, and capacity. The leaders of the regional or state trauma system should make an effort to use as many of the assessment parameters for which data are available; however, it is unlikely that a trauma system will be able to use all the parameters.

Each of the assessment parameters is stated as a benchmark or desired outcome. In many cases recommendations for a desirable outcome have been proposed, based either from the literature or common practice in other systems. As there are generally a range of potential values for each parameter, the desired outcomes will likely be different for each trauma system and must be determined by the trauma system's decision makers – choosing targets that are acceptable or desirable based upon local public opinion, policy, and infrastructure. For example, not every trauma system will have the resources to place trauma centers in every location necessary to achieve a goal of transporting 90% of patients to a level 1 trauma center within 1 hour, a goal that may well be achievable in some systems. In this case, the benchmark for system access might be better chosen to establish a threshold for transport to a level I or level II center, or transport to a participating system hospital within 1 hour.

When selecting a desired outcome, the potential gaps in the trauma system should be considered as they could potentially affect ability of the trauma system to meet the desired outcome. Additionally, trade-offs have been identified that should be considered when selecting a desired outcome.

Specific datasets are suggested to perform the assessment for each parameter, along with some strategies or considerations when analyzing the data. Several different datasets may be needed to assess each parameter, and some datasets can be used for several parameters. The list of datasets that have been identified to help perform this assessment includes the following:

- State trauma registry
- Individual trauma center registries
- State EMS registry
- Hospital discharge data (HDD)
- Emergency department data (EDD)
- State NEMSIS data
- State or Regional 911 data sets, local 911 data
- Trauma data reported by non trauma hospitals
- Computer-aided dispatch (CAD) registries
- Trauma system status management data (e.g. time hospitals are on diversion)

The following criteria represent the current state of an ongoing project to quantify metrics that are of potential utility in assessing trauma-related resource needs within a region. Further refinements are expected as the Committee continues its development efforts and various states and regions apply these metrics. Users are encouraged to check back with the Trauma System Evaluation and Planning Committee to ensure they have the most recent version of the tools.

American College of Surgeons – Trauma Center Needs Assessment Tool		
Category - Access	**Desired State**	**xx % of all injured patients meeting step one or two field triage criteria will receive care at a LI or LII trauma center within yy minutes of injury.**
	Parameters	xx - No data available for percentage of injured patients, suggested range 80%-100% yy - No data available for correct time to arrival, suggest 60 min
	Current State	Determine: • Injury time • Field triage step • Arrival time at facility • Destination facility, if other than level I or level II center, then need time to transfer ○ Arrival time at 2nd facility

	Data Sources	• EMS registry
		• Trauma registry at receiving trauma centers
		• Trauma data from intermediate facilities:
		  ○ Trauma specific data
		  ○ HDD or EDD data

	Gaps	• Delay in EMS dispatch • Delay in EMS arrival • Long transport time • No appropriate center
	Strategies	Include both ground and air medical transport time/ distance in calculations (add no-fly days into the calculations)
	Trade-Offs	Over designation likely to improve access but increases cost and volume at individual trauma centers Under-designation will maintain higher volume at individual trauma centers but potentially decreases access and places greater burdens of transport resources, both for field and inter-facility transports.

American College of Surgeons – Trauma Center Needs Assessment Tool		
Category - Access	**Desired State**	**xx % of patients meeting step three triage criteria will receive care at a level III or higher trauma center within yy minutes of injury**
	Parameters	xx - No data available, suggested range 80%-100% yy - No data available, suggest 60 min
	Current State	Determine: • Injury time • Field triage step • Arrival time at facility • Destination facility, if other than level I or level II center, then need • Time to transfer • Arrival time and 2nd facility • Destination facility

	Data Sources	• EMS registry
		• Trauma registry at receiving trauma centers
		• Trauma data from intermediate facilities:
		  ○ Trauma specific data
		  ○ HDD or EDD data

	Gaps	• Delay in EMS dispatch • Delay in EMS arrival • Long transport time • No appropriate center
	Strategies	Determine the number of injured patients without head injury to verify that a Level III trauma center is warranted. Ensure institutional commitment to trauma.
	Trade-Offs	Level III trauma centers improve access for minor to moderately injured patients. Essential in rural areas for immediate stabilization prior to transfer. Level III centers in urban and suburban areas may adversely affect both system efficiency and cost without significantly improving access

American College of Surgeons – Trauma Center Needs Assessment Tool		
Category - Access	**Desired State**	**xx % of patients not meeting any field triage criteria treated at an appropriate facility without inter-facility transfer**
	Parameters	xx - No data available, suggested range 80%-100%
	Current State	Determine: • Injury time • Field triage step • Arrival time at facility • Disposition

	Data Sources	• EMS registry
		• Trauma registry at receiving trauma centers
		• Injury data from non-trauma centers (community hospitals)
		  ○ Trauma registry specific data
		  ○ Hospital discharge or ED discharge data

	Gaps	• Over-utilization of transfer • Failure to transfer • Under-triage
	Strategies	This approach requires injury data from all acute care centers. It must be monitored to ensure minimal under-triage or miss-triage. Outcomes must also be monitored to ensure that patients are getting appropriate care in a timely manner.
	Trade-Offs	In an inclusive and integrated trauma system it is acknowledged that most minor injury is treated appropriately at Level IV-V trauma centers and community acute care hospitals.

American College of Surgeons – Trauma Center Needs Assessment Tool		
Category - Access	**Desired State**	**xx% of injured patients with ISS > 15 treated without transfer at facilities other than designated trauma centers**
	Parameters	xx - no data, suggest < 5%
	Current State	Determine: • % of patients with ISS > 15 treated in designated trauma centers compared with total number of injured patients with ISS >15 in the state
	Data Sources	• State trauma registry • Facility trauma registries • Hospital discharge data • Vital records (death certificates)
	Gaps	Limited enforcement of system guidelines for interfacility transfer
	Strategies	Identify hospitals not appropriately transferring seriously injured patients on a consistent basis (e.g., keep paying patients or neurosurgeon available daytime hours only). Identify as a potential location where trauma center or trauma participating hospital is needed. Monitor and enforce transfer guidelines and policies.
	Trade-Offs	In rural areas access to specialty care, e.g. neurosurgeon, may be occasionally life-saving. However, the resources supporting that sporadic care such as a qualified ICU may be lacking and the lack of their inclusion in the trauma center through a designation/verification process reduces oversight and performance improvement monitoring. Selective triage by ability to pay places a greater burden on higher level centers. Failure to recognize that all acute care facilities treat some level of injury negates the opportunity to collect data from those facilities and to more fully integrate them into an inclusive trauma system designed to meet the needs of the entire spectrum of injured patients.

American College of Surgeons – Trauma Center Needs Assessment Tool		
Category – Access	**Desired State**	**xx% of injured patients meeting step one or step field triage criteria are appropriately transported to the closest designated or verified trauma center regardless of state boundaries**
	Parameters	xx - no data, suggest transfer to out-of-state trauma center is it is more than 15 minutes closer than a trauma center designated or verified at the same or higher level in-state.
	Current State	Determine: • Number of trauma patients receiving care in surrounding states • Document and analyze transport time differences against in state resources
	Data Sources	• State trauma registry data from neighboring state • Trauma registry data from home state • HDD from neighboring state • EMS registry in home state • Vital records from home and neighboring states (death certificates)
	Gaps	• Need to dual recognition of border facilities as part of the trauma system in both states • Need for contributions to trauma registry data in both states • Reciprocal support for non-paying patients • Structured plan for repatriation to an in-state facility, if appropriate
	Strategies	Identify patients receiving appropriate care at out-of-state trauma centers. May reduce the need for duplication of resources within near proximity.
	Trade-Offs	In the neighboring center is not part of the home state's trauma system, there may be limited opportunities for formal confirmation of capabilities during verification or designation reviews. Likewise there may not be ongoing monitoring through system performance improvement processes. Out-of-state facilities may represent the only logical option for access to timely care if they abut rural areas in the home state.

American College of Surgeons – Trauma Center Needs Assessment Tool		
Category – Training Mission	**Desired State**	**Each level I center will see a sufficient volume of injured patients to support continued competence of trauma staff and the training mission of the center**
	Parameters	• Limit by admissions: COT 1200 • Limit by severe injuries: COT 250 with ISS > 15 • Limit by geographical proximity: One LI per region or catchment area
	Current State	Determine: • Required volume for competency mission • Required volume for training mission

	Data Sources	• EMS registry
		• Trauma registry at receiving trauma centers
		• Trauma data from intermediate facilities:
		  ○ Trauma registry specific data
		  ○ Hospital discharge or ED discharge data

	Gaps	• Over-triage to LI center • Underutilization and commensurate experience at LII-III trauma centers
	Strategies	If the training need cannot be met by standard patient flow, the field triage criteria may need to be adjusted to ensure the agreed upon volume. If patient transport is determined by geographic catchment area, boundary modifications may be necessary. The training mission should be factored into the model for trauma center number, location, and level.
	Trade-Offs	May result in under-designation of supporting facilities that would be necessary for surge or large scale events. This could, potentially, reduce redundancy in the event of a LI facility catastrophe such as a flood, tornado, earthquake, fire or act of terrorism.

American College of Surgeons – Trauma Center Needs Assessment Tool		
Category – Discovery/ Dispatch	**Desired State**	**xx% of population covered by E911 or Next Generation 911, yy% of geographical coverage by E911 or Next Generation 911**
	Parameters	xx - no data available, suggested 95-100% of population yy - no data available, suggested >90% of geography
	Current State	Determine: • % of population covered • % of geography covered
	Data Sources	• State 911 Office • Regional/Local 911 Offices
	Gaps	• Delay in ability to notify dispatch by cell phone • Inability to locate caller results in delayed response
	Strategies	Continued national and statewide efforts to upgrade 911 capacity is ongoing. Trauma stakeholders should be knowledgeable of such efforts in their state or region and should support legislative or grant efforts to secure sufficient funding for such improvements.
	Trade-Offs	While delays in discover do occasionally occur, delays in notification are far more common and may affect need for additional trauma centers in order to meet time to definitive care guidelines. Failure to identify caller location (E911 and Next Gen 911) may delay response times and may also suggest the need for additional trauma centers.

American College of Surgeons – Trauma Center Needs Assessment Tool		
Category – EMS Response	**Desired State**	**xx% of population covered by advanced life support personnel within zz minutes;** **yy% of population covered by basic life support ambulance within aa minutes**
	Parameters	xx - no data available, zz - in urban systems fractal response time of < 9 minutes >95% yy - no data available aa - in rural systems fractal response time of <20 minutes >90%
	Current State	Determine: • % of urban population covered by ALS within established response times parameters • % of rural population covered by ALS within established response times parameters • % of rural population covered by BLS within established response time parameters
	Data Sources	State EMS Office: • State NEMSIS databases • Computer aided dispatch (CAD) databases
	Gaps	• Limited availability of ALS resources in rural areas o Can be of high value due to extended transport or transfer times. • Local agencies may be reluctant to transport patients to distant trauma centers o Takes limited resources out of primary response area o If volunteer staffed takes people away from primary vocations
	Strategies	Computer aided dispatch may help identify the correct response type/mode. Pre-arrival instructions are essential in areas with extended response times but rural dispatch centers often do not have the resources to provide certification for their dispatchers. Trained emergency medical responders (EMR) such as law enforcement, fire department or freestanding quick response units may be essential to provide immediate medical care prior to the ambulance arrival in rural and remote areas.
	Trade-Offs	Properly positioned EMS agencies reduce response time. It may not be practical to expect high level prehospital resources in every community. Regionalization of EMS systems may help control costs and helps keep local resources within standard response areas. ALS rendezvous and hand-offs may improve system efficiency.

American College of Surgeons – Trauma Center Needs Assessment Tool		
Category – Air Medical Response	**Desired State**	**Use of air medical resources reduces initial transport time by xx minutes for patients meeting step one or step two field triage criteria beyond a yy ground transport radius. Use of air medical resources reduces inter-hospital transport time by aa minutes for patients meeting step one or step two field triage criteria beyond a bb ground transport radius.**
	Parameters	xx - no data available, suggest 15-30 minutes yy - no data available, suggest a 20-30 mile radius aa - no data available, suggest >30 minutes (assumes full ALS ground capabilities) bb - no data available, suggest greater than 50 mile radius (assumes full ALS ground capabilities)
	Current State	Determine: • Number, location and type of air medical resources in the region or state • Average length of time from dispatch to airborne • Average length of time for patient preparation for flight (scene and inter-hospital) • Average time savings by distance from the nearest appropriate trauma center (may not be the air medical assets home base). ○ Requires assessment and comparison of ground transport times
	Data Sources	• Statewide trauma registry • Individual trauma registry • Acute care facility ED discharge data • NEMSIS statewide database
	Gaps	• Overabundance of resources in some metropolitan areas • Paucity of resources stationed or immediately available in rural/remote areas • May not operate in a manner that best supports the trauma system
	Strategies	Establish clear expectations through rule, regulation or policy concerning the use of air medical resources for the initial transport or transfer of trauma patients. Ensure that data are collected and analyzed and that air medical providers are fully engaged in performance improvement activities.
	Trade-Offs	The use of rotor wing aircraft may result in the ability to increase the time/distance radius surrounding high level trauma centers. If "stationed" at the trauma center results in fly out – fly back time considerations that lessen the radius. Rotor wing aircraft affiliated with a hospital may result in over flights of closer appropriate trauma centers resulting in delays to care. Minor/moderate injuries may be transported resulting in increased individual and systems costs and significant risks to providers and patients. Fixed wing aircraft often take significant time from dispatch to launch but may be the only reasonable alternative for remote transfers. Air medical data are often not available for incorporation into other trauma data sets, for system planning, or performance improvement activities.

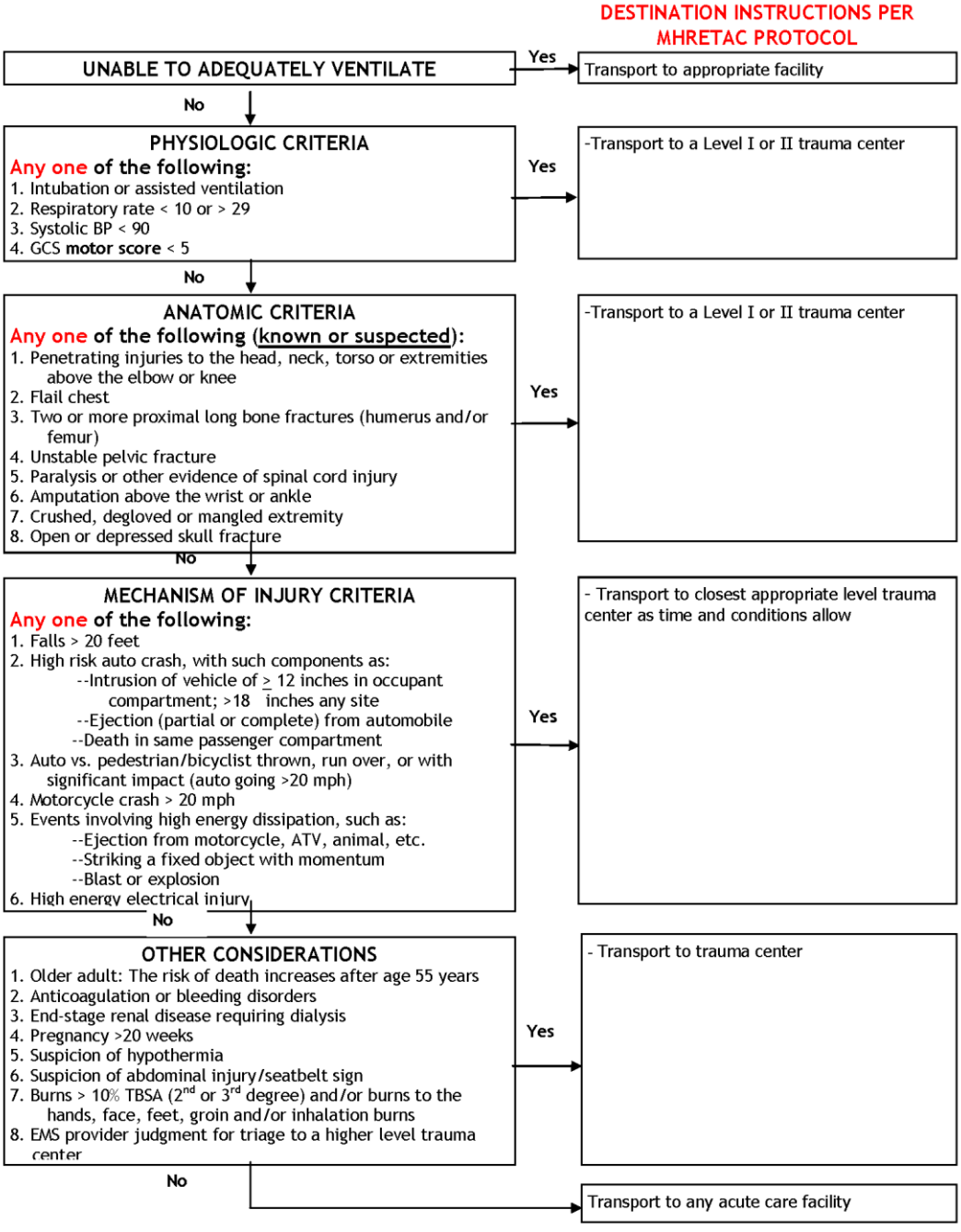
American College of Surgeons – Trauma Center Needs Assessment Tool		
Category – Triage/Trauma Activation	**Desired State**	**xx% of time EMS takes patients meeting field triage criteria to the correct facility and yy% of time step one or step two criteria notification by EMS results in trauma team activation.**
	Parameters	xx - no data available yy - no data available ACS Resources for Optimal Care of the Injured Patient suggests • xx <50% over-triage • xx <05% under-triage • yy Trauma surgeon immediately (<15 minutes) available (LI and LII trauma centers, promptly [<30 minutes] for LIII) for the highest level of trauma team activation upon prior notification by EMS.
	Current State	Determine: • % of over-triage • % of under-triage • % of mistriage • Percent of failure to require the highest level of trauma team activation for patients meeting step one or step two trauma triage criteria with appropriate notification by EMS prior to arrival.
	Data Sources	• State trauma registry • Facility trauma registries • State NEMSIS database • Hospital discharge data • Vital records (death certificates) • System (multi-disciplinary) performance improvement minutes
	Gaps	• Establish and enforce field triage guidelines o Adopt or refine CDC/ACS guidelines • Ensure facilities adopt and adhere to trauma team activation policies o Continuously monitored through PIPS processes
	Strategies	Develop “Cribari grid” for each facility to determine rates of over- and under-triage. Develop model criteria for trauma team activation at the regional or state level. Monitor compliance of both triage and activation.
	Trade-Offs	Over-triage ensures injured patients do not have occult injuries, however it increases system costs. Under-triage/mistriage contributes to poorer outcomes. Failure to initiate trauma team activations delays access to care.

American College of Surgeons – Trauma Center Needs Assessment Tool		
Category - Capacity	**Desired State**	**xx% of time trauma centers are on diversion; yy% of time trauma centers are 10% over capacity**
	Parameters	xx - no data available - suggest <5% total time on diversion yy - no data available - suggest <10% total time over-capacity
	Current State	Determine: • % of time on diversion • % of time overcapacity
	Data Sources	• Individual trauma registries • Statewide or regional system/bed status management data
	Gaps	• Limited trauma centers may result in excess diversion and subsequent delays in care. • Persistent overcapacity issues may result in inability meet unexpected demands during catastrophic events.
	Strategies	Establish and monitor diversion and capacity benchmarks as part of verification/designation process. Monitor system/bed status management data (such as EMSystem installed for use during catastrophic events) on an ongoing basis.
	Trade-Offs	Excessive diversion or over-capacity issues impact the system's ability to flex for surges and large scale events. It may indicate a need for additional trauma centers in an region or state. This could include lower level centers to relieve some burden for minor and moderate injuries.

Appendix E: Sample Destination Protocol

MHRETAC Prehospital Trauma Triage Algorithm Guideline, 4/7/10

Adult Patients (Ages 15 and older)



Mile High Regional Emergency Medical and Trauma Advisory Council (MHRETAC)

Adult Trauma Triage Algorithm Overview

The MHRETAC currently has 12 trauma centers. This region contains the most, and the highest level trauma centers in the state of Colorado. The counties included are Adams, Arapahoe, Broomfield, Denver, Douglas and Elbert. The region has all 3 Level I trauma centers, the only Level I Regional Pediatric Trauma Center in Colorado, 3 Level II trauma centers, 2 Level III trauma centers, and 3 Level IV trauma centers.

Closest Appropriate- MHRETAC actively supports and promotes the Medical Directors in defining the terms closest and appropriate trauma centers and applicable conditions. Ground transport between the Level I trauma centers in this RETAC is less than 15 minutes. The distance between trauma centers by air is measured in seconds. The terms time and closest have less significance in this region with the high population of trauma centers.

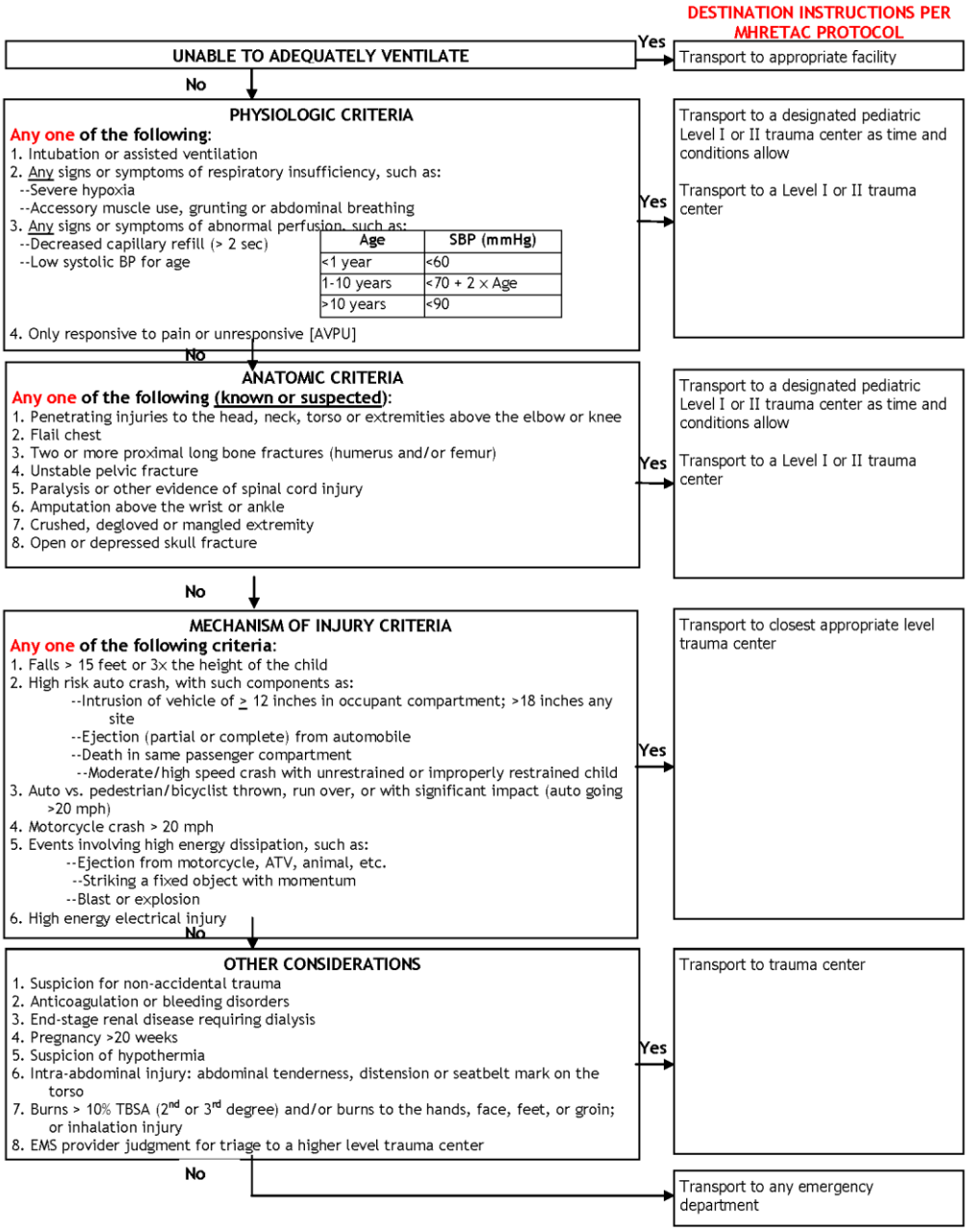
Interfacility Transfers- The MHRETAC recognizes that compliance with this algorithm may require interfacility transfers.

EMS Medical Direction- It is the expectation of the MHRETAC that the EMS Medical Directors will be active and involved in trauma destination decisions and oversight of the agencies for which they are responsible.

Approved by Mile-High RETAC Destination Committee on August 19, 2010 and October 21, 2010
Approved by Denver Metro EMS Medical Directors Group on November 3, 2010
Approved by Mile-High RETAC on November 18, 2010

MHRETAC Prehospital Trauma Triage Algorithm Guideline, 4/7/10

Pediatric Patients (Less than 15 years old)



Mile High Regional Emergency Medical and Trauma Advisory Council (MHRETAC)

Pediatrics Trauma Triage Algorithm Overview

The MHRETAC currently has 12 trauma centers. This region contains the most, and the highest level trauma centers in the state of Colorado. The counties included are Adams, Arapahoe, Broomfield, Denver, Douglas and Elbert. The region has all 3 Level I trauma centers, the only Level I Regional Pediatric Trauma Center in Colorado, 3 Level II trauma centers, 2 Level III trauma centers, and 3 Level IV trauma centers.

Closest Appropriate- MHRETAC actively supports and promotes the Medical Directors in defining the terms closest and appropriate trauma centers and applicable conditions. Ground transport between the Level I trauma centers in this RETAC is less than 15 minutes. The distance between trauma centers by air is measured in seconds. The terms time and closest have less significance in this region with the high population of trauma centers.

Interfacility Transfers- The MHRETAC recognizes that compliance with this algorithm may require interfacility transfers.

EMS Medical Direction- It is the expectation of the MHRETAC that the EMS Medical Directors will be active and involved in trauma destination decisions and oversight of the agencies for which they are responsible.

Pediatrics- The Children's Hospital is recognized as a specialized resource for pediatric patients less than 15 yrs of age.

Approved by Mile-High RETAC Destination Committee on August 19, 2010 and October 21, 2010
Approved by Denver Metro EMS Medical Directors Group on November 3, 2010
Approved by Mile-High RETAC on November 18, 2010

Appendix F: Participant List

Abbey, Dan
Akin, Shelley
Allen, Debra
Anthes, Loren
Armola, Rochelle
Barnett, Timothy
Bechtel, Nancie
Beeghly, Christy
Benecke, Gina
Berner, Theresa
Betz, Sally
Brown, Jennifer
Burt, Joyce
Butler, Daniel
Calkins, Kristen
Cass, Phil
Chambers, Rita
Chow, Stu
Claridge, Jeffrey
Clark, Gary
Clark, Mary
Coffey, Carla
Conyers, Teresa
Covert, Julia
Crow, John
Daugherty, Margot
Davis, David
DeFiore-Hyrmer, Jolene
Denlinger, Elizabeth
Deppe, Sharon
Dickson, Jane
Dressel, Rhonda
Erskine, Tim
Evans Rhonda
Falcone, Richard
Francis, Tondo
Frick, Ryan
George, Richard
Geyer, Rebecca
Giambri, Roxanna
Giles, Sheila

Goodman, Anne
Graymire, Vickie
Gruber, Brian
Haas, Lynn
Haley, Kathy
Haller, Virginia
Harris, Deanna
Harrison, Kelly
Hartman, Vanessa
Hevener, Katherine
Hirschfeld, Judy
Holdgreve, Gayle
House, Melvin
Hughes, John
Iske, Cindy
Johannigman, Jay
Johnson, Laurie
Kable, Renae
Keseg, David
Kessler, Taunya
Kirkham, Terry
Knotts, F. Barry
Kovach, Sherri
Lang, Carrie
Laurence, Susan
Li, Tianhong
Light, Andrea
Love, Lisa
Lowell, Wendi
Mace-Vadjunec, Daneen
Martin, Berni
Martin, Stacey
McCollum, Mark
Merk, Teresa
Michelson, Edward
Minnich, Albert
Mizla, Lori
Montanaro, Deanna
Moody, Suzanne
Morris, Sue
Morris, Tom
Moss, Anne
Muskat, Peter
Myers, Deb
Nagel, Cindy
O'Mara, Michael

Patterson, Brendan
Paul, Douglas
Penrose, Maria
Postage, J. D.
Pryer, Carl "David"
Pust, Adriana
Resanovich, Mark
Robinette, Marie
Robinson, Bryce
Ross, Johnny
Rozzell, Monica
Samberg, Jason
Saxe, Jonathan
Shannon, Michael
Simon, Diane
Stabler, Paula
Steinberg, Steve
Stewart, Terrie
Sutherly, Ben
Swearingin, Trisha
Szmigielski, Bernadette
Valentine, Kandi
Weaver, Lisa
Werman, Howard
Wilczewski, Patricia
Williams, Mallory
Wurster, Lee Ann
Xiang, Huiyun
Yao, Wenyan
Ziegler, Richard
Zimmerman, John