

Trauma System Consultation Report

State of Indiana

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Executive Summary

Indiana, the Hoosier State, is the Crossroads of America. The state has a population of 6.8 million distributed over 36,418 square miles. Large areas of the state have limited access to trauma center care, particularly in rural areas in north central, western, and southeastern Indiana. Age adjusted injury mortality is significantly higher in these regions of the state. When compared to the U.S. average, the age adjusted injury mortality rate for Hoosiers is higher for every age group up to the age of 75. Of note, the rates of motor vehicle crash mortality and firearm injury mortality are substantially higher in Indiana when compared to the U.S.

Historically, Indiana is privileged to have a stakeholder group of insightful and passionate providers across the spectrum of injury care that have been driving statewide trauma system development. In 2004, a Trauma Care Task Force made recommendations with respect to the need for a trauma system in Indiana. Subsequently, in 2006, Public Law 155 directed the Indiana Department of Health to develop, implement, and oversee a statewide comprehensive trauma care system. Department of Homeland Security was given the authority to adopt EMS triage and transportation protocols in 2008. Since the 2008 American College of Surgeons Committee on Trauma, Trauma System Consultation, the state has demonstrated several iterative improvements in trauma system development and implementation. Despite these efforts, the vision of an inclusive trauma system for Hoosiers has yet to be realized.

Overall, the components of a trauma system are generally fragmented and not well coordinated. There are few systematic endeavors directed towards developing and executing the Essential Trauma System Elements such as system-wide performance improvement, readiness operations, needs-based assessments, educational efforts, or organized outreach. Most activities that align with trauma system essential elements are hospital based.

There is currently no dedicated and secure source of funding established by legislation to support trauma system development. The current funding model was proposed with legislative support during the 2008 ACS Trauma System visit and was identified to be insufficient by the team at that time. This funding model does not sustainably support the trauma system or allow for continued program growth. Substantial additional funding is necessary to implement, manage, and maintain the trauma system.

The State of Indiana is at a pivotal crossroads in the evolution of its trauma system. Rallying around the vision of an inclusive trauma system with coordinated regional implementation and comprehensively leveraging the engagement of a large and diverse passionate stakeholder group will be essential to the evolution of the Indiana Trauma System.

Assets and Advantages

- Statutory authority assigns the Indiana Department of Health (IDOH) as lead agency for administration and oversight of trauma system
- Some dedicated funding through the Indiana Spinal Cord and Brain Injury Research Fund (ISCBIRF) exists with provisions for trauma system development

- The Indiana State Trauma Care Committee (ISTCC) and lead agency are passionate and engaged
- Demonstration of several successful state-led injury prevention efforts
- Well-established Emergency Medical Services system
- Triage and Transport Rule catalyzed an increase in trauma center verification
- Increased trauma center participation since the 2008 ACS Trauma System Consultation from 7 to 24 trauma centers
- Increased percentage of state population that is within 45 minutes of a trauma center from 58% in 2013 to 92% in 2022
- Trauma registry is codified in rule resulting in extensive trauma data collection across the state
- Multiple sources of epidemiologic data exist, and there is a commitment for utilization
- The existence of the Performance Improvement (PI) Subcommittee of the ISTCC demonstrates a commitment to PI
- The State has dedicated effort to emergency preparedness planning
- An established partnership with the Indiana National Guard exists for use in times of need

Challenges and Vulnerabilities

- Statutory authority and the ability to establish rules is not fully utilized
- No secure or sustainable funding is established in the state budget for the trauma system
- Representation of the ISTCC does not comprehensively reflect the stakeholder base
- No Trauma System Plan exists
- The bulk of injury prevention efforts are hospital-based and not implemented statewide
- Public education surrounding prevention efforts and the value of the trauma system is minimal
- The Section of EMS has limited ability to expand to meet additional current and future needs
- Lack of organized data and information on system wide triage, patient flow, and system capacity
- Lack of sufficient regulatory and financial incentives to encourage trauma system participation
- No trauma system performance improvement plan exists
- Engagement between trauma and rehab facilities is not formalized
- Limited trauma system integration
- Multiple barriers to relevant epidemiological information which can be translated into actionable information
- Leadership and stakeholders are not leveraging data to inform improvements in care
- No clear legal protection on release of identifiable information for performance improvement initiatives exists
- DTIP and ISTCC are not directly involved in disaster planning

Themes

- Passionate leadership and a culture of collaboration
- Need more guiding statute and rules to support trauma system development
- Funding and resources are needed
- Current resources and mechanisms are underutilized
- Use of informal mechanisms to overcome barriers
- Historically reactive and not proactive
- EMS challenges including workforce and lack of ambulance services
- Fragmented and underutilized available data sources
- Centers and regions operate autonomously due to fragmentation across trauma system

Priority Recommendations

From the list of all recommendations proposed by the ACS Trauma System Consultation (TSC) Review Team for the 2022 Indiana TSC, a select group of priority recommendations were identified as requiring the most focus and attention. The State of Indiana had their first TSC in 2008, and some of the findings and recommendations from that visit were still relevant. Recommendations that are italicized were also included as recommendations from the 2008 IN TSC Report.

Please note: Some of the 2008/2022 recommendations are verbatim, while others contain slightly different language, but the intent has been maintained.

ETSE #1: Statutory Authority

- Seek legislative statute governing the trauma system, including but not limited to:
 - Indiana State Trauma Care Committee (ISTCC)
 - Trauma Regional Advisory Committees (TRAC)
 - Trauma System Plan
 - Establish a dedicated fund to support state-wide trauma system development and sustainability
 - Confidentiality and peer review protection

- Develop administrative rules for the following:
 - Structure, governance, and reporting structure of Indiana State Trauma Care Committee
 - Structure, function, and accountability of Trauma Regional Advisory Committees
 - Formal process for state trauma center designation and de-designation

ETSE #2: Funding

- Secure defined, sustainable funding through a legislatively established trauma system fund to include:
 - Lead agency human resources for trauma and EMS
 - Support TRACs and ISTCC
 - Incentives for participating in trauma system
 - Funding for uncompensated care
 - Trauma research
 - Education
 - Data, registry, and analytics

ETSE #3: Multidisciplinary Advisory Group

- Conduct a full stakeholder analysis. Utilize this information to restructure the ISTCC to ensure there are ISTCC member seats for all ten districts to include representation such as:
 - Level I-III trauma centers, including clinical and administrative
 - EMS
 - Rehabilitation

- Non-designated facilities
- Military
- Special populations (e.g. pediatrics, geriatrics, rural)

ETSE #4: Trauma System Plan

- Develop a comprehensive state trauma system plan, led by IDOH Trauma in conjunction with stakeholders, that addresses all Essential Trauma System Elements (ETSEs). The state trauma system plan should be distinctly different from the IDOH internal strategic plan.

ETSE #5.2: Emergency Medical Services

- Complete a statewide EMS assessment to identify the agency and workforce needs for all areas of the state.
 - Continue to work with Ivy Tech or some other learning institution to identify mechanisms for addressing the educational needs identified in that assessment.
- Clarify the entity responsible for insuring EMS as an essential service in the state.

ETSE #5.4: Definitive Care Facilities

- *Develop clear, well-defined agreements between the lead agency, designated trauma facilities, and non-designated acute care facilities regarding the triage and transfer of injured patients and overall patient care.
(This was also a recommendation from the 2008 Indiana State Trauma System review.)*

ETSE #5.5: Rehabilitation

- Initiate formal engagement between state and district trauma leadership and physiatrists for inclusion in state trauma systems development activities.

ETSE #5.6: System Integration

- Pursue a strategy of maximally inclusive trauma system stakeholder engagement to support trauma system development.
 - Educate Hoosiers and state legislators about the public health value of the trauma system in Indiana.
 - Engage stakeholders that will advocate for legislation that promotes comprehensive trauma system development and sustainment.

ETSE #7: Trauma System Registry

- Develop a comprehensive approach to data quality that involves systematic identification of issues through analytics and audits, strategies to fix problems, and evaluation to ensure that issues are resolved.

ETSE #8: Injury Epidemiology

- Establish sufficient funding for resources necessary to support statewide and regional epidemiologic data management, analysis, reporting, and responses to requests for data.

ETSE #9: System-Wide Performance Improvement

- *Develop a trauma system performance improvement plan, which provides the foundation for PI structure and process.
(This was also a recommendation from the 2008 Indiana State Trauma System review.)*

ETSE #10: Confidentiality and Discoverability

- *Amend or create a statute with specific language to ensure the confidentiality of the trauma registry, trauma system performance improvement, and peer review activities and to protect each from discoverability.
(This was also a recommendation from the 2008 Indiana State Trauma System review.)*

ESTE #11: Disaster Preparedness

- *Develop, at the state level, a multi-disciplinary disaster planning group that includes, but is not limited to, representatives from IDOH, IDHS, trauma experts, EMS stakeholders, and others with identified expertise and resources in the management of multiple trauma events.
(This was also a recommendation from the 2008 Indiana State Trauma System review.)*

Essential Trauma System Element #1: Statutory Authority

Statutory authority to enable development and implementation of a trauma system should exist. A lead agency with sufficient authority to implement policy, maintain well-defined administrative rules, and allocate trauma system funds, should be established or identified. A multidisciplinary advisory group, consisting of stakeholders representing the full spectrum of trauma care, should guide the lead agency.

Purpose and Rationale

A trauma system is a public good with public and private sector partners. It integrates all-population injury care and prevention to achieve optimal outcomes by saving lives and restoring function in life for injured patients and communities. Statutory authority for the trauma system is provided through legislative action. Statute may define the sources of funding and mechanism of fund distribution to elements of the trauma system. A trauma system requires deliberate development and implementation to ensure optimal resources for care of the injured patient and readiness for mass casualties. State legislatures and municipalities determine requirements for components of trauma systems through statutes (i.e., laws) and administrative codes. Statutes and codes are implemented through public rulemaking by a lead agency designated by statute, typically within a Department of Health. On occasion, a legislative body may create and/or designate a not-for-profit foundation as the vehicle for trauma system oversight. Aggregated rules are the regulations that must be followed by the components of a trauma system. Regulations in the trauma system are subject to administrative judicial review and deliberation. The lead agency should regularly review trauma system statutes and regulations.

The legislature and chief governmental executive designate a lead agency to fulfill the functions described in statutes. Core functions of the lead agency should include implementation of prevention activities, coordination of EMS transport protocols, designation of trauma centers, data management and system-wide performance improvement, and provision to support patient data confidentiality and protection from discoverability. Lead agencies also implement trauma system related policies within the statutory framework. The lead agency should monitor aggregate care outcomes through a risk-adjusted, benchmarked registry program with validated data. Lead agency and trauma system component accountability is enhanced with transparency, such as an annual report on trauma system performance and public funding. The chief governmental executive or lead agency should have the authority to appoint a multidisciplinary advisory group of stakeholders, representing the full spectrum of trauma care, to conduct a gap assessment, anticipate emerging system needs, and share guidance with the lead agency.

Current Status

In 2006, Indiana passed Public Law 155-2006, sec 2, adopted as IC 16-19-3-28, providing broad authority to initiate a trauma system. This legislation names the Indiana Department of Health (IDOH) as the lead agency for development, implementation, and oversight of a statewide comprehensive trauma care system to prevent injuries, save lives, and improve the care and outcome of individuals injured in Indiana. This legislation provides specific authority for the IDOH to adopt rules concerning the development and implementation of a trauma registry as well as standards and procedures for trauma care level designation of hospitals.

Indiana Code 16-31-2 provides authority to the Indiana EMS Commission to oversee the statewide EMS system. The authority to regulate EMS services and providers is clearly outlined.

The EMS Commission resides in the Department of Homeland Security (IDHS). The EMS Commission has adopted detailed rules regarding the operation of ambulance services, non-transporting vehicles, advanced life support services, and advanced life support air medical services. The Commission has also adopted rules defining requirements for training and certification of EMS personnel. The EMS Commission may deny, rescind, and apply a variety of sanctions, including revocation, suspension, censure, and issuance of letters of reprimand to certified individuals. Promulgating regulations and imposing disciplinary action are the primary functions of the EMS Commission. In recent years, the EMS Commission was given the authority to certify emergency medical dispatch agencies, medical directors, and dispatchers. These are an important aspect of trauma system implementation. In 2008, legislation was passed giving the EMS Commission responsibility to adopt rules for trauma patient triage and transport protocols. This rule making process provides an important opportunity to appropriately direct trauma patients to the acute care facility providing the right care.

The Indiana State Trauma Care Committee (ISTCC) was established by gubernatorial Executive Order in 2009 and renewed in 2013 and 2017. This Executive Order authorizes the appointment of committee members but does not dictate the roles or responsibilities of the ISTCC or its members. Executive Orders require periodic review by the Governor and may be repealed.

The Indiana statutes provide broad authority to develop a statewide trauma system. However, stakeholders present during the consultation visit indicated that the current statutes may not be adequate or provide the full authority needed in some important areas of system implementation. It was also reported that the rule making process in Indiana is cumbersome and time-consuming due to the multiple governmental reviews required. Many felt that having statutes codified by legislative action may be best approach. At a minimum, statutes or rules should address the core functions of a trauma system that include but are not limited to:

- Implementation of prevention activities
- Designation of trauma centers
- Structure of the Trauma Care Committee
- System-wide performance improvement
- Establishment of adequate and stable funding
- Provisions to support patient data confidentiality
- Data protection from discoverability

Although challenging to develop and implement, statutory changes and rule implementation is critical to the successful development and operation of an effective trauma system. If the functions above are not supported by legislation, rules, or regulation, these should be developed to support all core functions. The structure, governance, and reporting structure of the Indiana State Trauma Care Committee and Trauma Regional Advisory Committees should also be established more clearly in order to support the lead agency in carrying out its specified roles.

Recommendations

- 1.1 **Seek legislative statute governing the trauma system, including but not limited to:**
 - **Indiana State Trauma Care Committee (ISTCC)**
 - **Trauma Regional Advisory Committees (TRAC)**
 - **Trauma System Plan**

- **Establish a dedicated fund to support state-wide trauma system development and sustainability**
 - **Confidentiality and peer review protection**
- 1.2 **Develop administrative rules for the following:**
- **Structure, governance, and reporting structure of Indiana State Trauma Care Committee**
 - **Structure, function, and accountability of Trauma Regional Advisory Committees**
 - **Formal process for state trauma center designation and de-designation**

Essential Trauma System Element #2: Funding

The lead agency should establish a sustained funding mechanism for trauma system infrastructure. Funding should include physical and staffing resources for program administration and oversight, data collection, data storage, data analysis, quality improvement activities, education, and support for disaster response and military integration.

Purpose and Rationale

Trauma systems need sufficient funding to plan, implement, and evaluate a statewide or regional system of care. Public funding should support trauma system components including trauma system administration, system level registry functions, and participation in statewide or municipal trauma performance improvement activities. The trauma system is a foundation for mass casualty readiness and response, and funds should be allocated to trauma system elements for this purpose as well.

The lead agency should have sustained funding for trauma system infrastructure which should be established in statute or code. Funding might also come from sources external to the trauma system (e.g. traffic fines, offender court fees, vehicle title and driver license fees, grants, and general revenue), rather than from internal trauma system elements (e.g. trauma center fees for verification). Funding mechanisms should be transparent and well documented, including identified funding sources, determination of allocations, and anticipated uses. Funding allocation plans to support the trauma system may be linked to population density and injury rates within a specific geography or by facility and should be periodically reassessed to ensure system needs are met. Participation in system level quality improvement, and reporting of data and outcomes to the lead agency, may be required prior to fund distribution. Uses of funds may relate to trauma readiness costs, uncompensated care, and discretionary needs. Organizations receiving public funds should report annually on the use of those funds.

Funding is also required to sustain the trauma system oversight functions of the lead agency. The lead agency should have a program office that administers the trauma system with an appointed trauma system medical director, program manager and necessary support personnel. The primary objectives of the trauma program office are data management, system wide performance improvement, trauma center verification/designation, and facilitating integration of injury prevention, education, and advocacy.

Current Status

IDOH has one dedicated source of state funding through the Spinal Cord and Brain Injury Research Fund (ISCBIRF). This funding is codified in IC 16-41-42.2-4 with provisions for trauma system development and generates approximately \$1.7 million annually through non-commercial motor vehicle registration fees. Up to 50% of this fund (~\$800,000 - \$900,000 annually) can be dedicated to trauma system development. IDOH also has historically received funding from the Indiana Criminal Justice Institute (ICJI) via a National Highway Transportation Safety Administration (NHTSA) grant (~\$175,000/year). This award was not received in 2022, but IDOH staff indicate they anticipate receiving this grant again in 2023. Neither of these sources provide a stable and sustainable source of funding.

The current total cost of trauma system administration is approximately \$529,000 annually. This supports lead agency personnel (Division Director, Division Operations Manager, Trauma and Injury Prevention Program Director, Trauma System Epidemiologist), the Indiana Trauma Registry subscription cost, two contractors working on trauma research and data analysis, and any special project needs. These staff are essential to trauma system development. However, additional staff will be required to meet current and future needs of the trauma system.

The bulk of the ISCBIRF funding is utilized for research grants. These grants are awarded annually to projects that have the potential of positively impacting health care costs, returning individuals to the community/workforce, or serving as a steppingstone to further economic opportunities. A scientific review committee assesses proposals and recommends projects to the ISCBIRF Board that meet the mission of the fund. There appear to be no current reports or deliverables on the return on investment to the department by the grantees, making it challenging to determine their benefit.

Uncompensated trauma patient care poses a significant financial burden on trauma centers. There is no current measure of the financial impact of unfunded trauma care to the trauma centers or the trauma system. No clearly defined financial incentives exist to encourage participation in the trauma system.

There is currently no secure, defined, recurrent funding established, in statute or as a line item in the Indiana State budget, for trauma system development. The current funding model was proposed in a draft bill with legislative support at the time of the 2008 ACS Trauma System visit, and subsequently passed by the legislature. The previous site visit team reviewed the proposal and determined that it would not sufficiently address the financial needs of the trauma system. This funding model does not sustainably support the trauma system or allow for continued program growth.

Additional funding is necessary to implement, manage, and maintain the trauma system. Examples of areas additional funding could support include: ISTCC and TRACs activities, education for EMS and trauma professionals, and data integration and utilization activities.

Recommendations

- 2.1. ***Secure defined, sustainable funding through a legislatively established trauma system fund to include:***
 - ***Lead agency human resources for trauma and EMS***
 - ***Support TRACs and ISTCC***
 - ***Incentives for participating in trauma system***
 - ***Funding for uncompensated care***
 - ***Trauma research***
 - ***Education***
 - ***Data, registry, and analytics***

(This was also a recommendation from the 2008 Indiana State Trauma System review.)
- 2.2. ***Determine cost of uncompensated care and the financial impact on the trauma system.***

(This was also a recommendation from the 2008 Indiana State Trauma System review.)
- 2.3. ***Identify opportunities for financial incentives for participation in the trauma system.***

(This was also a recommendation from the 2008 Indiana State Trauma System review.)

Essential Trauma System Element #3: Multidisciplinary Advisory Group

A multidisciplinary advisory group, consisting of stakeholders representing the full spectrum of trauma care, should be established. The role of the advisory group should be to guide the lead agency regarding trauma system development and operations. Representation should be diverse, with respect to geography, population (rural/urban, adult/pediatric, burn), phases of care (prehospital and rehabilitative) and trauma center level designation.

Purpose and Rationale

A multidisciplinary advisory group that provides subject matter expertise to the lead agency is a critical component of the trauma system. A key responsibility of the multidisciplinary trauma advisory group is regular communication of the trauma system status to the lead agency related to the burden of injury within the trauma system and the impact of the trauma system on the community. Membership should include representatives from a broad constituency across the full spectrum of injury care including, but not limited to, the following: trauma center medical directors, trauma program managers, data registry personnel, pre-hospital professionals, and injury prevention advocates. The multidisciplinary advisory group should be diverse with respect to geography, population (rural/ urban/ adult/ pediatric, burn), and trauma center designation level. The group should also include representation from military treatment facilities to support military civilian integration. The multidisciplinary advisory group works with lead agency officials to:

- Develop and evaluate the trauma system plan.
- Inform and educate the public and legislators about the trauma system.
- Provide consultative assistance for enabling legislation.
- Assist with trauma system quality and performance improvement and research efforts.
- Implement injury prevention programs.
- Promote collaboration and system integration amongst trauma system stakeholders.
- Assist with emergency preparedness and disaster response planning.

As challenges are encountered with providing optimal care to injured patients within the system, the multidisciplinary advisory group responds by evaluating the issue and collaborating with the lead agency to develop action plans with measurable results. The multidisciplinary advisory group contributes to building coalitions through the cultivation and maintenance of relationships with key constituents involved in trauma system development, including healthcare professionals, trauma center administrators, pre-hospital professionals, health insurers and payers, trauma registry and data experts, consumers and advocates, policy makers, and members of the media.

Coalition Building and Community Support

The trauma system must engage its constituents to pursue a common goal. Coalition building is a continuous process of cultivating and maintaining relationships with constituents in a state or region through collaboration on injury control and trauma system development. Key constituents include health professionals, trauma center administrators, prehospital care professionals, health insurers and payers, data experts, patients, patient advocates, policy makers, public safety, local industry and business, and media representatives. The coalition serves an important support role for the following:

- Trauma system plan development and implementation
- Collaboration among all of the trauma system members
- Integration of system elements
- Advocacy for policy development such as authorizing legislation and regulations

- Development and sustainment of system resources
- Disaster preparedness

The coalition informs the multidisciplinary state and regional advisory groups to support trauma system planning and implementation efforts. Information sharing and education are important to reduce the incidence of injury in all populations and to demonstrate the value of an effective trauma system. Regular communication about the status of the trauma system, using system-derived data, helps these key partners to recognize opportunities for improvement. The trauma system's stakeholders also communicate with elected officials regarding the development and sustainability of the trauma system. Stakeholders inform and educate governmental leaders to make them effective partners in policy development to support trauma system improvement.

Current Status

The components of the current trauma system infrastructure are overseen by the Indiana Department of Health as the lead agency and are guided by the Indiana State Trauma Care Committee (ISTCC). The ISTCC is defined by Executive Order and chaired by the IDOH State Health Commissioner with the IDHS Executive Director serving as vice chair. The membership of the ISTCC includes representation from Level I-III adult/pediatric trauma centers, EMS, rural hospitals, and Indiana's Hospital Association.

The role of the ISTCC is to advise the lead agency in trauma system development and on topics pertaining to the management of injured patients. The ISTCC also provides advisory expertise for data quality improvement and review of trauma outcomes across the state. One example of ISTCC's work within the realm of quality improvement is their analysis of trauma registry data to identify issues with delays in transfer.

The lead agency has established Trauma Regional Advisory Committees (TRACs) that allow for district/regional level data analysis, quality improvement, and ongoing trauma system development activities including region-specific projects (e.g., motor vehicle safety, mass casualty planning, gun violence). However, the TRACs are ad hoc and lack formalized structure and funding.

The Indiana Trauma Network (ITN) is a group of trauma and non-trauma center nurses and registrars that focus on trauma related topics including quality improvement, training/educational opportunities, verification experiences, and networking. The ITN meets after the Indiana State Trauma Care Committee meetings.

Of note, members of the Indiana State Trauma Care Committee (ISTCC) are highly dedicated and engaged. At the regional level, some rural districts have very functional TRACs. Additionally, the Indiana Trauma Network is a strong pillar within the Indiana Trauma System. However, current representation on the ISTCC is not inclusive of all key stakeholder groups. There is minimal representation from non-trauma centers, rehabilitation facilities, and military within the state. Additionally, there is no defined and integrated relationship between ISTCC, the TRACs, and the EMS commission. There are budgetary constraints at smaller hospitals which prevents participation in these groups.

There is little activity in the way of coalition building in Indiana. Coalition building is important for building support and buy-in for all essential trauma system elements. Key constituents include

health professionals, trauma center administrators, prehospital care professionals, health insurers and payers, data experts, patients, patient advocates, policy makers, public safety, local industry and business, and media representatives. These groups can help advocate for trauma system needs and serve as partners in an ongoing effort to improve care.

Recommendations

- 3.1. **Conduct a full stakeholder analysis. Utilize this information to restructure the ISTCC to ensure there are ISTCC member seats for all ten districts to include representation such as:**
 - **Level I-III trauma centers, including clinical and administrative**
 - **EMS**
 - **Rehabilitation**
 - **Non-designated facilities**
 - **Military**
 - **Special populations (e.g., pediatrics, geriatrics, rural)**
- 3.2. Establish operational guidelines for each group representative.
- 3.3. Formally define the relationship between the ISTCC, IDOH, and the EMS commission.
- 3.4. Codify the purpose and structure of the TRACs, with defined connection to the ISTCC and lead agency.

Essential Trauma System Element #4: Trauma System Plan

An integrated trauma system plan should be created and implemented. This plan should be reviewed annually and updated every three years at a minimum, under the direction of the lead agency and the multidisciplinary advisory group.

Purpose and Rationale

Each trauma system, as defined in statute, should have a clearly articulated process to develop a trauma system plan. This strategic plan is used to guide trauma system development and functionality and should address all essential trauma system elements. It describes the system design with adopted standards of care for prehospital and hospital personnel. The plan should be built on an inventory of trauma system resources, identifying gaps in services or resources and the location of assets. A needs assessment should be developed to support the trauma system plan and updated periodically to assess population and system changes over time. The plan should consider trauma system resources, population demographics, and barriers to care access (e.g., rural, geography, resources). It is critical that the plan also identify specific populations (e.g., pediatric, geriatric, burn) within the trauma system how the needs of each of these populations are addressed.

The plan should be developed by the lead agency with support from the multidisciplinary advisory group and any associated regional advisory committees. Based upon the system needs assessment, goals and objectives for each trauma system component should be developed with specific timelines for achievement. System stakeholders should regularly report to the lead agency to address barriers inhibiting system success and assure system and plan development. The plan should include references to regulatory standards, documents supporting trauma system development, and methods for data collection and analysis. The trauma system plan should include interfaces between the operational plans of supporting agencies and services, including EMS, injury prevention, public health, and emergency preparedness. The trauma system plan should be reviewed annually and updated periodically under the direction of the lead agency and the multidisciplinary advisory group.

Current Status

There is currently no trauma system plan for the Indiana State Trauma System. As such, there is no universal or formal plan that identifies roles and responsibilities of trauma centers, non-designated acute care facilities treating trauma, and facilities that provide care to special populations. A trauma system plan is essential to engage the full spectrum of stakeholders, from EMS to rehabilitation, and to clarify roles within the trauma system.

The Indiana Department of Health has created a two-year internal strategic plan. However, the plan development and the inclusion of input from stakeholders is unclear to the current staff. The strategic plan is not specific to the trauma system or trauma system development, but rather addresses the entire division's goals. Furthermore, an internal strategic plan is distinct from a trauma system plan, which addresses all Essential Trauma System Elements.

The ISTCC, along with several engaged trauma centers, has informed current trauma system efforts. An ISTCC ad hoc committee was convened prior to the COVID-19 pandemic to discuss development of a trauma system plan. Meeting attendance was a challenge, and the committee felt that they did not have adequate resources to move forward. Much of the group's focus at the time was on securing a follow-up ACS consultation. The ad hoc committee was not officially

approved. It is important to note that creation of a trauma system plan was one of the priority recommendations made in the 2008 ACS consultation report.

New leadership within the lead agency, IDOH, and ISTCC have demonstrated a commitment to improving the system. There are also committed stakeholders and a strong partnership with the Department of Homeland Security's EMS division. The participation of all the beforementioned is an essential component for success of the system as a whole.

Trauma Regional Advisory Committees (TRACs) have been created in an informal manner throughout the state. One of the advantages of the current TRACs is the ability to coordinate regional performance improvement activities. While they are functional in some areas of the state, they are highly fragmented with no clear reporting structure or formal integration of these committees with statewide or other organizations. Level III centers, non-trauma centers, and rehabilitation programs are not sufficiently represented in the TRACs or the state trauma system as a whole. There is no guidance on how challenges and barriers identified by TRACs are formally and effectively communicated with the ISTCC and IDOH trauma program staff.

Lack of sufficient legislation to establish a clearly identified trauma system plan contributes to the current status of trauma care and challenge to implement definitive plans for trauma care in Indiana.

Recommendations

- 4.1. ***Develop a comprehensive state trauma system plan, led by IDOH in conjunction with stakeholders, that addresses all Essential Trauma System Elements (ETSEs). The state trauma system plan should be distinctly different from the IDOH internal strategic plan. (This was also a recommendation from the 2008 Indiana State Trauma System review.)***
- 4.2. Consider the development of regional trauma system plans associated with TRACs to support and integrate with state plan.
- 4.3. Develop a formalized feedback mechanism in which challenges and barriers can be addressed locally, regionally, and state-wide.

Essential Trauma System Element #5 Continuum of Care

The trauma system should address the full continuum of injury from prevention and pre-hospital/interfacility emergency medical services, to acute hospital care (referring and accepting facility) through rehabilitation. The system should address all injured patients with special attention to pediatric, geriatric, and other vulnerable populations.

5.1 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 should take a central role in fostering collaboration and cooperation between stakeholders at the state, regional, and local level for injury control. In addition, the lead agency and providers throughout the system should work with public health authorities, business organizations, social services providers, community-based organizations, and the public to support, enact, and evaluate prevention programs. Prevention strategies should be evidence-informed and based on system epidemiologic data.

Prevention efforts may represent primary, secondary or tertiary prevention. Primary prevention efforts should be deployed across an entire population in order to decrease the overall risk of injury (e.g., civil engineering, window guards, smoke detectors). Secondary prevention efforts focus on a known population that is at risk and should be aimed at mitigating the effects of the traumatic incident (e.g., car seats, seat belts, helmets). Finally, tertiary prevention activities aim to lessen the impact of trauma on the individual and community (e.g., support for EMS and trauma systems, access to care, rehabilitation).

Efforts at prevention must be directed toward the intended audience at risk, well defined, and structured, with evaluation of their impact. Further, injury prevention efforts should be informed by and relevant to the local community. The implementation of injury control and prevention requires the same priority as other aspects of the trauma system, including adequate staffing, funding, and partnerships with community organizations. Many systems focus primarily on providing information and education directly to the general public (e.g., restraint use, not driving while intoxicated). A program that can be utilized is the STOP THE BLEED® (STB) program. STB provides a tool to partner with trauma systems and the community by empowering, informing, and educating the public to respond to a bleeding emergency. Education efforts should also be directed toward all continuum components, such as emergency medical services (EMS), acute hospital and rehabilitation personnel safety (e.g., securing the scene, infection control). Collaboration with public agencies, such as local departments of health, is essential to successful prevention program implementation. These partnerships can synergize and increase the efficiency of individual efforts. The formation of an injury control network with alliances across multiple healthcare, professional, and community organizations is beneficial. The prevention needs of children, elderly, and other vulnerable populations should be specifically addressed.

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

- Engagement of the lead agency and key stakeholders in the development of the community health needs assessments and the community health improvement plans.
- Integration with public health injury control programs for injury surveillance, coordination of resources, and implementation of prevention programs.

- Preparation of annual reports by the lead agency, along with partner organizations, on the status of injury prevention and trauma care in the system.

Current Status

The inclusion of injury prevention and trauma within the same Division at the state level increases functionality and integration of efforts. Within the Division of Trauma and Injury Prevention (DTIP), there are dedicated staff for injury prevention, data analysis, plan development, and implementation, including three full time employees: a Trauma and Injury Prevention Program Director, an Injury Prevention Program Coordinator, and an Injury Prevention Epidemiologist. The injury prevention epidemiologist collects and analyzes data, and the injury prevention program coordinator utilizes the data to drive program implementation and evaluation. The coordinator attends and participates in regional and national events such as conferences and committees to stay current of injury and trauma-related news, intervention strategies, and best practices. Health fairs, injury prevention advocacy, and professional outreach to engage the community are led by this team.

State-led injury prevention efforts focus on child passenger safety, elderly fall prevention, and Stop the Bleed. The Stop the Bleed efforts in Indiana schools has been commendable. The execution of Rural Trauma Team Development Courses (RTTDC) throughout the State promotes standardization and system inclusivity. In addition, the trauma centers lead robust injury preventions efforts at the local and regional level.

DTIP engages with many organizations to address injury prevention including Safe Kids Worldwide, the Automotive Safety Program, the Indiana Criminal Justice Institute, Kidz in Motion, the Midwest Injury Prevention Alliance (MIPA), and the Safe States Alliance. Collaborations with these organizations include activities such as the Booster Bash Program, the Child Passenger Safety Technician (CPST) Scholarship Program, Car Seat Clinics, Permanent Car Seat Safety Stations, and Stepping On Falls Prevention Program. The lead agency primarily funds child passenger safety/motor vehicle crashes and older adult falls programming. These programs are funded in partnership with the Maternal and Child Health Title V Block Grant and the Preventive Health and Health Services (PHHS) Block Grant.

Although coordination of some injury prevention efforts at the state level are taking place, there is fragmentation of efforts across the state. There is a lack of analysis and prioritization of injury prevention activities statewide. The bulk of injury prevention efforts are hospital-based and not implemented or disseminated statewide. There are various additional district and local level activities conducted by trauma centers that the lead agency doesn't capture. There is limited community outreach and engagement as well as a lack of public education surrounding prevention efforts and the value of the trauma system in general.

Recommendations

- 5.1.1. Utilize data to guide injury prevention efforts/initiatives and evaluate their effectiveness.

- 5.1.2. Track and report injury prevention (IP) efforts across the state through the Division of Trauma and Injury Prevention (DTIP).
- 5.1.3. Develop a community engagement and public outreach plan to educate the people of Indiana regarding injury prevention initiatives and efforts in addition to Stop the Bleed, child passenger safety, and fall prevention.

5.2 Emergency Medical Services

Purpose and Rationale

Emergency Medical Services (EMS) is a critical component in the trauma system and is often the vital link between the injury event and definitive care. Thus, strong relationships between leadership within EMS, trauma centers, and lead agency trauma programs are necessary for optimal management of injured patients to reduce mortality and to produce best outcomes. EMS is a complex system that not only transports patients, but includes public access, communications, patient care by trained personnel, patient triage, data collection, and quality improvement activities.

There must be an EMS system medical director who has statutory authority to develop operational protocols, oversee clinical practice, and establish ongoing quality assessment to ensure optimal provision of prehospital care. The EMS system medical director should work closely with the regional trauma system leadership to ensure that care protocols and treatment goals are mutually aligned. The EMS system medical director should also have ongoing interaction with adult and pediatric stakeholders, including local EMS agency medical directors and the EMS for Children (EMSC) program. This will ensure that there is understanding of and compliance with trauma triage and destination protocols for trauma patients of all ages.

The lead agency should ensure that EMS is sufficiently resourced to meet the needs of the community served. To achieve this end, a resource and needs assessment and periodic reassessment evaluating the availability and geographic distribution of EMS personnel and physical resources are important. This ensures rapid and appropriate scene response, as well as availability of timely and appropriate interfacility transport services. This assessment should outline a detailed description of the distribution of ground ambulance and aeromedical locations across the region. EMS system assets should be positioned according to predictable geographic or temporal demands to optimize response efficiencies. Such positioning schemes require integrated prehospital data collection systems that track the location of occurrence and timeliness of responses over time. Interfacility transport services should be available in a timely fashion and staffed with EMS professionals who are appropriately trained (ideally in critical care), ensuring optimal patient care between facilities. Pre-identified transfer algorithms should be in place and readily accessible to transferring facilities to expedite patient transfer to higher levels of trauma care. Periodic assessment of dispatch and transport times provides insight into whether resources are consistent with population needs.

Each region should have objective criteria dictating the level of response (advanced life support [ALS] or basic life support [BLS]), mode of transport, and disposition of the patient based on mandatory system-wide prehospital triage criteria. The National Guideline for the Field Triage of Injured Patients, Appendix A, should be used as the framework for regional triage decisions. This ensures that trauma patients are transported to the most accessible and appropriate facility based on their injuries. These triage criteria should identify major trauma patients, including special populations such as pediatrics and geriatrics. A mechanism should be in place that allows for case-based QI review of trauma patients by prehospital and hospital providers. This allows bidirectional communication and continuing education. Ongoing review of triage and treatment decisions promotes continuing quality improvement of the triage process and prehospital care protocols. A more detailed discussion of prehospital (primary) triage criteria is provided in the System Triage and Patient Flow section.

Human Resources

Periodic EMS workforce assessments should be conducted to ensure adequate numbers and distribution of personnel. Addressing recruitment, retention, and engagement of qualified personnel should be a

system priority. EMS system leaders must ensure that prehospital care professionals at all levels maintain competence in trauma care. This is best accomplished by requiring standards for credentialing and certification and specifying continuing educational requirements for all prehospital personnel involved in trauma care. The core curriculum for prehospital personnel (Emergency Medical Responder (EMR), Emergency Medical Technician (EMT), Advanced EMT (AEMT), paramedic, and all other levels of prehospital personnel) has 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 in collaboration with trauma system leadership (e.g. Prehospital Trauma Life Support®, International Trauma Life Support®, age-specific courses). Mechanisms for the periodic assessment of competence, educational needs, and trauma education availability within the system should be incorporated into the trauma system plan. Trauma patients are best served when EMS agencies (ground and air) and their training programs meet national standards and achieve national accreditation.

In some states, up to half of all EMS agencies are staffed by volunteers, typically in rural areas. These volunteer professionals are essential to the provision of immediate care and efficient transportation and may continue to augment care in the hospital setting. The trauma system should support these volunteer agencies in performing their vital role in the care of trauma patients. Such aid may be in the form of assistance with quality improvement activities, training, and clinical opportunities.

Due to the multidisciplinary nature of trauma care, educational conferences that include all levels of clinical professionals (e.g. prehospital personnel, nurses, and physicians) need to occur regularly. Communication with and respect for prehospital professionals is important, particularly 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 within the trauma system, as well as in connection with public health and other public safety agencies. EMS agencies have a critical role in ensuring that communication systems are available and have sufficient redundancy so that trauma system stakeholders will be able to access the EMS/trauma system and dispatch appropriate medical resources. This should be functional both at the single patient level and in response to mass casualty incidents (MCIs). Enhanced 9-1-1 services and a central EMS/trauma communication system ensure field-to-facility bidirectional communication, interfacility transfer dialogue, and an all-hazards approach among system participants. EMS should utilize all technological advances available to provide care to trauma patients, such as ultrasound, telemedicine, and wireless communications capabilities. Innovations such as automatic crash notification systems hold great promise for quickly identifying trauma-producing events, thereby reducing delays in discovery and decreasing prehospital response intervals. EMS data define geographic and demographic characteristics of injuries and thus should assist trauma systems with the identification of injury prevention program needs. EMS serves a critical role in the development and implementation of all-hazards response plans. This integration should be included in the state and regional trauma plan and overseen by the lead agency. EMS leadership should participate in all aspects of trauma system design, evaluation, and operation, including policy development, public education, and strategic planning.

Current Status

The emergency medical services system is well established within the State of Indiana. The lead EMS agency has been located in the Section of EMS, within the state's Department of Homeland Security for many years. Although in a state executive branch separate from the

Indiana Department of Public Health's trauma program, both agencies have well established working relationships as it relates to trauma activities. The 2008 ACS COT Trauma System Consultation included a recommendation to combine both agencies into a DOH Office of Emergency Care. This has been discussed by state stakeholders, with the decision to maintain the administrative structure as currently exists. As noted, both agencies have established very supportive and collaborative engagements to address the needs of a trauma system. This successful engagement appears to be based on the current good will of the leaders involved in these agencies. For purposes of clinical care issues and an effective trauma system, the lead EMS office would benefit greatly by being under the administrative and oversight structure of the health department, or alternatively as an independent division with secure funding in the IDHS, rather than in a state fire office division. This fully acknowledges that the fire service in Indiana provides a critical role as a component of local clinical EMS response capabilities.

The roles and responsibilities of the Section of EMS are outlined in Title 836 of the Indiana EMS Commission. State EMS staff is supported by five field EMS District Managers. The Section is funded by Homeland Security funds. Staffing levels support the baseline activities of the Section, but do not allow sufficient staff for currently needed additional or expanded activities as the trauma system evolves.

EMS is codified as an essential service in the state, but there is no specified requirement for any specific governmental jurisdiction or other entity to provide that service. This leads to confusion and inconsistency of EMS service provision throughout the state. A statewide EMS assessment was conducted by the National Highway Traffic Safety Administration (NHTSA) Office of EMS in 2015 resulting in a number of recommendations specific to EMS and trauma services that are still applicable.

No internal state assessment has been done to quantify the necessary number and provider level of EMS services, and number of EMS clinicians appropriate to provide continuous coverage in the diverse areas of the state. The Section has described a decrease in the number of EMS transporting units (by 233 ambulances) and numbers of EMS clinicians (by 1075) from 2018 to 2021, a workforce situation which is not unique to Indiana. In addition to affecting local emergency response capabilities, this has also affected the EMS system's ability to provide mutual aid coverage and needed resources for interfacility transports. Workforce issues are a challenge to sustaining the Indiana EMS system which includes a large number of volunteers. Initial discussions have been held with Ivy Tech to investigate options for additional EMS education programs on its multiple campuses throughout the state. Based on issues identified with an updated workforce needs assessment, these discussions and planning should continue and will likely expand.

Funding for EMS services continues to be a challenge universally. The long-outdated model of reimbursement for transportation does not address current needs, and it will certainly not accommodate future requirements of the EMS and trauma systems. Additional funding sources for EMS sustainability must be identified. A more formalized statewide EMS assessment would serve the entire EMS and trauma community to better quantitate the current gaps and inform future planning of service needs and distribution of services for both the EMS system in general and the trauma system specifically.

Since the last consultation, the position of State EMS Medical Director has been established as a part-time FTE within IDHS. Since the state does not have a State Trauma Medical Director, the State EMS Medical Director is informally assisting the IDOH with those responsibilities. The State EMS Medical Director participates with both the EMS Commission and the Indiana State

Trauma Care Committee, as well as with a number of IDOH trauma related initiatives. Each EMS agency (transporting and non-transporting) in the state is required to have an EMS Medical Director who is responsible for clinical care activities of that agency, as defined in rule 836 IAC 1-2-11, and provides oversight of EMS clinicians. EMS clinical protocols, education, and quality improvement activities are generally established at the local level as the responsibility of the local EMS Medical Director. The state has no direct oversight of those activities but does require review of those aspects of clinical care when agencies reapply for licensure. The State sponsors an annual EMS Medical Director conference which brings the local medical directors together. In addition, the Indiana Chapter of the National Association of EMS Physicians (NAEMSP) and the Indiana American College of Emergency Physicians (ACEP) EMS Committee serve as forums for EMS medical directors to engage with each other for education and information sharing. Local EMS medical directors participate to varying degrees in district EMS and trauma (TRAC) activities.

Clinical care provided in the field is documented electronically with data shared to the state EMS data repository and to the trauma registry. There are some data exchange challenges due to the multiple electronic platforms used throughout the state. There is limited use of the EMS clinical data at the state level for local, district, or statewide assessment and evaluation.

The EMS Section is responsible for oversight of the state licensing and credentialing activities of EMS agencies and clinicians in the state. Those services are provided at no cost to agencies or personnel. Consideration for implementing a licensing fee for EMS personnel and agencies is recommended. These fees will assist in providing additional funding to sustain the EMS office. Scope of practice is defined at the state level for EMS clinicians, based on the National Model EMS Clinical Guidelines. There is regular review by the state evaluating the need for additions or modifications to that scope of practice. Field Trauma Triage Guidelines had been implemented in the state based on the 2011 CDC Field Trauma Triage document; the state has recently issues a “non-rule” policy encouraging EMS agencies to adopt the 2021 updated Field Trauma Triage Guidelines.

The Section provides oversight of EMS education and is responsible for establishing the initial and continuing education requirements for the four levels of EMS clinicians in the state – emergency medical responder (EMR), emergency medical technician (EMT), advanced emergency medical technician (AEMT), and paramedic. Initial education by Section approved education programs is based on the NHTSA National EMS Educational Standards. Those standards require specific trauma related topics; continuing education requirements include trauma related requirements for AEMT and paramedic level clinicians only. Additional trauma continuing education in Indiana is available through the International Trauma Life Support and Pre-Hospital Trauma Life Support programs. There is lack of clarity at the state level regarding local overall quality assurance and improvement activities relating to clinical care provided throughout the state.

The Indiana University School of Medicine contracts directly with the federal EMS for Children program to implement pediatric specific training, education, equipment, and guidelines for Indiana hospitals, trauma centers, and EMS agencies. It has facilitated the identification of Pediatric Emergency Care Coordinators for hospitals and EMS agencies throughout the state.

There are 14 air medical programs providing over 30 aircraft to support clinical care throughout the state, established under 835 IAC Article 3. The level of interactions between the air medical programs and the state trauma activities regarding utilization and data sharing is unclear. An

assessment of appropriateness of air medical transports would provide valuable information for trauma system leaders.

Although EMS protocols allow for robust patient care provision under standing orders, each EMS agency has communications capabilities to contact receiving hospitals via IHERN radio or telephone for on-line consultation. Other than the IHERN system, there is no coordinated statewide EMS or hospital communications capability.

The Indiana 9-1-1 Board is responsible for the state's 9-1-1 program. That board interacts closely with both the Department of Homeland Security and the Department of Health on trauma related issues. Emergency Medical Dispatching capabilities occur throughout the state by trained emergency medical telecommunicators at either the Public Safety Answering Point (PSAP) or EMS agency level.

The Indiana General Assembly enacted HEA 1314 and SEA 247 in 2022 requiring the Indiana Departments of Health and Homeland Security, the Integrated Public Safety Commission, and the Statewide 9-1-1 Board to make recommendations to the General Assembly on both the interoperability of the state's 9-1-1 system and issues relating to regionalized trauma care systems. This report was released in October 2022. Issues and options were outlined in the report with resulting recommendations. Much of the Information identified in this report is very consistent with observations and recommendations of this trauma systems consultation and should be reviewed and strongly considered as the state moves forward with trauma systems evolution.

Recommendations

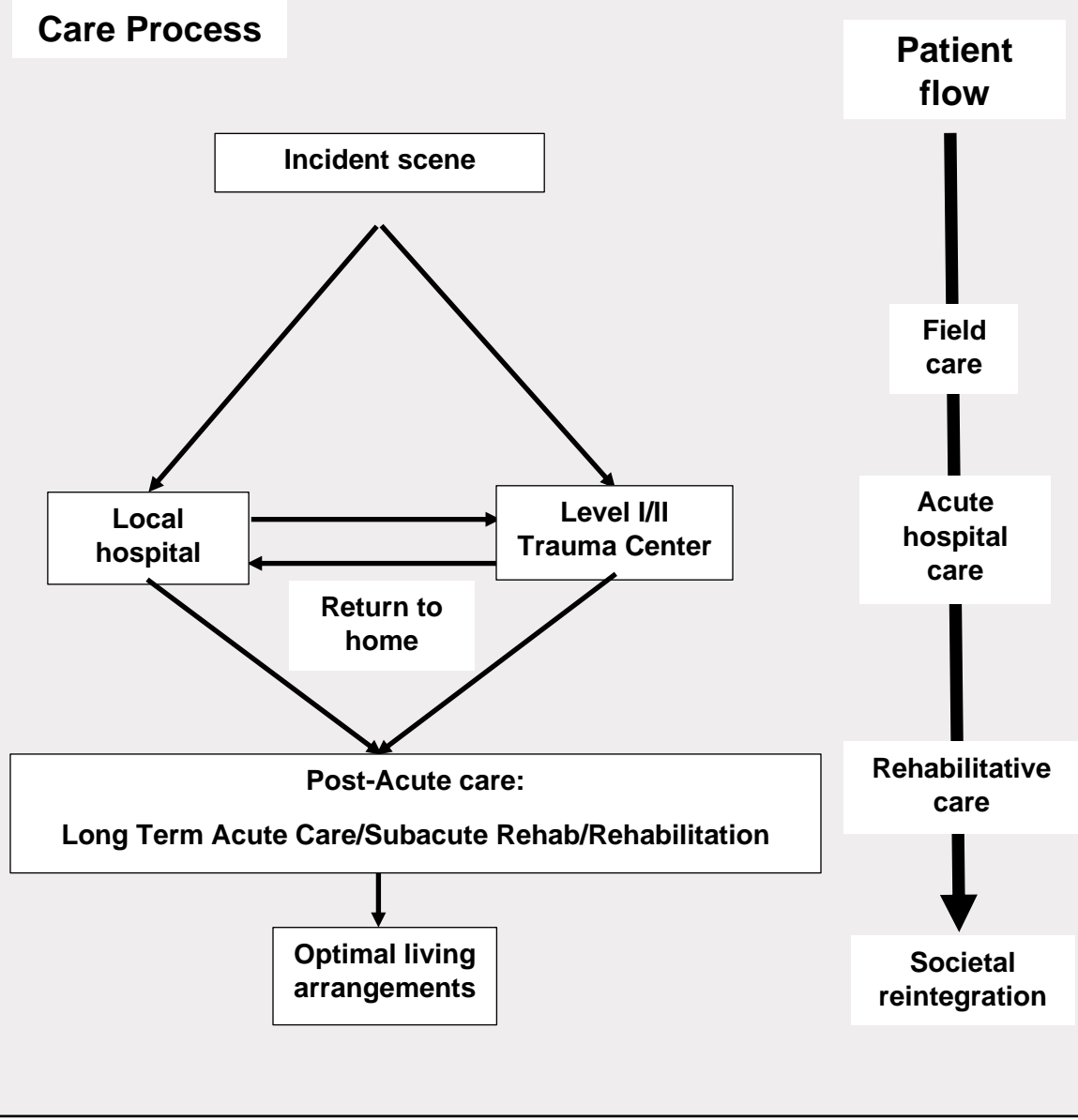
- 5.2.1. Complete a statewide EMS assessment to identify the agency and workforce needs for all areas of the state.**
 - **Continue to work with Ivy Tech or some other learning institution to identify mechanisms for addressing the educational needs identified in that assessment.**
- 5.2.2. Clarify the entity responsible for insuring EMS as an essential service in the state.**
- 5.2.3. Establish a position within lead agency for a State Trauma Medical Director to support the trauma program.
- 5.2.4. Evaluate on an ongoing basis the most appropriate Executive Branch administrative structure for the section of EMS for insuring appropriate integration of EMS, trauma care, and public health capabilities.
- 5.2.5. Identify additional, sustainable funding sources for the Section of EMS operations and the provision of clinical care at the local level.
- 5.2.6. Expand the sharing of EMS data at the district and state levels for more complete evaluation of the overall system in the state.
- 5.2.7. Review and incorporate the findings in the IDHS 9-1-1 Interoperability & Regionalized Trauma System Recommendations report released in October 2022.

5.3 System Triage and Patient Flow

Purpose and Rationale

One of the fundamental aims of a trauma system is seamless and timely patient care that is needs-based and appropriately transitions injured patients through the entire continuum of care including prehospital, acute care, rehabilitation, and return home. Although on the surface this objective seems relatively straightforward, individual patient characteristics, geography, and transportation systems often present significant challenges. The most critically injured trauma patient is often easy to identify at the scene (e.g., 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 professionals. Primary or field triage criteria aid professionals in identifying patients at greatest risk for adverse outcomes and who might benefit from the resources of a designated trauma center. Even if the need is identified, regional geography or limited transport services might not allow for direct transport to the most appropriate facility.

This diagram shows the care process and patient movement through the trauma system.



Primary triage of a patient from the field to a center capable of providing definitive care is an initial goal of the trauma system. However, there are circumstances (e.g., 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 (e.g., pediatric trauma, burns, severe traumatic brain injury, spinal cord injury, ocular trauma, and extremity reimplantation). Finally, temporary resource limitations might necessitate the transfer of patients between acute care facilities. Prehospital trauma triage protocols should be consistent with national guidelines.

Secondary triage at the initial receiving facility has several advantages, especially 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 focus on the transfer of the most severely injured patients to Level I or II facilities, thus preserving limited resources 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 expedite the transfer process and minimize the potential for delays in care. Delays in transfer may increase mortality, complications, and length of stay. A system with excessive trauma transfers might stress the resources of the regional trauma facility and transport agencies, particularly in smaller communities. Conversely, inappropriate retention of patients at centers without adequate facilities or expertise to appropriately take care of the patient might increase the risk of adverse outcomes. Given the importance of appropriate interfacility transfers, timeliness of the decision to transfer, the time to transfer, and the rates of over and under triage should be evaluated regularly. Bidirectional corrective actions should be instituted when events 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. It is critically important that injury related data be collected from all acute care facilities where injured patients are evaluated and not only from designated trauma centers.

A central communication coordinating base (e.g., transfer center) with real-time access to information on system resources greatly facilitates the transfer process. This communication base should identify a receiving center, facilitate dialogue between the transferring and receiving facilities, and coordinate interfacility transport.

Once acute needs have been met, patients often benefit from rehabilitation to maximize function and limit disability. Some patients, such as those with limb loss, loss of sight, paralysis, or significant head injury, benefit from specialized rehabilitation. Ideally, patients requiring rehabilitation should be identified early in their acute hospital phase so arrangements for an appropriate facility and transfer planning can occur before the patient is ready for discharge from an acute care hospital.

In order to optimize trauma system efficiency, efforts should be made to return patients back to their local community once the acute phase of trauma care is complete. Returning patients opens the limited resources available to care for the acute severely injured patients at Level I and II trauma centers. In addition, it brings patients back into their social networks for reintegration into their communities.

Current Status

System triage and transport of trauma patients occurs throughout the state, primarily at local and district levels with some transport of specialty patients outside the district as believed appropriate. The State had adopted field trauma triage guidelines based on the CDC Field Trauma Triage Guidelines (2011) and recently issued a “non-rule” policy encouraging the use of the updated 2021 Field Trauma Triage Guidelines throughout the state to provide guidance for patient destination decisions. The State has also adopted an interfacility transfer policy as guidance for transfer to higher echelons of trauma care and specialty care facilities. Although geographically distributed around the state, the currently verified trauma centers are not equitably distributed, mostly grouped in the larger population centers. Air medical resources are available for interfacility and critical care patient transport / transfer. EMS agencies are also utilized for interfacility transfer but lack the capability of transporting patients requiring critical care. With the currently existing workforce shortages, EMS agencies are experiencing increasing stress and, in greater numbers, are unable to provide both mutual aid response to 9-1-1 requests from surrounding agencies and resources for interfacility transports, particularly involving long distances and extended time commitments.

In 2021, less than one half of critical trauma patients who arrived at non-trauma center hospitals were transferred to a trauma center within the goal time of two hours of initial arrival at hospital. Non-trauma hospitals, primarily in rural areas, experienced 91% of those delays. With the greater stress currently felt by rural areas (limited transport resources), consideration might be given to developing a centrally coordinated interfacility transport service throughout the state (as was done during the pandemic) to facilitate those transfers. As critical care paramedic capabilities don't exist in Indiana, the possibility of creating that level of care for ground interfacility transport program may also help relieve some of the stress.

The data and information challenges described elsewhere in this report also pose challenges in assessing the effectiveness or needs regarding patient flow throughout the regions and state. The ability to accurately assess the under and over triage of trauma patients both at the district and state levels is critical to effectively evaluate patient flow patterns. There is also currently no way to assess system capacity in a timely manner for the purpose of addressing time-dependent patient conditions, potentially contributing to delays in trauma patient transfer and clinical care. Additionally, use of data for other performance improvement activities is minimal but does occur at limited level at the district levels. That information is shared with others on a limited basis and is not generally shared with the state.

There is no centralized communications mechanism to facilitate patient destination decisions or patient transfer destination. With the current process, it is incumbent on each sending facility to identify an appropriate receiving facility, which is often a time-consuming effort. EMResource is used by the IDOH to provide near-real time information about hospital resources and capabilities. In addition to use of this resource in times of disaster or overwhelming stress, routine use of this resource by both EMS agencies and hospitals may facilitate destination decision-making. The federal Department of Health and Human Services (DHHS) further refined the concept of a Medical Operations Coordination Center (MOCC) during the COVID-19 pandemic response to facilitate coordinated transfer of patients. Using this concept, it may be possible to use currently existing EMS communications resources to fill this role without a significant increase in overall workload of those resources. Additionally, the utility of teleconsultation during the pandemic proved beneficial. Consideration of establishing teleconsultation services between initial receiving facilities and trauma center consultants may facilitate both care at the initial hospital and decrease needs for some interfacility transfers, allowing patients to be cared for at the initial hospital. This is consistent with the inclusive trauma system construct.

Recommendations

- 5.3.1. *Create, approve, and implement a performance improvement process to monitor over and under-triage in the state.
(This was also a recommendation from the 2008 Indiana State Trauma System review.)*
- 5.3.2. *Develop performance indicators and ongoing performance improvement surveillance processes to monitor adherence to or issues related to prehospital trauma triage guidelines and inter-facility transfer criteria.
(This was also a recommendation from the 2008 Indiana State Trauma System review.)*
- 5.3.3. Develop a mechanism to share data in a timely manner at both the district and state levels to allow for appropriate patient destination decision making.
- 5.3.4. Investigate the use of EMResource as a tool to facilitate initial field triage destination decision making and interfacility referral decision making.

5.4 Definitive Care Facilities

Purpose and Rationale

The goal of the inclusive trauma system is one where patient needs are matched to available resources and capabilities. Inclusive trauma systems include all health care facilities, where each hospital contributes to the best of its ability to meet patient needs. Thus, as the core of a regional trauma system, acute care facilities operating within an inclusive trauma system may provide definitive care to the entire spectrum of patients with traumatic injuries or deliver initial stabilizing care before transferring to a facility better matched for higher patient acuity. Acute care facilities should be well integrated into the continuum of care, including prevention and rehabilitation, and operate as part of a network of trauma-receiving hospitals. All acute care facilities, both designated and non-designated, 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 readiness through mutual operational agreements to address interfacility transfer, educational support, and outreach. The roles of all definitive care facilities, including non-designated hospitals, designated trauma centers, and specialty hospitals (e.g., pediatric and burn) should be clearly outlined in the state or 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 trauma system. The system should have a funding source for expected leadership activities by facilities providing trauma care.

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 facilities within their community, whereas the most severe injuries 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 major injuries and have a system in place for the most efficient and 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 to review and verify 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 verified/designated centers do not meet set standards, there should be a process for remediation. This should include corrective action plans, probation, and ultimately accountability through suspension, 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 in the regional trauma system. There should be a well-defined regulatory relationship between the lead agency, designated trauma facilities, and non-designated acute care 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 acute care facility.

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 clinical professionals 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. 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 should 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 by sponsoring multidisciplinary annual educational events. These activities foster teamwork and cooperation in a functional, 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 supported by the state and/or regional trauma plan and facilitated 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, strategic planning, and education of legislators and the public. In addition, the trauma program and subspecialty leaders should provide direction and oversight for the development, implementation, and monitoring of integrated care protocols used throughout the system. The highest-level trauma facilities should provide leadership of the regional trauma committees through their trauma program medical leadership. These medical leaders can assist the lead agency and help ensure that opportunities to improve the quality of care within the system are recognized and corrected. Educational outreach by these higher-level centers should be used as appropriate to help achieve this goal.

Current Status

Indiana has a population of almost 7 million served by 130 acute care hospitals, 22 of which are ACS-verified trauma centers. The State does not independently designate acute care facilities, with the exception of providing provisional status to hospitals that are in-process for ACS verification, although it does have the statutory authority currently to do so. There is a 2-year time limit for hospitals to complete the ACS verification process when they receive provisional status. The current number of ACS-verified acute care facilities has substantially increased since 2008 when there were only seven centers. The change in verification numbers was prompted by the Trauma Triage and Transport rule, which came into effect in 2011. After this rule, hospitals that were already caring for trauma patients were motivated to obtain ACS verification for fear of losing patients. Of the current ACS-verified trauma centers in the state, there are 4 Level I, 5 Level II, 13 Level III, one provisional pediatric Level I, and one provisional Level III. These centers are distributed across ten districts but mostly grouped in the larger population centers. All four Level I trauma centers are in Indianapolis, whereas the Level II trauma centers are distributed across the next three largest of Indiana's population centers.

Indiana State has made strides since the 2008 Indiana State Trauma System Consultation. The first notable area of development is the increased number of ACS-verified trauma centers. The second is establishing a statewide trauma registry that includes both designated and non-designated acute care facilities. There is also strength that arises in the passion of the ISTCC committee driving continual dialogue around improvement, and the fact that the Department of

Health is actively engaged with improving the system. However, opportunities exist with regard to the maturation of definitive care capabilities to fulfill the vision of a true inclusive trauma system.

One challenge within the system is that participation is voluntary and ad hoc. There is poor engagement from non-designated acute care facilities and many Level III centers. There are no guidelines that ensure that designated centers demonstrate leadership through establishing guidelines and policies for other hospitals. These activities are broad in scope and include education, outreach, participation in TRACs and ISTCC, and up-to-date guideline dissemination. Such activities would likely engage non-designated and Level III centers.

Another issue is that resource-sharing between hospital systems is limited. Often, resources within hospital systems might not be shared with other hospital systems. There is little interest for these systems to collaborate between systems on trauma-related priorities such as performance improvement. Given that over 60% of the statewide hospitals participate in a hospital system, this creates barriers to establishing a true inclusive trauma system.

Trauma center levels currently range from Level I to III centers. The State is just starting to explore Level IV designation. This would be an advantage to the system in several ways. For one, it would facilitate deeper engagement by acute care facilities that care for injured patients. Furthermore, in combination with a trauma system plan, it would ensure injured patients receive appropriate care and transport.

Currently, the Indiana Trauma System functions as a non-integrated patchwork of individual hospitals and regions not governed by process or policy and not coordinated from local to regional to state levels. There are several reasons for the fragmentation. The most important is that there are few mechanisms in place to incentivize participation or to dis-incentivize poor performance. There should be a well-defined regulatory relationship between the lead agency, designated trauma facilities, and non-designated acute care facilities in the form of a contract, guidelines, or memorandum of understanding that guides patient triage and transfer. Currently, such a relationship does not exist. There are also few regulatory mechanisms in place to ensure accountability as it relates to trauma care performance. Expected leadership activities at trauma centers are not funded. There is one disincentive that does exist, which pertains to the withholding of funds for hospitals that do not submit data to the registry. However, this threat has little weight because there are few funds to withhold.

There are other barriers for definitive centers to collaboratively work together towards the care of injured patients. For one, there is currently no capability of the regions or state to easily monitor the capacity status of the hospitals. There are concerns that many hospitals are at or above capacity, but it is unclear to what degree this is true. This also limits the ability to understand in real-time, or near real-time, how to optimize triage during day-to-day operations or times of mass population events. Developing this capability would help to understand how to maximize capacity and reduce the dependency on non-enforceable agreements, such as Indiana's decision to encourage hospitals to not go on divert. The vendor used by Indiana's EMS systems is EMResource. This platform does support the ability of hospitals to upload capacity data to be made available to all providers in the trauma system and could be leveraged by the Indiana Trauma System more fully.

With regard to trauma center designation, the state does have statutory authority to designate but does not do so. Instead, ACS verification is used as a surrogate. This meets patient requirements for good care, however, it also deprives the state of an ability to assert more

influence over the system. In combination with other financial and regulatory mechanisms, the state could use the designation and de-designation process to ensure that acute care facilities meet defined metrics for adequate participation in the trauma system. Reviews and audits should be conducted regularly and can be done through either internal or external processes.

Each designated acute care facility should participate in all aspects of trauma system design, evaluation, and operation including policy and legislative development, strategic planning, the use of protocols, and education of legislators and the public. The highest-level trauma facilities should provide leadership of the regional trauma committees through their trauma program medical leadership. While there is passion for trauma care from several trauma centers and districts, this degree of leadership is not evident systemwide. The TRACs demonstrate varying levels of effectiveness, which are impacted by varying degrees of designated facility engagement.

The magnitude of all these limitations has been exacerbated by the recent COVID-19 pandemic. Since that time, there is a sense that hospital capacity is lower due largely to staffing issues, and there are similar challenges in the prehospital space. Staffing has been noted as an issue across the system, but action has been relatively limited in addressing this. A trauma system must take active efforts to maintain a capable workforce. For example, it must conduct periodic workforce assessments, and the system should work to address any gaps identified. Similarly, there should be mechanisms for ensuring maintenance of competency, as well as for ensuring educational needs are met. These mechanisms are not in place in Indiana.

Taken together, there are opportunities for improvement across the state to ensure that Indiana's acute care facilities can serve the goals of an inclusive trauma system.

Recommendations

- 5.4.1. ***Develop clear, well-defined agreements between the lead agency, designated trauma facilities, and non-designated acute care facilities regarding the triage and transfer of injured patients and overall patient care. (This was also a recommendation from the 2008 Indiana State Trauma System review.)***
- 5.4.2. Utilize the regulatory ability to designate and de-designate as a mechanism to ensure proper engagement in the system.
- 5.4.3. ***Establish incentives and disincentives for hospitals to participate in the system. These should include regulatory and financial mechanisms. (This was also a recommendation from the 2008 Indiana State Trauma System review.)***
- 5.4.4. Expand EMResource to evaluate and monitor capacity issues during day-to-day function and mass population events.
- 5.4.5. Engage in regular review of all designated and non-designated centers to ensure that centers are engaged in the process of continuous improvement as measured by patient outcomes. This can involve internal and external reviews.

- 5.4.6. Explore designation of Level IV centers to address challenges in rural areas and to encourage trauma system engagement by current non-designated acute care facilities.
- 5.4.7. Establish guidelines and policies for designated centers to provide leadership in the trauma system process. This should include activities such as education, outreach, participation in TRACs and ISTCC, and up-to-date guideline dissemination.
- 5.4.8. Conduct periodic workforce assessments from across the continuum of trauma patient care, including prehospital, pre-acute, acute care, and post-acute care facilities.
- 5.4.9. Ensure appropriate training and certification for all workforce members that have regular contact with injured patients.
 - In cooperation with nursing licensure authority, ensure that all nurses that regularly care for injured patients have a trauma training certificate.
 - In cooperation with physician licensure authority, ensure that all physicians that regularly care for injured patients have a current trauma training certificate, such as Advanced Trauma Life Support.

5.5 Rehabilitation

Purpose and Rationale

An integral component of the trauma system includes rehabilitation services provided across a spectrum of injury care, including acute care, inpatient rehabilitation, and community-based services. The goals of these services are to provide coordinated care for trauma patients through rehabilitative programs that enhance recovery and speed of return to the highest level of function while reducing disability. Rehabilitative interventions require an integrated knowledge of both medical and ancillary support services, particularly in the context of social determinants of health and their relationship to functional outcomes for trauma survivors. Post-acute and community-based rehabilitation services also should focus on the management of chronic conditions related to the injuries sustained, optimizing long term function, and supporting secondary prevention.

The rehabilitation process should begin in the acute care facility as soon as possible, ideally within the first 24 hours, and should integrate discharge planning and wrap around services to alleviate barriers to rehabilitation access. Inpatient rehabilitation providers should be an active part of acute trauma care management. These professionals are integral to determining each patient's next level of care and functional needs and offering prognostic input about long term functional needs and services. Rehabilitation programs should utilize best practices supported by published guidelines and recommendations for the provision of high-quality rehabilitation care. Trauma systems should include subspecialty rehabilitation services for care involving patients with SCI, TBI, and burns. Additionally, the trauma system should conduct a rehabilitation needs assessment (including specialized programs for SCI, TBI, and children) to identify the number of beds needed for rehabilitation in the geographic region and to ensure that appropriately trained staff are available at centers to meet the needs. 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 are across state lines, should be part of rehabilitation system planning. Feedback on functional outcomes after rehabilitation should be made available to the trauma centers.

Current Status

Much of the information presented in the 2008 consultation report rehabilitation section is still applicable. The State of Indiana has multiple resources in place regarding its rehabilitation capacity, ranging from inpatient capabilities within acute care hospitals and trauma centers to general and specialty inpatient and outpatient facilities, including nursing homes. Historically, those services have generally operated at the local and district levels engaging with local hospitals and trauma centers; disparities in those capabilities apparently exist among districts. Rehabilitation specialists (physiatrists) have not participated in routine state trauma systems activities to date simply from a lack of inclusion; no rehab-specific individuals participated in the consultation visit. State trauma system leaders are interested in increasing that interaction at the larger trauma system level. Physiatrists are routinely participating in clinical care at local levels and have provided educational programs to trauma clinicians locally, however, limited engagement has occurred with the ISTCC. There is a capability to include rehab data in the state trauma registry, but such data are not routinely submitted.

It appears that there are sufficient general and specialty rehab beds for the current needs of the state, but that need is somewhat underestimated due to the requirement for patient financial resources to be eligible for rehab care. Those who lack insurance, whose insurance doesn't cover rehab services, or have other disqualifying conditions (e.g., violent crime convictions, substance abuse, or other disadvantaged persons) have difficulty finding placement in appropriate rehab facilities and are cared for in acute care hospitals or suboptimal settings. It is likely that volume would exceed current capacity if there were improvements to access to rehabilitation services and greater identification of patients requiring care. A formal assessment of rehab needs and capacity would better inform current and future system requirements.

Recommendations

- 5.5.1. **Initiate formal engagement between state and district trauma leadership and physiatrists for inclusion in state trauma systems development activities.**
- 5.5.2. Identify and implement resources to expand rehab capacity for individuals not currently eligible for rehab services.
- 5.5.3. Re-evaluate current eligibility surrounding access to rehabilitation resources.
- 5.5.4. Conduct a formal need and capabilities assessment for rehab services for all the districts in the state.
- 5.5.5. *Create a database of rehabilitation facilities according to capabilities for treating patients with various conditions and acuity such as ventilator-dependent or ventilator weaning, severe versus moderate versus mild traumatic brain injury (TBI), spinal cord injury (SCI), and pediatric.*
(This was also a recommendation from the 2008 Indiana State Trauma System review.)
- 5.5.6. *Analyze trauma patient flow and discharge patterns to rehabilitation facilities, skilled nursing facilities, and nursing homes to determine if patients are transferred to the appropriate rehabilitation facility.*
(This was also a recommendation from the 2008 Indiana State Trauma System review.)
- 5.5.7. *Develop, implement, and monitor compliance with transfer agreements, policies, and criteria from trauma centers and acute care facilities which assure patient needs are matched with rehabilitation facility capabilities, regardless of ability to pay for services.*
(This was also a recommendation from the 2008 Indiana State Trauma System review.)
- 5.5.8. *Explore possible financial or other incentives for rehabilitation facilities to more fully and reliably participate in the care of trauma system patients.*
(This was also a recommendation from the 2008 Indiana State Trauma System review.)
- 5.5.9. *Increase utilization of post-acute care data elements to allow pertinent questions regarding long term functional, financial, and other outcomes to be answered.*

- *Establish a process for rehabilitation facilities to enter data directly into the statewide trauma registry.*
- *Include the rehabilitation phase of care in the systemwide performance improvement process by identifying and monitoring salient long term and short-term post-acute care performance indicators and benchmarks.*

(This was also a recommendation from the 2008 Indiana State Trauma System review.)

5.6 System Integration

Purpose and Rationale

For the system to function optimally, trauma care must be integrated into the larger public health framework. A trauma system should have a plan, overseen by the lead agency, that specifies how the various components work together to achieve the intended goals and discusses how integration and cooperation from the time of injury through ultimate repatriation will be achieved. The system must also work to identify and eliminate health care disparities. Using this public health approach, the trauma system should aim to reduce the burden of injury in a state or region. In addition, this approach enables the trauma system to address primary, secondary, and tertiary injury prevention by mobilizing community partnerships.

Trauma system integration is essential for the daily care of injured people. Coordinated activity among emergency medical services, definitive care institutions, and rehabilitation centers ensures optimal care of the injured patient. This care, however, must be augmented by other essential services and partners, including mental health providers, social services, child protection, public safety, and disaster response and recovery. The system needs to be on alert for disparities, bias, and lesser outcomes of vulnerable populations. Collaboration with the public health community provides access to epidemiologic data that can be used for system assessment, development of public policy, and informing and educating the community.

Each element of the trauma system, through its leadership, should participate in trauma system design, evaluation, and operation. This participation should include policy and legislative development, public education, and strategic planning. In addition, trauma and subspecialty leaders should provide direction and oversight to the development, implementation, and monitoring of integrated protocols for patient care used throughout the system (e.g., TBI guidelines used by prehospital professionals and non-designated transferring centers). This should also include region-specific primary and secondary triage protocols. Trauma leadership, through regional trauma committees, can assist the lead agency and help ensure that system deficiencies in the quality of care, relative to national standards, are recognized and corrected.

The increasing level of threats to our society, such as mass violence, terrorist attacks, infectious diseases, and natural disasters, underscore the importance of trauma system integration. The trauma system is a significant state or regional resource for the response to mass casualty incidents. It has been demonstrated that communities supported by developed regional trauma systems are more organized and better able to respond these events. The impact of disasters and mass casualty incidents (MCIs) on the functioning of trauma centers, EMS, and public health systems within an affected region or state must be considered in the joint planning for optimal use of all resources to enable a coordinated response through recovery.

Current Status

Despite a vision to develop an inclusive trauma system for the State of Indiana, efforts have been hampered by several factors including the inability to elucidate this vision with a trauma system plan. Without a trauma system plan, there is no architecture upon which to promote trauma system integration. At its core, the integration of emergency medical services with the trauma centers and other acute care facilities within the Indiana Trauma System make the provision of care quite functional. However, this modicum of functionality is largely driven by the

passion and volunteerism of a small group of committed and collegial stakeholders across the state.

Another substantial impediment to trauma system advancement within the state is the limited number of stakeholders currently engaged in the system. Within the lead agency, there is a strategic plan which addresses a more comprehensive group of trauma system stakeholders including pre-hospital, trauma/acute hospital care, rehabilitation, and injury prevention. This is an internal operational document that is not disseminated beyond the IDOH. However, the content may provide a good springboard upon which to develop a formal trauma system plan in the future. Neither the lead agency nor members of the trauma system have made substantive efforts to educate the general public or legislators on the vital role of the trauma system in their communities. Best practice in the realm of trauma system integration would be to have maximally inclusive stakeholder engagement. The trauma system should seek to develop collaborative ties to a broad stakeholder pool in order to optimize functionality of the system. Beyond EMS and acute healthcare facilities, prominent members of this stakeholder community should include public health, emergency management, mental health, social services, protective services, fire, and law enforcement to facilitate resource and information/data sharing. As importantly, salient education of Hoosiers and state legislators with respect to the clinical and financial impact of trauma in their communities and the value of a trauma system in this context will drive advocacy for trauma system development.

Building upon the advice of the ACS COT Trauma Systems Consultation visit in 2008, the lead agency utilized existing Public Health Preparedness Districts to overlay and institute ten Trauma Regional Advisory Committees with the intent to develop a composite network of regional systems to serve the relevant trauma needs of their regions. However, there has been no statutory authority and/or rule, funding, or overarching trauma system plan to support and guide these regional systems. As a result, the TRACs are a heterogeneous group of trauma systems and tend to function in siloes. Their operational success is driven exclusively by the interest and insight of individual stakeholders within the region, with some demonstrating success and others struggling.

The lead agency, through the TRACs, has had some successful projects, although their ongoing surveillance and maintenance has been a challenge. As a reaction to adverse outcomes associated with delays in injury care, regional stakeholders made substantive efforts to limit specific healthcare disparities, particularly in the rural environment, by developing triage and transport initiatives focused upon improving access to injury care. Future development of the Indiana Trauma System should support the goal to advance operational functionality of the current ad hoc TRAC system through statute and rule authority, as well as providing a source of dedicated funding. Based upon this level of support, the regions will have the resources to collect data, perform injury surveillance, and perform data analysis to inform regional trauma quality improvement to improve injury outcomes. In addition, a second order benefit of these data and analytic resources is that they will allow the regional trauma systems to become proactive versus reactive to injury care issues within their regions.

Recommendations

- 5.6.1. Pursue a strategy of maximally inclusive trauma system stakeholder engagement to support trauma system development.**
 - **Educate Hoosiers and state legislators about the public health value of the trauma system in Indiana.**

- **Engage stakeholders that will advocate for legislation that promotes comprehensive trauma system development and sustainment.**
- 5.6.2. Improve collaboration and bidirectional communication across the breadth of trauma system stakeholders.
- 5.6.3. Formalize Trauma Regional Advisory Committees (TRACs) within statute and/or administrative rule.
- 5.6.4. Establish operational consistency of all Trauma Regional Advisory Committees (TRACs).
- 5.6.5. Alter the philosophy of the trauma system to be proactive versus reactive in developing initiatives.

Essential Trauma System Element #6: Needs Based Designation

The lead agency should develop and administer a trauma center designation process, which is based upon population needs.

Purpose and Rationale

Regional trauma system implementation has been shown to improve mortality and reduce complications. The number, level, and location of trauma centers are critical elements of trauma system function and disaster response. The importance of controlling the allocation of trauma centers, as well as the need for a process to designate trauma centers based upon regional population need, has been recognized as an essential component of trauma system design since the 1980's.

The designation of trauma centers is the responsibility of the lead agency, with input from the multidisciplinary advisory group. The lead agency must have a strong mandate, clear statutory authority, and the political will to execute this responsibility. In determining number, level, and location of trauma centers, the lead agency must be guided by the local needs of the region for which it provides oversight. The applicability of specific metrics and benchmarks for establishment of need will vary depending on the unique attributes of the region. Furthermore, the needs of patients must be optimized, and it is the professional obligation of health care professionals, facilities, and political leaders to work together to ensure that patient's needs come first. Assessment determinations should be transparent and derived through a broad-based, locally driven consensus process that is balanced, fair, and equitable. Utilizing the inclusive trauma system model, the number and location of trauma centers by level of designation and integration of non-designated 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, with the appropriate statutory authority, for identifying the appropriate number and/or level of trauma centers based on these periodic assessments. The trauma system plan should address means for improving the participation of both designated and non-designated acute care facilities to improve access to injury care within the trauma system.

Current Status

Establishing a process for needs-based designation for trauma centers is critically important for a system as it ensures adequate matching between patient needs and resources. Since the 2008 Indiana State Trauma System Consultation, the State has increased the number of ACS-verified trauma centers, significantly improving access to care for injured patients. It currently approaches needs predominantly based on geospatial access to a trauma center. While this is an important component of a needs-based evaluation, it does not completely suffice. Population size and trauma burden may exceed the capacity of trauma centers. For example, a significant burden in the northwest portion of the state flows into Chicago. It may be that additional resources are necessary when analyzed. Another consideration, which should go hand-in-hand with needs-based assessments, is how to match EMS transportation capabilities. For example, limited EMS availability may affect the true reach of a trauma center's catchment area.

Additionally, when evaluating needs-based assessment it is important to consider the flow of patients across state lines. A needs-based assessment should include the expected flow of patients into Indiana's trauma hospitals, as well as the effect of the neighboring state's ability to care for patients.

In addition, the trauma status of acute care facilities as trauma centers has been voluntary. This means that trauma center location is driven predominantly through market forces. By evaluating needs in a comprehensive fashion and leveraging a designation process, Indiana can likely continue to improve in access to care.

Recommendations

- 6.1. *Conduct a needs assessment to determine the number and level of designated acute care facilities in the state, and perform periodic assessments of need.*
 - *This should include consideration of all acute care facilities within the state as well as those in other states that may receive Indiana residents.*
 - *It should also include an assessment of the capacity of existing centers to inform whether the designation of additional facilities is required.*

(This was also a recommendation from the 2008 Indiana State Trauma System review.)

- 6.2. *Include neighboring state hospitals in the designation process and develop memorandums of understanding to help guide patient triage and transfer between neighboring states.*

(This was also a recommendation from the 2008 Indiana State Trauma System review.)

Essential Trauma System Element #7: Trauma System Registry

The lead agency should have the authority to establish and maintain a trauma system registry to collect, validate, and analyze injury surveillance data. Data collection should include the full continuum of care from point of injury through rehabilitation. These data should include all care facilities that treat injured patients. These data should be integrated with other data collection systems (i.e., vital records, medical examiner, law enforcement, and rehabilitation). Data definitions and patient inclusion criteria should be standardized to a national standard. Data sharing should be inclusive of system stakeholders to support quality improvement, research efforts, and legislative outreach pertaining to trauma.

Purpose and Rationale

There should be sufficient legal authority to establish a lead trauma system agency that can collect, validate, analyze, and distribute data. This legislative mandate should provide for collaboration, coordination, and integration with other entities engaged in providing care or surveillance activities related to the care of the injured patient. The lead agency should be authorized in statute to develop rules for the collection, analysis, use, and distribution of data within the system.

The lead agency should establish and maintain oversight of a single, system-wide trauma registry that collates and links hospital-level data with other data collection systems into one accessible data set to assess trauma system quality and outcomes. These data should guide planning, development, and maintenance of the trauma system during all phases of care. This system-wide trauma registry should meet national data collection standards and utilize current technology. Data collection should encompass the full continuum of care from point of injury to transport, hospitalization, rehabilitation, and return to community. Data collection should focus on identifying individual patients and linking patient-level data across the continuum of care among all relevant databases. Quality system information and data to support trauma system metrics should be provided by all those involved in a patient's care (pre-hospital, critical access facilities, transferring hospitals, trauma centers, rehabilitation, skilled nursing facilities, and therapy services).

The lead agency should define those responsible for contributing data and outline submission requirements such as demographics, mechanism of injury, diagnoses, treatment, and long-term outcomes. The lead agency should facilitate and foster integration of data collection systems with the addition of administrative discharge data, vital statistics data (government records), death certificates, medical examiner records, law enforcement, and financial data to add additional perspectives. Data collection processes designed by the lead agency should address the accuracy, timeliness, standardization, quality, validation, confidentiality, and completeness of the submitted data. An optimal information reporting process includes standardized reporting tools that allow for the assessment of historical and/or system changes and a dynamic reporting tool that permits the ability to tailor specific "views" of the information.

Research drives development of the trauma system, defines evidence based best practices, and provides a foundation for system growth and improvement. Trauma research should be facilitated and encouraged through processes designed to make data available to investigators. The lead agency should have a protocol to address requests for research data and have a method for evaluating these requests in a timely manner. While most lead agencies will not have the resources to maintain a self-contained board to meet federal human subjects research standards, they should develop relationships with Institutional Review Boards that can provide this service. Grants or contracts through the lead agency or constituencies may provide funds to support research activities.

Current Status

In 2013, the Trauma Registry Rule was established to collect and analyze trauma related data key to evaluating the delivery of trauma care within the state and improve the health outcomes of injured Hoosiers. The trauma registry has been maintained by IDOH since its inception. ImageTrend provides the state registry platform, and hospitals use a variety of trauma registry software products.

The Indiana trauma registry follows the ACS National Trauma Data Standard (NTDS). The IDOH maintains registry data definitions, a data dictionary, and patient inclusion criteria in accordance with the NTDS annual updates. In addition, the ISTCC and PI Subcommittee have input on data elements that are collected. The IDOH DTIP is responsible for collecting and maintaining the data via the Indiana Patient Registry (trauma registry) on a quarterly basis. The DTIP is also responsible for providing technical assistance and recommendations on improving data collection, reporting, and validation processes. Current staffing for the registry consists of the Trauma and Injury Prevention Program Director and Trauma System Epidemiologist.

There are 130 hospitals with EDs, and 113 submit data to the state registry, including several non-designated acute care facilities. There is a process for data validation, which includes providing feedback to hospitals on data quality issues. The Epidemiologist reviews data, and hospitals are notified through a report of their data quality issues. The hospitals and regions receive quarterly descriptive reports. In addition, there is a state level descriptive report produced each quarter that covers Level I, II, and III trauma centers in addition to non-trauma centers.

While there has been a commitment to data validation and there is a process to identify issues, there is not a comprehensive strategy to address and close the loop on ongoing issues with data quality and completeness. The State does not have a process to clearly delineate abstraction versus mapping issues. The State does not conduct external data audits to verify data quality.

The Epidemiologist conducts all data quality activities through a primarily manual process. The State lacks staff with the appropriate experience and expertise in trauma registries to assist with the data quality and validation process. The State offers minimal online training resources for hospital abstractors to improve data accuracy but has not taken advantage of training and resources offered by TQIP for NTDS data elements.

Data are not used to support state-wide performance improvement, quality improvement initiatives, and research. Registry data are not linked with other datasets within the state, including EMS, crash, rehab, and medical examiner data. Hospitals that provide data have expressed concerns regarding the quality of the state registry data. Stakeholders and staff note that the registry is not ready to support use of the data due to quality issues. While there is a TQIP collaborative for Level I and II trauma centers, those centers have not engaged with each other to use their results to improve care at the state level. Current resources, including state registry software capabilities, are not leveraged to allow for real-time data access by stakeholders in the trauma system.

Following basic best practices for the registry will help to address challenges and establish the state registry as a trusted foundation for epidemiologic analysis, research, and performance improvement. The recommendations below call for best practices in the areas of data validation and quality, appropriate staffing, training, and transparency.

Recommendations

- 7.1. **Develop a comprehensive approach to data quality that involves systematic identification of issues through analytics and audits, strategies to fix problems, and evaluation to ensure that issues are resolved.**
- 7.2. Expand lead agency personnel to include trauma registry professionals.
- 7.3. Engage stakeholders in the data quality process by involving leaders and researchers in quality initiatives and establishing trust through transparent data collection, management, and reporting practices.
- 7.4. Provide resources and training to hospital abstractors to address:
 - Updates and changes in the registry.
 - Data quality issues that are attributed to abstractor error.

Essential Trauma System Element #8: Injury Epidemiology

The lead agency should have systems and processes in place to regularly track and report on injury frequency, rates, and patterns across the entire jurisdictional population. Analysis and reporting should be based on multiple pertinent data sources (e.g., vital statistics, hospital discharge data, EMS, ED data, and trauma registries), including information obtained through surveillance activities. Data from these sources should be synthesized to provide a comprehensive description of injury and analyzed to identify trends and patterns to inform system development, injury prevention, and performance improvement efforts.

Purpose and Rationale

Trauma leaders and public health officials should collaboratively use injury surveillance data and outcome measures to describe and monitor injury events and emerging injury trends in their jurisdictions. This information will enable trauma system leaders to identify emerging threats that call for a reassessment of priorities and/or reallocation of resources. In addition, the data should be used to assist in ongoing planning, implementation, and evaluation of public health interventions and programs, to include disaster response. The trauma system, in conjunction with the system's epidemiologist, should complete a periodic trauma risk assessment and gap analysis using all available data to establish policy and develop an injury prevention and control plan.

Reducing injury related morbidity and mortality is the measure of success of a trauma system. Data from the system-wide registry and other sources must support injury epidemiology efforts with a focus on the frequency, rates, and injury pattern events in a population. Injury pattern refers to the occurrence of injury-related events by time, place, and personal characteristics, including demographic factors, pre-existing conditions, behavioral influences (e.g., protective device use), and environmental exposures. This provides a relatively simple form of risk-factor assessment. System data should be used to identify the burden of injury across specific population groups (e.g., children, elderly, races, and ethnicities) to ensure that specific needs or risk factors are identified. The lead agency should distribute this epidemiologic information to the public and government at least annually and upon reasonable request.

Current Status

Indiana obtains data relevant to injury epidemiology from several sources including the Indiana state hospital discharge dataset, CDC WISQARS, the Indiana State Trauma Registry, the Indiana Violent Death Reporting System (INVDRS), and the mortality dataset. These are overseen by the Office of Data Analytics in the Indiana Department of Health but primarily accessed and utilized by the Division of Trauma and Injury Prevention. The State is also evaluating expanding data capabilities through engagement with the state's sole Health Information Exchange. One notably absent data source available to the Office of Data Analytics is the EMS registry. This is housed within Indiana's Department of Homeland Security. While data can be made available, there are barriers to ready access. Other potential sources of data include the Indiana Criminal Justice Institute, including traffic safety databases and rehabilitation center data, which is required for accreditation. These data sources are similarly not integrated.

These rich sources of data are fragmented by ownership and platform, which limits the ability to evaluate and monitor data in an integrated fashion across the continuum of care, as would be needed for a high-functioning, inclusive trauma system.

Integrating these data sources would require several resources and elements to be put into place including technologic components, programming time by personnel, data sharing agreements, and regulatory data protections for information sharing. However, there is also the ability to fully leverage the capabilities of existing vendors. For example, there is one state vendor for both the trauma and EMS registries. Linkage by the vendor could reduce the burden on the state to conduct these linkages.

Epidemiologic data are analyzed by staff epidemiologists at the Office of Data Analytics and DTIP, who issue reports to stakeholders at regular intervals. There are several barriers to having this information translate to actionable information for the trauma system. These are listed below:

1. Fragmented platforms by which data is collected, and trauma-related data are owned by different departments.
2. Limited access to important information from prehospital phases of care.
3. Integration and mapping of data across platforms requires significant investments of time.
4. The quality of data is variable (particularly from non-designated acute care facilities).
5. There is limited bandwidth for data analysis at the Office of Data Analytics and DTIP.
6. There is limited bandwidth for answering data requests at the Office of Data Analytics.
7. Lack of guidance to Office of Data Analytics on which questions need to be answered by the data.
8. Legal data privacy concerns mandate de-identification of data for performance improvement, which stretches limited epidemiologist time.

The Office of Data Analytics does conduct validation reviews, however, there are concerns about the data quality from end-users. For example, there is a significant degree of data missing for key variables from non-designated centers. This is not surprising given there is limited authority by the State to enforce the quality of data input by non-designated centers. Furthermore, there are some concerns that reports generated from analyses at the state level do not necessarily match local analyses.

It is also not clear that the State is fully leveraging the capabilities of its current registry vendor. The State does use the web-based version offered by its vendor, which affords the ability for participating trauma system members to evaluate the data in real-time. This function could offload limited resource analytic time. However, these web-based reports are limited in granular detail and there is a need for the trauma system to be able to query finer-level information. Given that many challenges exist with limited epidemiology data management and analytic resources, there is a need for more funding for data management and analytics. This has been identified by the State as an issue.

Additionally, the data that are present are currently not used for performance improvement. This is due to many reasons. For one, use of data is usually driven through performance initiatives. As the trauma system is not actively engaged at the state level in systematic performance improvement and because of variable regional engagement, the data are not frequently queried. This limits the analytic output to static reports that might not meet performance improvement needs. Furthermore, when it is requested for performance improvement initiatives, access to data is limited due to the barriers listed above. This has resulted in an underdeveloped life cycle of data analysis and performance improvement. One potential solution is to consider developing an injury surveillance and injury control data consortium. This consortium would bring together experts in data analysis, statistics, and subject matter experts in trauma to help inform analytic

needs and activities. Such a consortium could serve a bridge between the epidemiologic team and end-users.

Indiana has identified several opportunities for improvement from their data. For one, Indiana has higher rates of injury-related mortality than the remainder of the U.S. One group that drives this is the youth population. This has informed some state and local injury prevention efforts, such as addressing mental health issues in schools. The largest proportion of injury admissions in Indiana is in the older adult population. This has led to fall prevention programs at the state and local levels. These are good examples of how injury epidemiology should drive interventions. However, it is not clear if the impact from the interventions have been tracked in the data over time, which is an important component of using epidemiologic data over time.

Recommendations

- 8.1. **Establish sufficient funding for resources necessary to support statewide and regional epidemiologic data management, analysis, reporting, and responses to requests for data.**
- 8.2. Create a mechanism to facilitate data sharing between Indiana's Department of Homeland Security, Department of Health, Department of Justice, and other data sources.
- 8.3. Address data privacy legal barriers through legislation or rule to make data more available.
- 8.4. Ensure that there are thorough descriptions and reporting of the epidemiology of injuries at the state, regional, and local levels. These should also include high-risk and special populations such as pediatric and the elderly.
- 8.5. Systematically use epidemiologic data strategically to inform improvement efforts and policy at the state, regional, and local levels.
- 8.6. *Consider developing an injury surveillance and injury control data consortium. Such an entity can support the Office's efforts at ensuring quality data acquisition from all relevant sources.
(This was also a recommendation from the 2008 Indiana State Trauma System review.)*

Essential Trauma System Element #9: System-Wide Performance Improvement

The lead agency should establish a system-wide trauma performance improvement (PI) process to evaluate all aspects of the trauma system. The plan should define audit filters to monitor and track specific processes and outcomes, such as access to care, availability of services, and effectiveness of injury prevention initiatives. In addition, the plan should define a process for tracking of the audit filters, addressing performance gaps, and determining loop closure.

Purpose and Rationale

The trauma lead agency has responsibility for instituting and analyzing the structure, processes, and outcomes to evaluate the performance of all aspects of the trauma system. Appropriate data should be collected to identify opportunities for PI in the system and to develop action plans with measurable outcomes. These data should be used to monitor PI efforts and effectiveness of corrective action within the system at all levels of care. Dedicated regional staff and resources should be available to ensure time-sensitive reporting of information to stakeholders.

The lead agency should design trauma system performance indicators with meaningful accountability-based incentives focused on achieving defined quality goals. These will act to ensure the support of key constituents in the health care community and the general population. The trauma lead agency should promote ongoing dialogue with key stakeholders, ensuring that any initiatives remain aligned with system needs. Success is enhanced when all system participants consistently comply with the guidelines and can evaluate performance in a confidential manner.

The lead agency should use data to generate reports and conduct analyses regularly. These reports should use data that compare cohort outcomes (e.g., adult/pediatric, varying trauma center levels, urban/rural) using risk adjusted benchmarking. An optimal information reporting process should include standardized reporting tools that allow for the assessment of system changes over time. This dynamic reporting tool should permit stakeholders to tailor data analysis and focus on vulnerable or frequently encountered cohorts (groups based on age, injury patterns, or outcomes). The lead agency should provide regularly generated reports that support trauma system operations by evaluating trauma system performance and processes of care.

Current Status

A Performance Improvement (PI) Subcommittee exists within the Indiana State Trauma Care Committee. The Indiana Department of Health has the authority to implement changes at the request of the subcommittee, which acts in an advisory role. The ISTCC and the PI Subcommittee members are actively engaged and included in implementation processes. Currently, there is limited bi-directional communication between each TRAC and the PI Subcommittee to allow for reporting to the ISTCC.

Each year, the PI Subcommittee focuses on either new or continued goals. Discussion occurs around increasing the number of participating hospitals that submit data to the trauma registry, evaluating certain data points submitted for the group to review, and registrar education through quiz refreshers. There has not been much of a focus on evaluation of PI goals, but rather a continuation of addressing previous year's goals. Outcomes from the PI Subcommittee are largely addressed at the hospital level. PI Goals for 2022 were to decrease the ED LOS for

critical patients at non-trauma centers; increase trauma registry quiz participation with a focus on providing more streamlined education to registrars; collection of hospital level variables annually; continued EMS run sheet collection; establishment of a structure with district (TRACs) leadership in developing regional PI processes; and targeted Core Metrics: ED Length of Stay > 2 hours, and Transfer Time Transfer Delay Reasons.

A trauma system performance improvement plan has not been developed. A trauma system performance plan should provide the structure and processes to focus actions and discussion that promote outcome reviews, data-driven decisions, and the development of outcome measures defined by the stakeholders. The plan should clearly set definitions and terminology that ensure data reliability and integrity. It should encompass the prehospital setting, trauma center care, access to rehabilitation, financial outcomes such as length of stay and associated costs, injury prevention outcomes, and disaster response outcomes.

Despite the potential for robust performance improvement activities to take place at the TRAC level, TRAC productivity has been limited on several fronts. Concern for discoverability and lack of ability to share patient level information has limited the PI and QI efforts. The 2008 report indicates that there is insufficient legislation to protect peer review from discovery, which likely contributes to the limited ability of regions and the state to engage in system wide PI. While this can pose challenges, there is an opportunity to use de-identified data to facilitate improvement activities without the risk of discovery.

A TQIP Collaborative was formed in 2021. However, the Collaborative has not been utilized to drive statewide PI initiatives to date. Collaborative participants should engage regularly to identify and address PI opportunities. The PI process should identify goals with consistent tracking and reporting and provide loop closure or event resolution.

Recommendations

- 9.1. ***Develop a trauma system performance improvement plan, which provides the foundation for PI structure and process.***
(This was also a recommendation from the 2008 Indiana State Trauma System review.)
- 9.2. Create a process to routinely identify PI opportunities based on TQIP collaborative results and other statewide data, and develop a plan to review the data, develop an action plan, implement, and evaluate effectiveness to address the areas of opportunity.
- 9.3. Encourage ongoing active engagement with national trauma quality improvement activities such as TQIP.
- 9.4. Formalize statewide and regional quality improvement programs utilizing national performance measures:
 - Identifying local issues.
 - Including stakeholders from all aspects of the trauma system from non-designated hospitals and EMS through rehabilitation.

- 9.5. Promote quality initiatives through the TRACs while allowing for bi-directional communication between each TRAC and the PI Subcommittee to report progress at the ISTCC.

Essential Trauma System Element #10: Confidentiality and Discoverability

The lead agency should establish a process to ensure confidentiality and provide statutory protection from discoverability to support trauma system performance improvement and research efforts.

Purpose and Rationale

A designated process, with dedicated staff having expertise to protect data confidentiality, should be constructed to maintain privacy and security of any data under trauma system control. Because protected health information, personal identity information, or unique identifiers may be collected, the process must ensure that patient confidentiality is respected and is consistent with state and federal law. Policy should outline how data are requested. Data requests should be reviewed with efforts to ensure compliance with privacy safeguards that prevent improper use or disclosure. Access to information must be limited to only necessary personnel for authorized purposes. Given the sensitivity of this data, the system should also determine when formal patient authorization is required for the release of registry information. There should be a mechanism for feedback to the system regarding the final utilization of the data provided and confirmation of final data disposition.

Trauma system data should be protected in statute from discoverability and used to support trauma system performance improvement and research efforts at the regional, state, and national levels. The lead agency should establish a process with explicit safeguards to ensure confidentiality throughout the performance review process. Statutory provisions should foster system development that permits data sharing, collaboration, coordination, and integration with other agencies and entities engaged in prevention, patient care, and surveillance activities related to care of the injured patient. The lead agency should encourage bi-directional flow of information across the continuum from prevention to pre-hospital and return to the community.

Current Status

The Indiana Trauma Registry is authorized under IC 16-19-3-28; additionally rule 410 IAC 34-9-1 was enacted in 2013. This rule states, in part, that all data created by a provider and submitted to the department for inclusion in the registry will be treated as confidential and the department will follow appropriate state and federal law regarding the confidentiality of medical information. The department may grant any person involved in a legitimate research activity access to confidential information including trauma registry. The Division of Trauma and Injury Prevention has implemented a multilayer approval process for those requesting access to the registry data for research.

The statutory authority and rules appear to provide protection of confidentiality, as it applies to trauma data, that are compliant with Indiana Code 4-1-6-8-6 that provide procedure to request access to confidential records. There is currently no statutory language to protect trauma peer review activities from legal discovery. Introduction of this language was recommended in the 2008 ACS TSC report to ensure that trauma peer review, including performance improvement activities, are protected from such discovery. This recommendation was a result of a 2008 case that challenged the Indiana state law and deemed that medical peer reviewed data were legally discoverable and not protected information.

Without these protections, it is challenging to conduct patient level reviews, identify areas of opportunity, and implement system improvement measures to advance care in the trauma system. This lack of protection has stifled further regional performance improvement activities.

Having statutory protection of peer review and trauma improvement record data is paramount to assuring ongoing and timely trauma system development.

Recommendations

- 10.1. ***Amend or create a statute with specific language to ensure the confidentiality of the trauma registry, trauma system performance improvement, and peer review activities and to protect each from discoverability.
(This was also a recommendation from the 2008 Indiana State Trauma System review.)***

Essential Trauma System Element #11: Disaster Preparedness

A comprehensive emergency disaster preparedness and response plan should be established and reviewed annually. This plan should integrate all components of the trauma system and coordinate with all existing response entities including local, state, federal and particularly military partners. There should be a developed and operational network of Regional Medical Operations Centers (RMOCs) as a major component of the disaster preparedness plan. The plan should be exercised at least semiannually. One of these exercises should be operationally based (not tabletop) and test all components of the system.

Purpose and Rationale

The lead agency, in collaboration with trauma system leaders, needs to be actively involved in disaster preparedness for the local, regional, or national area of responsibility. These system leaders should be the subject matter experts in disaster preparedness to ensure that trauma system resources are optimally integrated across the continuum of the emergency response. A mass casualty incident (MCI) is defined by numbers of casualties that overwhelm available hospital and system resources. Contingent upon the size of the MCI, a plan for activation of a larger emergency response with support provided by region, state, and national assets may be required. In an MCI, acute care facilities (sometimes including one or more trauma centers) within an affected community must be willing to adjust their daily operations to manage the MCI. This plan should be practiced to ensure effective communication between centers and public resources. An assessment of the trauma systems response to simulated incidents or tabletop drills must be conducted and documented on a regular basis to determine the trauma system's ability to respond. Resource assessment of the system should be coupled with a system specific hazard vulnerability analysis to identify gaps requiring remediation.

Complex disasters may mimic the austere environment and logistical challenges faced in military deployments; thus, military resources for evacuation, triage and treatment of the affected population should be incorporated into regional disaster plans if available. Planning and integration of the trauma systems with civilian agencies (public health, law enforcement, EMS and emergency management) and military partners are important because of the extensive impact disasters have on the trauma system and the need for the trauma system to provide care to the local populace. Cooperative relationships between these agencies support the provision of assets that enable a more rapid and organized disaster response on every level.

As a major component of the disaster preparedness plan, there should be a developed, integrated, and functional network of Regional Medical Operations Centers (RMOC). The goal of the RMOC is to strengthen regional care delivery through enhanced resource coordination. The RMOC model is designed to facilitate the most appropriate level of care for as many patients as possible, while simultaneously maintaining patient safety and keeping as many patients as possible within local facilities capable of providing high quality care. The RMOC enables the entirety of a region's healthcare system during any mass casualty or large public health event to "load balance" patient care needs across healthcare facilities and healthcare systems prior to any individual facility transitioning to a crisis standard of care. In addition, it provides a communication link to other RMOCs to lead or participate in a broader coordinated multi-regional, state, or national effort. This includes multi-state response and nationwide network integration.

Current Status

Indiana's approach to disaster planning follows federal funding targets and availability, and the State has taken advantage of several federal funding opportunities. IDOH maintains responsibility for hospital preparedness while IDHS focuses on out-of-hospital aspects. However, it is not apparent from provided documentation and stakeholder discussions that trauma experts or leaders have been integrated into preparedness efforts.

Disaster preparedness efforts focus on ten emergency preparedness districts. The ten districts have formed public health coalitions that receive guidance from IDOH. Each coalition's acute care facilities cooperate to determine preparation priorities and have been granted authority to receive and distribute grant funds. Supply and equipment stores are being developed in each district. Assessments at the regional level and within IDOH have been void of direct engagement of trauma experts and EMS stakeholders. It is unclear how staffing of acute care facilities will be coordinated while the state is experiencing workforce shortages of medical professionals.

IDOH has implemented EMResource for tracking bed availability and medical resources. It is not clear how this capability is used day-to-day or the use without a declaration of disaster or mass casualty event. IDOH public health preparedness has relied heavily on the regions for coordination and resource management. These activities should be formalized and integrated by developing Regional Medical Operation Center (RMOC) capabilities to manage patient flow and resources during a disaster.

Indiana has a state disaster plan that has been operationalized by IDHS. The disaster plan embraces an all-hazards approach that includes responses to mass casualties and an interoperable communications system. IDOH is represented within the comprehensive emergency operation plan and provides medical coordination under Emergency Support Function 8 (ESF 8). IDOH has recently exercised this function in response to COVID-19 pandemic activities.

Indiana has considerable expertise and resources related to disaster preparedness and response. However, it is unclear whether all potential resources, such as experts in trauma care or the National Guard, have been included in disaster preparedness planning processes, and whether they have "bought in" to the existing plan.

Recommendations

- 11.1. ***Develop, at the state level, a multi-disciplined disaster planning group that includes, but is not limited to, representatives from IDOH, IDHS, trauma experts, EMS stakeholders, and others with identified expertise and resources in the management of multiple trauma events. (This was also a recommendation from the 2008 Indiana State Trauma System review.)***
- 11.2. *Conduct a human resources assessment to determine how the potential multiple occupational commitments of disaster responders might affect their abilities to contribute to a disaster response. (This was also a recommendation from the 2008 Indiana State Trauma System review.)*

- 11.3. Conduct mass casualty planning and exercises that focus on trauma center capabilities.
- 11.4. *Develop and implement plans to routinely assess and validate each hospital's potential surge capacity.*
(This was also a recommendation from the 2008 Indiana State Trauma System review.)
- 11.5. Develop Regional Medical Operation Coordination Center (RMOCC) capabilities.

Essential Trauma System Element #12: Military Integration

The trauma system should actively support integration and cooperation with military personnel, medical treatment facilities, and transport capabilities. This should include patient care, education, data collection, performance improvement, research, training, disaster response, and clinical readiness.

Purpose and Rationale

Integration of military trauma and emergency care resources into the local, regional, and national trauma system is an essential component of a trauma system plan to optimize patient outcomes and support the National Security Strategy. Through military-civilian collaboration at the local, regional, and national levels, a trauma system plan should work towards achieving zero preventable death and disability from injury both for our citizens at home and for our service members who are injured in defense of the nation.

When military and federal medical resources exist within the geographic area of the trauma system, public policy should authorize the lead agency to include military representation. A regional military trauma representative should be a member of the multidisciplinary advisory group. The military trauma resources should be fully integrated into the Department of Defense (DoD) Joint Trauma System just as the civilian regional trauma system should be linked to the national strategic trauma and emergency care system leadership. Military treatment facilities capable of achieving trauma center verification and designation and geographically located to support population need, should be supported to fully integrate and be operationalized within the state, regional and the DoD Joint trauma systems.

Military-civilian collaboration should include both individual and trauma team clinical readiness programs. There should be provisions for credentialing and privileging of medical personnel between military and civilian centers to optimize the education and training benefit for both civilian and military personnel. Standing agreements that enable military trauma teams to provide patient care in civilian trauma centers within regional trauma systems should be established and maintained to ensure clinical readiness. Level I and II trauma centers should engage in military-civilian partnerships for ongoing readiness training of military trauma teams.

A regional trauma system that functions daily is foundational for a successful response to crisis. The regional trauma system should be able to provide an appropriately scaled response to any disaster or mass casualty scenario. In the situation of a mass casualty scenario that overwhelms local and regional resources, the fully integrated military and civilian trauma and emergency care system can be efficiently and effectively mobilized. Integrated military-civilian trauma system resources should be leveraged to care for military casualties that overflow the capacity of regional military treatment facilities. There should be a comprehensive plan with annual drills to leverage the full spectrum of military, federal (Veterans Affairs facilities), and non-federal partners (via the National Disaster Management System).

Achieving the goals of an integrated national trauma system requires better integration between civilian and military trauma system elements, which should be supported with funding. The lead agency should have situational awareness of civilian-military trauma partnership agreements within its jurisdiction.

Current Status

The State of Indiana has demonstrated emergency response relationships between the emergency management activity of the IDOH and the U.S. Military. During the COVID-19 pandemic, the Indiana National Guard was mobilized by gubernatorial order to support

emergency medical relief under the responsibility of the Division of Emergency Management. The vast majority of this assistance was rendered in the form of non-medical care ancillary support functions since National Guard personnel cannot treat civilians, except for life, limb, or eyesight, unless they are activated under a Federal Emergency Management Agency (FEMA) Mission Assignment. Similarly, the Division of Emergency Preparedness also received federal aid from the Department of Defense (DoD) to staff a number of contingency “medical packages” with healthcare providers. These healthcare workers were sourced from DoD medical facilities across the nation as there were no DoD medical treatment facilities within the State of Indiana. The trauma system had no direct role in the planning or implementation of this relationship as it was developed as a result of the response to a pandemic communicable illness.

There is no written Indiana Trauma System Plan to provide impetus to develop a codified relationship between the military and civilian medical systems. As such, there is no formal relationship between the two entities. Similarly, the trauma system has not developed any form of reciprocal partnership with military entities to address the possibility of a civilian or military mass casualty event within the state. Currently, any required military-civilian MOA/MOUs are executed based upon contingency between the Indiana National Guard and the Indiana Department of Homeland Security. An enhanced relationship between the civilian and military systems, including incorporating a military representative into the Indiana State Trauma Care Committee, would prove beneficial in order to capitalize upon an expanded shared work force and an increased breadth of expertise, particularly in supporting disaster and mass casualty events.

There was interest from the Level I center in Indianapolis to seek Mission Zero funding, but the center was unsuccessful due to the DoD priority assigned to initial applications with preexisting military-civilian training programs. Level I/II trauma centers within the state should actively seek future Mission Zero agreements with Department of Defense. Successful award of these contracts will not only augment the trauma teams within Indiana trauma centers, but it will also provide realistic and relevant injury care training and readiness to military trauma teams.

Recommendations

- 12.1. Integrate military capabilities into Indiana Trauma System Plan.
- 12.2. Engage local/regional military resources in trauma system development and function.
- 12.3. Incorporate a military representative into the Indiana State Trauma Care Committee (ISTCC).
- 12.4. Seek Mission Zero agreements with Department of Defense to augment trauma teams and support military training and readiness (Level I/II trauma centers).

Appendix A: Acronyms

ACEP- American College of Emergency Physicians
ACS COT- American College of Surgeons Committee on Trauma
AEMT- Advanced Emergency Medical Technician

CDC- Centers for Disease Control and Prevention
CPST- Child Passenger Safety Technician

DHHS- Department of Health and Human Services
DoD- Department of Defense
DTIP- Division of Trauma and Injury Prevention

ED- Emergency Department
EMR- Emergency Medical Responder
EMS- Emergency Medical Services
EMT- Emergency Medical Technician
ESF 8- Emergency Support Function 8
ETSE- Essential Trauma System Element

FEMA- Federal Emergency Management Agency
FTE- Full-time Equivalent

ICJI- Indiana Criminal Justice Institute
IDHS- Indiana Department of Homeland Security
IDOH- Indiana Department of Health
IHERN- Indiana Hospital Emergency Radio Network
INVDRS- Indiana Violent Death Reporting System
IP- Injury Prevention
ISCBIRF- Spinal Cord and Brain Injury Research Fund
ISTCC- Indiana State Trauma Care Committee
ITN- Indiana Trauma Network

LOS- Length of Stay

MCI- Mass Casualty Incident
MIPA- Midwest Injury Prevention Alliance
MOA- Memorandum of Agreement
MOCC- Medical Operations Coordination Center
MOU- Memorandum of Understanding

NAEMSP- National Association of EMS Physicians
NHTSA- National Highway Traffic Safety Administration
NTDS- National Trauma Data Standard

PHHS- Preventative Health and Health Services

PI- Performance Improvement
PSAP- Public Safety Answering Point

RMOC- Regional Medical Operations Center
RTTDC- Rural Trauma Team Development Course

SCI- Spinal Cord Injury

TBI- Traumatic Brain Injury
TQIP- Trauma Quality Information Program
TSC- Trauma System Consultation
TRAC- Trauma Regional Advisory Committee

WISQARS- Web-based Injury Statistics Query and Reporting System

Appendix B: Methodology

The State of Indiana requested this consultative review of the Indiana State Trauma System, which was conducted under the auspices of the Trauma Systems Consultation (TSC) Program of the American College of Surgeons (ACS) Committee on Trauma (COT). The multidisciplinary TSC Review Team consisted of three ACS staff and six nationally recognized trauma experts, including: two trauma surgeons, an emergency physician, two state emergency medical services directors, and a trauma program manager. Biographical information about the 9 ACS TSC Review Team Members is provided in Appendix C.

The primary objective of the ACS TSC for the Indiana Trauma System was to guide and promote a sustainable effort in the development of an inclusive and integrated system of care in the state. The format of this TSC Report correlates with the Essential Trauma System Elements outlined in the *ACS Trauma Systems Consultation Guide: Essential Elements, Framework, and Assessment for State and Regional Trauma Systems*. Prior to the Site Visit, the TSC Review Team studied the ACS Pre-Review Questionnaire (PRQ) and additional supporting documents submitted by the State of Indiana. Other information publicly available on government and official websites was also assessed.

The ACS TSC Review Team convened for a site visit from November 7th- 10th, 2022 in Indianapolis, IN. The four-day site visit consisted of a stakeholder plenary session during which the ACS TSC Review Team engaged with a broad range of representatives from the Indiana Trauma System, with the opportunity for more informal discussions to take place in between. The ACS TSC Review Team sequestered in private team meetings for more detailed review and discussion of the trauma system data, to establish consensus on essential elements regarding the trauma system, develop recommendations for system improvement, and to prepare the TSC Report.

The conceptual framework of the *Trauma Systems Consultation Guide* is the Essential Trauma System Elements. Since the 1980s, experts in the field of trauma system development have sought to define the necessary and essential components of a working trauma system. The functional elements of highly effective trauma systems were outlined in two documents published by HRSA, the Model Trauma Care System Plan in 1992 and Model Trauma Systems Planning and Evaluation in 2006. Using these sources as well as data gained from over 40 trauma system consultations performed by the Trauma Systems Evaluation and Planning Committee of the ACS COT, a draft set of essential elements was developed in 2018 by a multidisciplinary workgroup led by the ACS COT. These essential trauma system elements were subsequently refined through input from provider organizations from across the spectrum of injury care.

The Trauma System Consultation (TSC) Report for the Indiana Trauma System presents the same Purpose and Rationale as those within the *Trauma Systems Consultation Guide* for each of the Essential Trauma System Elements.

Appendix C: ACS TSC Review Team Biographies

Brian J. Eastridge, MD FACS

Role: Trauma Surgeon
(Team Lead)

Dr. Brian Eastridge received his BS in biochemistry from Virginia Tech in 1985 and his MD from the University of Maryland School of Medicine in 1989. He entered the US Army Reserve as a second lieutenant Medical Service Corps officer in 1988. Dr. Eastridge did his residency in general surgery at the University of Maryland Medical System and then pursued fellowship training in surgical critical care at the University of Texas Southwestern Medical Center in Dallas, TX. During his tenure on the academic faculty at UTSW, Dr. Eastridge was deployed three times in support of combat operations Operation Enduring Freedom and Operation Iraqi Freedom as a U.S Army Reserve surgeon in 2002, 2003, and 2004. During his deployment in 2004, he was appointed as the first Joint Theater Trauma System Director.

Dr. Eastridge matriculated to active duty U.S Army in 2005 and served as Trauma Medical Director for the Brooke Army Medical Center, Surgical Critical Care Program Director for SAUSHEC, Director of the Joint Trauma System (U.S. Army Institute of Surgical Research of the U.S. Army's Medical Research and Materiel Command (MRMC), and Trauma Consultant to the US Army Surgeon General. During his active duty service, he was deployed two more times to combat in Southwest Asia during which time he lead the development and implementation of the military trauma system. During his career, Dr. Eastridge has published extensively in the peer reviewed literature and edited three books focused upon improving the military trauma system and improving combat casualty care outcomes for our Wounded Warriors. Dr. Eastridge left active service and returned to the active US Army Reserves in late 2012 and is currently the DCCS of the 228th Combat Support Hospital. His military awards and decorations include the Combat Medical Badge, Combat Action Badge, Legion of Merit, Bronze Star Medal, Defense Meritorious Service Medal, and the Joint Service Commendation Medal. He is a member of Order of Military Medical Merit. For his military service, he has been awarded the American Association for the Surgery of Trauma Honorary Medal for Combat Surgical Care in 2004 and the US Army Medical Research and Materiel Command Combat Casualty Care Program Award for Excellence in 2011.

Currently, he is Professor of Surgery at the University of Texas Health Science Center and was appointed as the Trauma Medical Director of the University Health System in San Antonio, TX. He holds the Jocelyn and Joe Straus Endowed Chair in Trauma Research. His current research interests are focused on trauma system development, including development of the regional trauma system performance improvement initiatives, predictive modeling of injury outcomes, and improved pre-hospital resuscitation strategies for casualties. Dr. Eastridge also serves as an active member on the American College of Surgeons Committee on Trauma, and is the current Chair of the Trauma Systems Evaluation and Planning Committee, and the Trauma Systems Pillar.

Kristan Staudenmayer, MD, MS, FACS

Role: Trauma Surgeon

Dr. Kristan Staudenmayer received her medical degree at the University of Texas at Southwestern Medical School in 1999 and completed her residency in General Surgery at Parkland Hospital in 2006. During her post-graduate training, she conducted NIH T32-funded

research at Harborview Hospital evaluating the effects of innate immunity on trauma. She obtained further training in Trauma and Surgical Critical at San Francisco General Hospital, completing her training in 2008. She was subsequently double boarded in General Surgery and Surgical Critical Care.

Dr. Staudenmayer joined Stanford in 2008. She has developed a robust research program and active clinical practice. Her clinical and research interests have contributed to Stanford's multi-disciplinary approach to the management of surgical trauma. Dr. Staudenmayer's clinical focus is on trauma, emergency general surgery, and surgical critical care, and her research interests encompass trauma systems of care and vulnerable patient populations such as the elderly. Her efforts have been noteworthy and recognized in her 2013 K08 grant from the National Institute on Aging to study trauma in the elderly population. In 2016, Dr. Staudenmayer was honored by becoming the inaugural Gordon and Betty Moore Endowed Faculty Scholar, which helps to support her ongoing research efforts. Additional research accomplishments include being a co-principal investigator on an NIH CTSA award evaluating trauma systems.

Dr. Staudenmayer has published over 50 articles and book chapters and has served on the editorial review board of several academic journals. She contributes nationally towards the academic mission by serving on committees for both the American Association for the Surgery of Trauma and the Eastern Association for the Surgery of Trauma. Dr. Staudenmayer was promoted to Associate Professor of Surgery in 2016, and continues her research, policy and advocacy work to improve the care and outcomes for patients with traumatic injuries and critical surgical illnesses.

Jon R. Krohmer, M.D., FACEP, FAEMS

Role: Emergency Physician

Jon R. Krohmer, M.D., FACEP, FAEMS has recently retired as the Director of the NHTSA Office of EMS in the Department of Transportation. He continues to serve as the EMS Medical Director for the Caroline County (MD) Department of Emergency Services. He also served as the NHTSA Acting Associate Administrator for Research and Program Development from October 2018 to January 2020. Previously, he was the principal deputy assistant secretary for DHS Office of Health Affairs and DHS deputy chief medical officer. He began serving in that position as a member of the Senior Executive Service (SES) with DHS in September 2006 and served as the acting assistant secretary for health affairs and chief medical officer from August 2008 to August 2009.

Dr. Krohmer was an attending physician and director of emergency medical services (EMS), emergency medicine residency and Department of Emergency Medicine at the Spectrum Health Butterworth Campus in Grand Rapids, MI, associate professor of emergency medicine at the College of Human Medicine at Michigan State University and EMS medical director of Kent County Emergency Medical Services and was the medical director for the West Michigan Metropolitan Medical Response System and the Region 6 Consortium. Dr. Krohmer received his undergraduate degree at Ferris State College, School of Pharmacy in Big Rapids, MI, and is a graduate of the University of Michigan Medical School in Ann Arbor, MI. He completed his emergency medicine residency and EMS Fellowship at Wright State University in Dayton, OH. He is board certified in emergency medicine and emergency medical services.

Fergus Laughridge, AEMT, ASM, CPM

Role: State Emergency Medical Services Director

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

Mr. Laughridge currently serves as the Health Director for Fort McDermitt Paiute Shoshone Tribe in McDermitt, NV. As Health Director, Mr. Laughridge is responsible and accountable for the continued development of comprehensive and quality health care service delivery system including ancillary health programs focused upon prevention and early interventions.

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

Tracy Cotner-Pouncy, BSN, RN, TCRN

Role: Trauma Program Manager

Tracy Cotner-Pouncy is currently the Sr. Director of Trauma Services for UHealth Northern Colorado. She has been in this role since March 2021. Previously, she served as the Senior Director of Trauma Services for the Level I Adult and Pediatric Trauma Programs at University Health System in San Antonio, TX for ten years. Prior to that, she was the Trauma Program Manager at Wilford Hall Medical Center, a military Level I trauma program in San Antonio. Ms. Cotner-Pouncy started her trauma career as the Trauma Designation Coordinator for the Texas Department of Health.

Ms. Cotner-Pouncy is a regional, state, and national leader in trauma management. She currently serves as a Director-at-Large for the Society of Trauma Nurses (STN). She is also a member of the Trauma Nursing Leadership Council for the American Trauma Society (ATS). Ms. Cotner-Pouncy serves as a Nurse Reviewer for the American College of Surgeons (ACS) as well as the STN liaison to the ACS Trauma Systems Committee and the Best Practice Guideline Workgroup.

Richard Wisniewski, MAEL, CPM, NRP

Role: State EMS and Trauma Director

Richard Wisniewski has been the State EMS Director since November 2020. Prior to that, he was the State Trauma Program Manager (5/2013-11/2020). During his tenure as State TPM, he hosted an ACS System Consultation and successfully utilized the final report to advance the trauma care system in South Carolina.

Mr. Wisniewski has also served two terms as a NASEMSO liaison to the ACS for the EMS committee and the Systems Committee. He was a part of two work groups to help revise the System Consultation guide ("White book").

Melanie Neal, MS

Role: ACS Staff Team / Trauma Management Information Systems Specialty Reviewer

Ms. Melanie Neal has been with the American College of Surgeons for over 19 years, and is Assistant Director, Trauma Quality Programs. In this position, she provides strategic direction and high-level management for Verification, TQIP, Trauma Systems, Injury Prevention, and PIPS. Ms. Neal has a Master's degree in Social Science Research Methods.

Holly Michaels, MPH

Role: ACS Staff Team

Ms. Holly Michaels joined the American College of Surgeons (ACS) in January 2007 and has served in several key areas of the Trauma Quality Programs during her tenure at the ACS. As the Program Administrator for the Trauma Systems Consultation Program, Ms. Michaels managed over 30 state and regional system reviews, bringing together multidisciplinary teams of industry experts to assess, evaluate, and recommend strategic improvements for state and regional trauma systems. Following several years facilitating the growth and development of this program, she transitioned into a Program Manager role, leading the development of new programs including piloting the Level III Trauma Quality Improvement Program (TQIP) and expanding the TQIP Collaborative Program. In her role as Program Manager, her responsibilities continue to evolve to match the growth of programs and needs of stakeholders.

Having received her Bachelor of Arts in English from the University of South Florida in 2001, Ms. Michaels began her career in public health at the non-profit organization 2-1-1 Tampa Bay Cares, providing the Clearwater, FL community with access to critical resources, such as health and social services. In August 2014, Ms. Michaels earned a Master of Public Health from the University of Illinois at Chicago.

Mackenzie Dafferner, MPH

Role: ACS Staff Team

Ms. Mackenzie Dafferner joined the American College of Surgeons (ACS) as the Program Manager of Trauma Systems Programs in September 2021. In this role, Ms. Dafferner provides administrative support to the COT subcommittees within the Trauma Systems Pillar and is the point of contact for the Trauma Systems Evaluation and Planning Committee. She also serves as the program manager for the Trauma Systems Consultation Program and other Trauma Systems and Quality initiatives.

Having received her Bachelor of Science in Health Sciences from Northeastern University, Ms. Dafferner began her career in healthcare as an EMT-B in Boston, MA. Prior to joining the ACS, Ms. Dafferner worked as a clinical research specialist at the Regenstrief Institute in Indianapolis, supporting clinical research interventions focused on longevity and Alzheimer's disease. In August 2021, Ms. Dafferner earned a Master of Public Health from Loyola University Chicago.

Appendix D: Consultation Participant List

| First Name | Last Name | Organization/ Affiliation |
|------------|-------------|---|
| Brian | Busching | IDOH; DTIP Director |
| Lindsay | Weaver | IDOH; Chief Medical Officer |
| Andrew | Bowman | Major Health Partners, ACNP |
| Ramzi | Nimry | IDOH; Trauma and Injury Prevention Program Director |
| Kaitlyn | Sheridan | IU Health Ball Memorial; Trauma Program Manager |
| Lisa | Hollister | Parkview; ISTCC |
| Emily | Pham | IDOH |
| Trinh | Dinh | IDOH |
| Kelly | Blanton | St. Vincent Indy- PMCH |
| Brett | Engbrecht | St. Vincent Indy- PMCH |
| Lindsay | Haut | IEMSC; Riley |
| Meredith | Addison | Volunteer Emergency Nurse |
| Dharmesh | Patel | ESA; St. Vincent Trauma |
| Andrew | VanZee | IHA |
| Pete | Hammer | IUH Methodist |
| Erik | Streib | Eskenazi Health |
| Mark | Rohlfing | Community Hospital Anderson |
| David | Welsh | ISMA |
| Sherri | Marley | Eskenazi Health |
| Joel | Thacker | IDHS |
| Matt | Landman | Riley IU Health |
| Elizabeth | Weinstein | EMSC |
| Nat | Ridge | Decatur Co EMS |
| Eldon | Whetstone | IDOH |
| Mark | Lynch | Union |
| Allison | Thomas | Good Samaritan, Vincennes IU |
| Justin | Koenig | Elkhart General |
| Frank W. | Safrit | Terre Haute Regional |
| Betsy | Tenbarge | Ascension St. Vincent Evansville |
| Jay | Woodland | Deaconess |
| Kraig | Kinney | IDHS |
| Shannon | Meek | Good Samaritan |
| Madison | Halter | Good Samaritan |
| Anthony | Murray | ISTCC; PFFVI |
| Brad | Barrett, MD | State Representative District 56 |
| Peter | Jenkins | IDOH; IUH |
| Chris | Hartman | ACEP |
| Scott | Thomas | Memorial South Bend |
| Emma | Heltzel | IDOH |
| Lewis | Jacobson | St. Vincent Indy |
| Tony | Myers | ASVI |
| Mallory | Bray | ASVE; ESA |
| Maria | Cariaso | IDOH |
| Miranda | Newberry | GSH |

| | | |
|-----------|--------|---------------|
| Katie | Lykins | DCMH |
| Jen | Homan | Franciscan CP |
| Stephanie | Wilsey | IU Arnett |
| Eric | Yazel | IDHS |