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

Trauma System Consultation Report

Commonwealth of Virginia

Glen Allen, VA
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Executive Summary

Overview

The Commonwealth of Virginia, the Old Dominion, has a long and storied past, dating back to the founding of Jamestown in 1607, and the first permanent English settlement in North America. Virginia was the site of the British surrender ending the Revolutionary War, and the 10th state to join the union of colonies forming the original United States. Virginia and Virginians have figured prominently in United States history, including eight Presidents who were born in Virginia. Not surprisingly, the culture of Virginia reflects both a tradition of leadership and a respect for that history.

Virginia was among the first states to begin active development of a trauma system and to implement a designation program for trauma centers, beginning in 1980. Over the past 35 years, through the dedicated efforts of trauma system leaders, including surgeons and other physicians, nurses, hospital staff, and prehospital care providers, the state system has made substantial progress, aided by stable administrative leadership at the state level. Significant milestones include the establishment of statewide trauma triage protocols in 1997 and the establishment of the statewide trauma center fund in 2006.

Current Status

As of fiscal year 2013 the Commonwealth of Virginia had 75 acute care hospitals with 3,201-staffed beds and more than 3.4 million admission days. Seven critical access hospitals offering limited acute care were also present. Ten stand-alone rehabilitation hospitals with 410-staffed beds are located in the state, mostly in the central and most populated area. In addition, the Veterans Association operates three medical centers. The Commonwealth of Virginia has designated 15 trauma centers – 5 Level I, 4 Level II and 5 Level III. State designation makes each trauma center eligible to receive a percentage of trauma fund resources. The trauma center designation process is conducted by the state, using criteria that are similar to, but distinct from those developed by the American College of Surgeons Committee on Trauma (ACS-COT). There has historically been some inconsistency in uniform application of the standards across centers. In addition to the state verification process, three adult Level I trauma centers and one pediatric Level I trauma center have sought verification by the ACS-COT.

Emergency Medical Services (EMS), also known as prehospital care, has a strong historical presence in Virginia. The Virginia trauma system was initially created as an extension of the EMS system, and this historical structure has persisted over the years. Essentially all current trauma system oversight falls under the EMS Advisory Board, with no separate process established for trauma system issues. A statewide EMS System Plan exists, and is scheduled for regular updates, a process involving a wide range of stakeholders. The plan is both operational and strategic in nature. No specific trauma system plan exists.

The state trauma program advisory group is the Trauma System Oversight and Management Committee (TSO&MC), a subcommittee of the EMS Advisory Board. Despite its name, the TSO&MC does not have operational authority to conduct either oversight or management of the trauma system, operating instead as an advisory body to the EMS Board. This reporting relationship and the very heavy preponderance of regional EMS representatives on the EMS Advisory Board have resulted in frustrating trauma system leaders who do not feel empowered to make needed changes.

Arising from its historical roots in EMS, most of the working elements of the trauma system are focused on field triage criteria. In accordance with that historical view, designation of trauma centers and establishment of field triage criteria are viewed as the only requirements for a trauma system plan. The challenge to this viewpoint is that, in most regions, the plan has not been further defined by specific destination criteria and expectations for trauma team activation. Additionally, no performance improvement (PI) or enforcement strategies exist. The Trauma Performance Improvement Committee (TPIC), a recently created subcommittee of the TSO&MC, holds great promise for future analysis of the effectiveness of the trauma triage criteria, and in the evaluation of other system elements. Currently, the composition of the TPIC is somewhat dominated by trauma center representatives.

The data information system is currently in a state of transition, and limited ability exists to produce working reports. The re-structuring of the data systems is being undertaken to place both the EMS and trauma registry on the same platform. This has great potential for linkage of EMS and trauma center data, but this linkage process has yet to be constructed.

Assets and Advantages

The Commonwealth of Virginia trauma system has many strengths. Perhaps most important among these is a cadre of dedicated facilities and leaders who have contributed to the development of the trauma system over many years. Additionally, a relatively stable source of funding provides facilities with the incentive to participate in the trauma system.

A state process for designation of trauma centers has been established, utilizing a set of criteria that have been adapted to meet the perceived needs of the Commonwealth. The current distribution of trauma centers provides relatively good coverage for the citizens of the state. However this has occurred by chance, as the application and verification processes are not based on need for a trauma center in a specific location or serving a defined population area. Broad adoption of the Centers for Disease Control Field Triage Guidelines is apparent.

The Office of Emergency Medical Services (OEMS) is guided in trauma system management by broad legislation and regulatory authority. A stable administrative team is present within the lead agency. The trauma stakeholders are supported by a strong EMS community. The Office of EMS has implemented a strong volunteer recruitment and retention campaign, which has kept the number of volunteer prehospital providers stable when other states are facing declining numbers of volunteers.

The Commonwealth of Virginia has good access to multiple sources of population-based injury data, and it made a strong commitment to the newly developing EMS and trauma registries. Support for trauma research exists, including some possible financial support. Additionally, strong interest and support were evident to ensure that all trauma system development includes pediatric emergency readiness.

Challenges and Vulnerabilities

The TSO&MC has a generic vision and mission statement, but these do not provide any real direction or guidance to the stakeholder group or to provide a template for future growth and development. As a result, the trauma system continues to function largely as it has over the past decades, and individual challenges are addressed in isolation without a coherent sense of direction. The entrenched historical structure and the lack of a shared vision for the future are manifested in the largely uncoordinated nature of the current trauma system, which includes many highly functional independent components.

One of the most important challenges is the absence of a functional trauma system plan. Without this guiding document, efforts are fragmented without a unifying element to bring the various components together. The absence of a trauma system plan is symptomatic of the absence of a vision for trauma system development and functional integration. As a result, the trauma system is still grounded in a historical model of which evolved several decades ago, with its narrow focus on field triage criteria and center designation.

Also in concert with its historical roots, the Commonwealth of Virginia is largely a home rule state. Much of the authority and most of the resources for EMS system (and thus trauma system) development lies with the EMS regions. While the OEMS provides some central guidance, substantial autonomy is permitted at the regional/

local level. This autonomy includes regional treatment protocols, operating standards, and quality assurance processes. As a result, a high degree of variability exists between the regions with respect to clinically relevant elements. While OEMS has contracts with each of the regions, the reporting and deliverable expectations are also variable. This situation contributes to the limited system-level monitoring and performance improvement, and it creates substantial differences in the care provided to patients in different regions.

The OEMS is very heavily oriented to the EMS system, and the trauma system is seen as one of its components. The recent recruitment and hiring of a trauma critical care coordinator demonstrated the recognition of need for a greater focus on trauma. However, the OEMS remains significantly unbalanced in favor of EMS activities.

Virginia has a good data available from a variety of sources. Unfortunately, those data are not currently used on a regular basis to help inform various aspects of the trauma system function, including performance improvement.

Various stakeholders reported that rehabilitation is not well integrated with the trauma system. The participation of two rehabilitation experts during the trauma system consultation could stimulate improved dialogue, collaboration, integration and data inclusion.

Themes

A strong sense of history and tradition are important to the ongoing development and maturation of the Commonwealth of Virginia trauma system. However, it is also important to balance this with the recognition that change is necessary and an essential part of the maturation process. The stakeholders need to create and agree upon a shared vision for the future. A trauma system plan is a prerequisite for change. Contained within that plan should be an understanding that the current trauma system structure must be updated, that field triage and trauma center designation do not equate to a trauma system plan, and that an inclusive system is not the same as an unregulated system.

While regionalization is a strength, variability between and among the regions should be decreased. Statewide minimum standards are essential. Neither regional nor central authority should be absolute, but the lead agency must be able to establish firm minimum standards that apply to all regions.

Priority Recommendations

System Leadership

- Engage the Trauma System Oversight and Management Committee (TSO&MC) and its subgroups in the development of a vision for the future progress of the Virginia trauma system.
- Engage the TSO&MC in regular oversight of the trauma system, including regular review of operational data.

Lead Agency

- Ensure accountability in the Regional Councils, by tying continued regional council funding eligibility to successful completion of all contract deliverables.
- Revise the Office of Emergency Medical Services' (OEMS) organization structure to elevate the state trauma program and to provide greater support to trauma system development.

Trauma System Plan

- Develop a statewide trauma system plan.
    - Task a broad multi-disciplinary work group under the authority of the TSO&MC.
    - Include all aspects of a trauma system identified in the Health Resources and Services Administration's *Model Trauma System Planning and Evaluation* document, and use that document as a template for the plan.
    - Identify priorities and timelines for implementation.
    - Proceed through the appropriate review and approval channels.
    - Revisit and revise the plan every 3 years.

Financing

- Use the information from the recommended trauma program report to inform elected officials about the importance of the trauma system and need for their constituents to have trauma centers.

Emergency Medical Services

- Establish minimum statewide destination guideline standards for each step of the state trauma triage criteria for both adult and pediatric populations.
    - Allow regions to adapt the destination guidelines to match trauma system resources but ensure adherence to the statewide minimum standards.
- Develop and implement of a minimum set of statewide trauma treatment protocols for adult, pediatric and geriatric patients.
- Develop resources for ground critical care transport.

Definitive Care

- Establish a process for designation of new trauma centers based on need.
- Engage all acute care facilities in the trauma system.
    - Provide technical assistance and guidelines for treatment and transfer protocols.
    - Promote participation in statewide trauma system performance improvement.
- Place the trauma center designation criteria in administrative rule.

Disaster Preparedness

- Decrease the number of regional councils, and align the new regions with the current emergency preparedness regions.

Trauma Management Information System

- Contract with an expert in data system implementation to accelerate the installation, testing, and linkage of the prehospital and trauma registry products.
- Develop a reporting mechanism for the routine aggregation, interpretation and presentation of data to stakeholders, the public, and policy officials, including legislators.

Trauma System Assessment

Injury Epidemiology

Purpose and Rationale

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

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

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

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

An ongoing part of injury epidemiology is public health surveillance. In the case of injury surveillance, the trauma system provides routine and systematic data collection and, along with its partners in public health, uses the data to complete injury analysis, interpretation, and dissemination of the injury information. Public health officials and trauma leaders should use injury surveillance data to describe and monitor injury events and emerging injury trends in their jurisdictions; to identify emerging threats that will call for a reassessment of priorities and/or reallocation of resources; and to assist in the planning, implementation, and evaluation of public health interventions and programs.

Optimal Elements

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

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

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

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

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

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

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

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

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

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

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

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

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

Current Status

The Commonwealth of Virginia is fortunate to have an epidemiologist with a 0.75 full-time equivalent (FTE) commitment to injury epidemiology. This position is funded from the state's Preventive Health Block Grant. The injury epidemiologist is located with the other Virginia epidemiologists, in the Office of Family Health Services (OFHS) of the Virginia Department of Health (VDH). The epidemiologist is closely aligned with the Injury and Violence Prevention Program (IVPP), and she responds to requests for injury data from various Virginia health programs, regions, and organizations.

The epidemiologist has ready access to population-based data for the description of injury, including vital records and hospital discharge data. Access to data from the state medical examiner, motor vehicle crash data, and other datasets was reported. However, clinical data are not used at this time as the prehospital and trauma registry conversions and linkages are not yet completed. Virginia is establishing a data warehouse so that access to datasets from all state health programs can be more widely accessible. Some datasets have identifiers that allow for deterministic data linkage. It was reported that one state epidemiologist has experience with probabilistic data linkage.

A description of injuries in Virginia using population-based data was provided in the pre-review questionnaire (PRQ) that revealed patterns of injury by mechanism for mortality, hospitalizations, and cost. Further descriptions were provided by age. Injury mortality by county was also provided in graphic format for presentation. Emergency medical services (EMS) and trauma registry data were not used to further describe the pattern of injury by factors such as injury severity or length of stay. An emergency department dataset is not available to help describe the overall burden of injury for the Commonwealth of Virginia.

No statewide injury report has been produced since 2011 when the funding for the Centers for Disease Control and Prevention (CDC) Core Injury grant ended. This statewide injury report was not included in the PRQ, and it was not posted on the IVPP website. As a result the trauma program does not have ready access to this report. Factsheets for specific injury mechanisms are posted on the IVPP website, but no new factsheets have been produced since 2010. The 2011 statewide injury report provides a good model for the production of future reports with detailed tables and graphic representations for different mechanisms of injury. One region has produced an updated injury prevention needs assessment that integrates behavioral (adult hospitalization discharges for alcohol dependency syndrome and the Youth Risk Behavior Surveillance System) data to further identify injury risks. This report has elements that would be beneficial for a statewide injury report.

Virginia has an on-line injury reporting system that enables interested individuals to perform data queries. While an extremely valuable resource, at present, guidelines for its use by dataset novices have not yet been developed. However, the injury epidemiologist reported that she often assists individuals with guidance about how to conduct queries using the on-line injury reporting system

Recommendations

- Ensure that the injury epidemiologist has access to the prehospital and trauma registry data to produce a more detailed description of injury for the Commonwealth of Virginia.
- Seek legislative authority to establish a state emergency department discharge dataset.
- Encourage the new trauma statistician to develop a relationship with the injury epidemiologist to learn about software and datasets for linkage that can be used for the production of injury reports from the prehospital and trauma registries.
- Produce an updated statewide injury report that includes data from the prehospital and trauma registries.
    - Integrate elements of the injury needs assessment report produced for the University of Virginia service area into the statewide injury report.
    - Update this report at least every 3 years.
    - Frame the report to demonstrate the value of the trauma system for response to the burden of injury.

Indicators as a Tool for System Assessment

Purpose and Rationale

In the absence of validated national benchmarks, or norms, the benchmarks, indicators and scoring (BIS) process included in the Health Resources and Services Administration's *Model Trauma System Planning and Evaluation* document provides a tool for each trauma system to define its system-specific health status benchmarks and performance indicators and to use a variety of community health and public health interventions to improve the community's health status. The tool also addresses reducing the burden of injury as a community-wide public health problem, not strictly as a trauma patient care issue.

This BIS tool provides the instrument and process for a relatively objective state and sub-state (regional) trauma system self-assessment. The BIS process allows for the use of state, regional, and local data and assets to drive consensus responses to the BIS. It is essential that the BIS process be completed by a multidisciplinary stakeholder group, most often the equivalent of a state trauma advisory committee. The BIS process can help focus the discussion on various system strengths and weaknesses, can be used to set goals or benchmarks, and provides the opportunity to target often limited resources and energies to the areas identified as most critical during the consensus process. The BIS process is useful to develop a snapshot of any given system at a moment in time. However, its true usefulness is in repeated assessments that reveal progress toward achieving various benchmarks identified in the previous application of the BIS. This process further permits the trauma system to refine goals to be attained before future reassessments using the tool.

Optimal Element

I. Assurance to constituents that services necessary to achieve agreed-on goals are provided by encouraging actions of others (public or private), requiring action through regulation, or providing services directly. **(B-300)**

Current Status

The Commonwealth of Virginia has conducted three applications of the BIS criteria. The first, in 2005, the Virginia trauma system was part of the beta test associated with the creation of the tool. During that effort the entire set of 113 indicators was reviewed with the assistance of a facilitation team. The stakeholders included trauma surgeons, trauma medical directors, emergency physicians, trauma program managers, state agency personnel, and others. Results of that process were compiled by the American College of Surgeons (ACS) and provided to the Virginia Office of Emergency Medical Services (OEMS).

The ACS selected a subset of 16 BIS indicators to assess key components of the trauma system. These indicators are also used to monitor the progress made over time by states and regions after a trauma system consultation. These 16 indicators were circulated to the Trauma System Oversight and Management Committee (TSO&MC) in April 2015, using an electronic survey platform to a broad group of stakeholders. Approximately 23 responses were received. After reviewing the results, the TSO&MC chairperson requested that members and guests who had not completed the BIS during the electronic survey process complete a paper-based survey. This resulted in an additional 10 respondents. These ten respondents were predominately physicians. The secondary process revealed varying responses for multiple indicators.

The responses from both 16 BIS applications were provided. The results were presented in the percent of responses for each of the 5 scores associated with the 16 criteria as well as the percent of change between the two time periods. This approach in reporting did not facilitate “scoring per se” and precluded the direct comparison to the 2005 BIS scores which could be used as a baseline score.

Recommendations

- Convert the 2015 scores to median responses and compare to the 2005 scores.
- Establish a regular schedule to revisit the BIS in a facilitated, face-to-face forum of multi-disciplinary group of stakeholders.

Trauma System Policy Development

Statutory Authority and Administrative Rules

Purpose and Rationale

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

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

Optimal Elements

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

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

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

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

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

Current Status

The Commonwealth of Virginia has enabling legislation and provides broad authority to the Board of Health (BOH) for the trauma system. The Code of Virginia (COV) Chapter 32 authorizes the BOH to develop an Emergency Medical Care System to include the development of a state EMS plan. The BOH has designated the VDH OEMS as the lead agency for the state trauma system.

Chapter 32 of the COV also establishes the state EMS Advisory Board and defines its membership, purpose, and duties. The EMS Advisory Board consists of 28 members all appointed by the Governor, and it is representative of stakeholders throughout the state. The EMS Advisory Board has a number of subcommittees that provide excellent opportunities for stakeholders and the public to participate in the planning and policy making process for both the EMS and trauma system.

EMS regulations are located in Virginia Administrative Rules (2 VAC5). Many of the trauma program regulations are also located in this section. The OEMS delegates some of these responsibilities to the 11 regional councils through a contractual process. The OEMS monitors the regional councils for compliance with contract requirements to ensure the VAC rules are met. An example is the requirement for a performance improvement process. The contract is fairly specific in addressing this requirement.

The process for trauma system policy change requires any new proposals or amendments to the Statute or Administrative Rules first be presented through the appropriate EMS Advisory Board subcommittee and then to the EMS Advisory Board. Once approved by the EMS Advisory Board recommendations are forwarded to the BOH for consideration and adoption. This process has excellent participation from interested parties.

Over time the state's trauma system has become much more complex than when the original legislation was enacted. The trauma system now includes15 designated trauma centers working in collaboration with 11 regional councils. Any future federal and state changes to the healthcare system will require appropriate planning to meet the changes needed in the EMS and trauma system.

Although the COV addresses some components of an inclusive trauma system, it does not specifically require the development of an inclusive statewide trauma system plan or a plan for any other time-sensitive diagnosis, such as stroke and ST elevation myocardial infarction (STEMI). A statewide trauma plan would strengthen and improve the care being delivered to the citizens of the state. Many components of a trauma system are not clearly addressed in the COV and administrative rules, and these components are necessary to maintain trauma system infrastructure, planning, oversight, and future development.

The definition of a trauma patient varies among the 11 regional councils as the contract with the OEMS requires each regional council to establish a definition. To effectively plan and provide consistent trauma care statewide, it is imperative that all regions develop plans using the same baseline. The same challenge exists regarding the standard of trauma care being delivered by prehospital providers. Regional councils have developed and approved EMS treatment protocols; however, the local EMS agency medical director has the ability to develop their own treatment protocols. Allowing some local flexibility is often appropriate; however, it is essential for the state to establish a minimal standard of care. The public and state visitors have reasonable expectations that they will receive at least the minimum statewide standard of care when accessing the EMS system.

Virginia currently requires a state designation review process conducted by in-state reviewers. Some differences exist in the ACS verification requirements and the Commonwealth of Virginia's requirements. Three of the five Level I trauma centers have received ACS verification in addition to the state designation review. However, with existing administrative rules ACS verification cannot substitute for the state verification process prior to designation. An opportunity to reduce staff time and avoid potential conflicts of interest may exist if trauma centers were allowed the option of an ACS verification review that integrates the additional state criteria for designation into the survey visit.

Some discussion during the trauma system consultation (TSC) centered upon the potential need for pediatric trauma center state designation. Virginia should consider establishing a process to designate two levels of pediatric trauma centers. This may require amending the administrative rules.

Recommendations

- Consider amending The Code of Virginia 32.1.111.3 "The Statewide Emergency Medical Care System" to require the development and implementation of an inclusive statewide trauma system plan and a plan for other time-sensitive diagnoses.
- Establish a single statewide definition of a trauma patient.
- Codify, in regulation, the option for trauma centers to utilize the ACS verification process in lieu of the state site review process.
- Codify, in regulation, the designation of two levels of pediatric trauma centers.

System Leadership

Purpose and Rationale

In addition to lead agency staff and consultants (for example, trauma system medical director), there are other significant leadership roles essential to developing mature trauma systems. A broad constituency of trauma leaders includes trauma center medical directors and nurse coordinators, prehospital personnel, injury prevention advocates, and others. This broad group of trauma leaders works with the lead agency to inform and educate others about the trauma system, implements trauma prevention programs, and assists in trauma system evaluation and research to ensure that the right patient, right hospital, and right time goals are met. There is a strong role for the trauma system leadership in conveying trauma system messages, building communication pathways, building coalitions, and collaborating with relevant individuals and groups. The marketing communication component of trauma system development and maintenance begins with a consensus-built public information and education plan. The plan should emphasize the need for close collaboration between coalitions and constituency groups and increased public awareness of trauma as a disease. The plan should be part of the ongoing and regular assessment of the trauma system and be updated as frequently as necessary to meet the changing environment of the trauma system.

When there are challenges to providing the optimal care to trauma patients within the system, the leadership needs to effect change to produce the desired results. Broad system improvements require the ability to identify challenges and the resources and authority to make changes to improve system performance. However, system evaluation is a shared responsibility. Although the leadership will have a key role in the acquisition and analysis of system performance data, the multidisciplinary trauma oversight committee will share the responsibility of interpreting those data from a broad systems perspective to help determine the efficiency and effectiveness of the system in meeting its stated performance goals and benchmarks. All stakeholders have the responsibility of identifying opportunities for system improvement and bringing them to the attention of the multidisciplinary committee or the lead agency. Often, subtle changes in system performance are noticed by clinical care providers long before they become apparent through more formal evaluation processes.

Perhaps the biggest challenge facing the lead agency is to synergize the diversity, complexity, and uniqueness of individuals and organizations into a finely tuned system for prevention of injury and for the provision of quality care for injured patients. To meet this challenge, leaders in all phases of trauma care

must demonstrate a strong desire to work together to improve care provided to injured victims.

Optimal Elements

I. Trauma system leaders (lead agency, trauma center personnel, and other stakeholders) use a process to establish, maintain, and constantly evaluate and improve a comprehensive trauma system in cooperation with medical, professional, governmental, and other citizen organizations. **(B-202)**

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

III. Trauma system leaders, including a trauma-specific statewide multidisciplinary, multiagency advisory committee, regularly review system performance reports. **(B-206)**

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

Current Status

The leadership structure of the Virginia trauma system is well described and well established for the provision of advisory input to the lead agency, the BOH. The main advisory body is the State EMS Advisory Board, a 28-member group established and defined in the COV. Members are appointed by the Governor, and each may serve a maximum of two 3-year terms. The composition of the EMS Advisory Board includes representatives from the 11 EMS regions, representatives from county and municipal organizations, fire service representatives, ambulance service representatives, the Virginia Hospital Association, a consumer representative, and professional organizations representing the medical and nursing professions.

The EMS Advisory Board has several subcommittees that provide input, organized along functional lines, patient care, administrative, infrastructure, and professional development. Under the patient care subgroup four subcommittees exist, including the TSO&MC, Emergency Medical Services for Children (EMSC), Medical Direction, and Medevac.

The TSO&MC is the primary trauma system advisory group. The chairperson of the TSO&MC is a gubernatorial appointee, who also sits on the EMS Advisory Board. The composition of the TSO&MC is not set in statute. Membership on the TSO&MC is approved by the EMS Advisory Board. Members also serve a maximum of two 3-year terms.

In previous years the TSO&MC membership exceeded 40 people. Recently, the TSO&MC was restructured to its current configuration, with 15 members chosen to represent the spectrum of stakeholders. The TSO&MC is heavily weighted toward trauma center representatives, with 10 of 15 members in this category (6 from Level I centers, 2 from Level II centers and 2 from Level III centers). This composition contrasts strongly with the relatively heavy prehospital representation on the EMS Advisory Board. A potential concern is the lack of representation from the entire continuum of the trauma system and professional organizations.

The broad stakeholder involvement in system leadership is achieved through participation in subcommittees and workgroups of the TSO&MC. The formal subcommittees include the Trauma Process Improvement committee and the newly-formed Injury and Violence Prevention committee. The TSO&MC is also supported by an active trauma program manager group and trauma registrar group, each composed of volunteer members from Virginia trauma centers, however, neither group has a formal organization or a formal relationship with the TSO&MC.

Despite its name, the TSO&MC does not actually perform direct oversight or management functions. The TSO&MC does not regularly review system performance data, and historically, it has not been involved in development of patient care guidelines. The work of the TSO&MC has been primarily focused on the development of standards for field identification of trauma patients, destination policy for trauma patients (falling under the heading of trauma triage), and updates of the trauma center designation criteria.

Stakeholders reported that the process for putting forward recommendations and changes to existing documents is time-consuming and involves considerable discussion, especially around issues that have proven contentious. At the same time, participants expressed that generally the lead agency is responsive and provides adequate communication regarding its decisions. Many stakeholders expressed concern regarding trauma system progress, but the TCS team perceived that this frustration seemed to be related to a lack of ability to enforce adoption of guidelines developed through the TSO&MC. Most prominent of these are destination guidelines for trauma patients transported from the field.

The TSO&MC has a generic vision and mission statement, but these do not provide any real direction or guidance to draw together the stakeholder group and provide a template for future growth and development. As a result, the

trauma system continues to function largely as it has over the past decades, and individual challenges are addressed in isolation without a coherent sense of direction. The entrenched historical structure and the lack of a shared vision for the future are manifested in the largely uncoordinated nature of the current trauma system, which includes many highly functional independent components. An over-arching strategy and framework for trauma system integration would be beneficial.

Recommendations

- Engage the Trauma System Operations and Management Committee (TSO&MC) and its subgroups in the development of a vision for the future progress of the Virginia trauma system.
- Utilize the vision developed to create a trauma plan based upon that vision.
- Engage the TSO&MC in regular oversight of the trauma system, including regular review of operational data.
- Engage the TSO&MC in the development of best practice treatment guidelines for use in trauma centers and system hospitals.
- Formalize the status of the trauma program managers group as a subcommittee or working group of the TSO&MC.
- Formalize the status of the trauma registrars group as a subcommittee or working group of the TSO&MC.
- Consider re-evaluation of the TSO&MC membership with the intent to broaden stakeholder involvement.

Coalition and Community Support

Purpose and Rationale

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

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

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

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

Optimal Element

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

Current Status

The Commonwealth of Virginia identified an extensive list of stakeholders for the trauma system. This list is predominantly composed of trauma center medical directors, trauma program managers, and registrars from the 15 trauma centers, EMS providers and agencies, as well as regional council managers. The state would benefit from a broader coalition of stakeholders, such as professional organizations, voluntary organizations, injury prevention advocates, media representatives, and elected state and local officials.

The state previously had funding for a CDC Core Injury grant, during which time an active injury prevention coalition existed. The IVPP manager maintains a list of individuals interested in injury prevention. These individuals can still be engaged with through email, even though regular face-to-face meetings do not occur. The TSO&MC recently formed an Injury and Violence Prevention Subcommittee that has provided a mechanism for trauma center injury prevention coordinators to meet. No media representatives or elected officials were reported to be members of this stakeholder group.

The TSO&MC meetings are open to the public. Individuals interested in trauma system issues are welcome to attend, and they may express opinions and suggestions for trauma system development. Opportunities exist for development of future trauma system leaders through participation on TSO&MC subcommittees and work groups.

It was reported in the PRQ that stakeholders have access to the agendas and meeting minutes for the TSO&MC and the EMS Advisory Board meetings through the Virginia Town Hall website. This website appears to function most effectively to notify stakeholders of scheduled meetings. The notice for the September 3, 2015 TSO&MC meeting did not reflect an agenda or prior meeting minutes as of the scheduled meeting date. It was reported that meeting minutes are often posted on the OEMS website. When reviewing the OEMS website, minutes for the EMS Advisory Committee were posted, but minutes from TSO&MC minutes were not apparent. An EMS newsletter is produced quarterly and disseminated on the OEMS website.

The Commonwealth of Virginia does not produce a report on the status of the trauma system and its contribution to the care and health of injured citizens. Such a report would be valuable to educate the general public and elected officials about the value of the trauma system.

Recommendations

- Build a broad coalition of stakeholders to support of the state trauma system.
    - For example, engage state chapters of the American College of Emergency Physicians and the Emergency Nurses Association, voluntary injury prevention organizations such as Mothers Against Driving Drunk and Kiwanis, elected officials, and media representatives, among others.
- Develop a plan for raising public awareness about the trauma system and its importance to the state population.
- Develop a report about the trauma system and its contribution to the heath of Virginia residents, the nature of injuries treated, and geographic regions with more limited access to services.
    - Identify potential partners and resources (volunteers, communication student interns, and funding) to format and prepare the trauma system report for the general public.
    - Ensure that information about the trauma system, as well as links to injury data and injury prevention resources, are readily available on the OEMS website and social media outlets.
- **Use the information from the recommended trauma program report to inform elected officials about the importance of the trauma system and need for their constituents to have trauma centers.**

Lead Agency and Human Resources Within the Lead Agency

Purpose and Rationale

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

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

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

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

Optimal Elements

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

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

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

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

Current Status

The VDH OEMS is the designated as the trauma system lead agency by the BOH through administrative rule. The agency is to be commended for its efforts to increase the manpower resources for the state trauma program to meet the growing needs of the trauma system. The trauma critical care coordinator position has been re-established and now has a qualified person serving in the position. A new statistician has been hired to fill a vacancy, and a second statistician will be hired soon. Two positions have also been established for the trauma registry in preparation for the new data system coming on-line soon.

Trauma program performance improvement (PI) is essential to the effectiveness of the trauma system. This responsibility has for the most part been delegated through contract to the 11 regional councils. With the limited resources in the lead agency it is not clear how well these contract deliverables are met. Adding a trauma PI coordinator position with the responsibility of monitoring statewide trauma system PI and supporting with PI coordination at the regional level would be valuable to the trauma program.

The OEMS includes many other deliverables in the regional council contracts, in addition to PI. It is important for an effective EMS and trauma system to have all deliverables accomplished in accordance with the contract requirements. It was apparent to the TSC team that OEMS and the regional councils have worked diligently to build good working relationships, but it is also important that each region be held accountable to carry out its contract obligations. OEMS should

develop a process to monitor the contract deliverables more effectively. One suggestion for improvement would be to revise the regional council contracts tying eligibility for continued funding to successful completion of all the contract deliverables.

The current organizational structure in the OEMS trauma program is flat with all staff reporting to the trauma program manager who also has responsibilities for programs for other time-sensitive diagnoses. While this organizational structure may have worked well in the past, the state trauma program is now expanding and adding staff. A new organizational structure should be considered, such as with giving the trauma critical care coordinator a new management working title and supervisory responsibilities for the trauma registry staff and the proposed injury prevention coordinator. Such a change would provide an opportunity for more daily oversight and guidance to the trauma program staff. It would also provide additional time for the trauma program manager to focus on more global issues related to the trauma program, as well as manage the non-trauma responsibilities now placed in the program.

The state trauma program does not have a medical director focused solely on the development and management of the trauma system. The EMS Medical Director who works an estimate 0.2 FTE has limited time to support the trauma system. With the amount of work needed to develop and sustain the state trauma program, OEMS should consider establishing a part-time or contractual position to provide medical direction for the trauma program. This physician will need to work collaboratively with the agency EMS Medical Director.

Recommendations

- **Establish a Performance Improvement position for the state trauma program.**
- **Establish a Trauma Medical Director position for the lead agency.**
- **Ensure accountability in the regional council contracts and tie continued funding eligibility to the council meeting all deliverables.**
- **Revise the Office of Emergency Medical Services' (OEMS) organization structure to elevate the state trauma program and to provide greater support to trauma system development.**

Trauma System Plan

Purpose and Rationale

Each trauma system, as defined in statute, should have a clearly articulated trauma system planning process resulting in a written trauma system plan. The plan should be built on a completed inventory of trauma system resources identifying gaps in services or resources and the location of assets. It should also include an assessment of population demographics, topography, or other access enhancements (location of hospital and prehospital resources) or barriers to access. It is important that the plan identify special populations (for example, pediatric, elderly, in need of burn care, ethnic groups, rural) within the geographic area served and address the needs of those populations within the planning process. A needs assessment (or other method of identifying injury patterns, patient care review/preventable death study) should also be completed for initial trauma system planning and updated periodically as needed to assess system changes over time.

The trauma system plan is developed by the lead trauma agency based on the results of a needs assessment and other data resources available for review. It describes the system design, integrated and inclusive, with adopted standards of care for prehospital and hospital personnel and a process to regularly review the plan over time. The plan is built on input from trauma advisory committees (or stakeholder groups) that assist in analyzing data, identifying resources, and developing system standards of care, including system policies and procedures and overall system design. Ideally, although every stakeholder group may not be satisfied with the plan or system design, the plan, to the extent possible, should be based on consensus of the advisory committees and stakeholder groups. These advisory groups should be able to review the plan before final adoption and approve the plan before it is submitted to the lead agency with authority for plan approval.

The trauma system plan is used to guide system development, implementation, and management. Each component of the trauma system (for example, prehospital, hospital, communications, and transportation) is clearly defined and an established service level identified (baseline) with goals for enhancement (benchmark). Within the plan are incorporated other planning documents used to ensure integration of similar services and build collaboration and cooperation with those services. Service plans for emergency preparedness, EMS, injury prevention and control, public health, social services, and mental health are examples of services for which the trauma system plan should include an interface between agencies and services.

Optimal Element

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

a. The trauma system plan clearly describes the system design (including the components necessary to have an integrated and inclusive trauma system) and is used to guide system implementation and management. For example, the plan includes references to regulatory standards and documents and includes methods of data collection and analysis. **(I-203.4)**

Current Status

The PRQ states that the Commonwealth of Virginia "does not have a trauma system plan". It goes on further to describe that a semblance of such a plan is incorporated into the EMS system strategic and operational plan. The BOH is responsible for overseeing the revision the EMS system plan on a 3- year cycle.

In reviewing the EMS System Plan, only a limited number of action steps include or involve the trauma systems or trauma system components (e.g., 2.1.2 Determine quality of EMS service and conduct analysis of trauma triage effectiveness, and 3.1.5 Maintain and enhance the Trauma Center designation process). It is noted that enhancements or improvements to the EMS system may have a direct impact on the prehospital care of the injured patient, and the timely disposition of the patient to a trauma center that is best matched to meet the needs of that particular patient.

A trauma triage plan has been developed by the TSO&MC, approved by the BOH, and further refined and adapted at the regional and local level. A misperception seems to exist that this plan serves as a surrogate for a trauma system plan. Limited recognition of the public health approach identified in the Health Resources and Services Administration (HRSA) 2006 *Model Trauma System Planning and Evaluation* (MTSPE) document was noted by the TSC team. The MTSPE describes how the identified components of a trauma system correspond to the three core functions of public health (assessment, policy development, and assurance). System assessment focuses on the injury problem, system resources and performance, and benchmarks for the assessment phase. Under policy development the considerations include: designation of the lead agency, description of the role of the lead agency, enabling legislation, state trauma system plan, preparation for the plan, management information system, and benchmarks for policy development.

Under assurance the sections are inclusive of enforcement and regulation, patient destination and hospital care, EMS systems and assurance. A trauma system plan is essential to serve as a guide for all stakeholders providing a shared vision and direction for the short-term, intermediate, and long-term stages of development for the Virginia trauma system. The plan's development process provides an opportunity for consensus building and engagement of the stakeholders. Implementation of individual objectives within the plan can then become projects for individual workgroups that further engage stakeholders.

Recommendations

- **Develop a statewide trauma system plan.**
    - **Task a broad multi-disciplinary work group under the authority of the TSO&MC.**
    - **Include all aspects of a trauma system identified in the Health Resources and Services Administration's *Model Trauma System Planning and Evaluation* document, using that document as a template**
    - **Identify priorities and timelines for implementation**
    - **Proceed through the appropriate review and approval channels.**
    - **Revisit and revise the plan every 3 years.**

System Integration

Purpose and Rationale

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

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

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

Optimal Elements

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

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

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

Current Status

In the PRQ the standard of system integration is addressed at the regional level rather than at the VDH level. The OEMS develops a contract every year with the 11 regional councils, each of which a 501(c) 3 organization. In return the regional councils perform defined duties for the advancement of the EMS system. Many of these duties advance the region's capabilities to improve the care capabilities for the severely injured patient. Many regions have developed their own modifications of the State trauma triage plan to meet local needs. Some efforts related to system integration for EMS functions occur at the state level. For example, efforts are ongoing statewide to improve the care of the patient with acute stroke or STEMI. Such integration involves training for prehospital providers, assurance of rapid critical care transport capability, and other system components essential for optimal survival of patients with time-sensitive emergency medical, surgical, and traumatic conditions.

System integration at the state level will be assisted by the new Injury and Violence Prevention subcommittee of the TSO&MC. The implementation of the new trauma registry system, expected to be fully implemented in 2016, will allow detailed description of the injury patterns, both at the state and regional level. It can guide the selection of injury prevention programs appropriate to the needs of Virginians with critical injuries. It is also anticipated that data from the trauma registry will assist in identifying additional issues, such as locations with a higher incidence of intentional injury that may be useful for law enforcement. Another example could be EMS responses in which patients have a need for social services or child protective services.

While some communication was reported between the designated trauma centers and the Disaster Preparedness program, the state trauma program and Disaster Preparedness Program do not appear to be well integrated. Communication, albeit variable between regions, could possibly be improved. Many disaster scenarios will involve many severely injured patients, and a better understanding by the trauma surgeons and the hospitals regarding the types of injuries expected under different disaster scenarios might be beneficial.

At the local level some efforts of system integration are especially robust. One region experienced a mass casualty incident (MCI) on a university campus. This region subsequently developed and implemented a comprehensive program to improve the response and survival from mass shootings. These materials are now utilized widely within this region, and they are also available to other regions. These materials appear to be “best practice,” and they should be disseminated throughout the Commonwealth of Virginia. Additionally, presentations to the media and elected officials should also be considered. The TSC team perceived that the 11 regional councils appear to collaborate and share information well through regular meetings and informal communications.

Recommendations

- Continue to implement the trauma registry, and request the Injury and Violence Prevention Subcommittee of the Trauma System Operations and Management Committee to identify appropriately targeted statewide and regional injury prevention priorities.
- Recognize the strengths and successes of regional trauma programs.
    - Identify, promote, and share best practices statewide,
    - Develop a communications strategy to inform elected officials, the general public, and the news media.
- Improve the linkage between the Disaster Preparedness Program and the state trauma program.

Financing

Purpose and Rationale

Trauma systems need sufficient funding to plan, implement, and evaluate a statewide or regional system of care. All components of the trauma system need funding, including prehospital, acute care facilities, rehabilitation, and prevention programs. Lead agency trauma system management requires adequate funding for daily operations and other important activities such as advisory committee meetings, development of regulations, data collection, performance improvement, and public awareness and education. Adequate funding to support the operation of trauma centers and their state of readiness to care for seriously injured patients within the state or region is essential. The financial health of the trauma system is essential for ensuring its integrity and its improvement over time.

The trauma system lead agency needs a process for assessing its own financial health, as well as that of the trauma system. A trauma system budget should be prepared, and costs should be reported by each component, if possible. Routine collection of financial data from all participating health care facilities is encouraged to fully identify the costs and revenues of the trauma system, including costs and revenues pertaining to patient care, administrative, and trauma center operations. When possible, the lead agency financial planning should integrate with the budgets and costs of the EMS system and disaster, rehabilitation, and prevention programs to enable development of a comprehensive financial health report.

Trauma system financial planning should be related to the trauma plan outcome measures (for example, patient outcome measures such as mortality rates, length of stay, and quality-of-life indicators). Such information may demonstrate the value added by having a trauma system in place.

Optimal Elements

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

a. Financial resources exist that support the planning, implementation, and ongoing management of the administrative and clinical care components of the trauma system. **(I 204.2)**

b. Designated funding for trauma system infrastructure support (lead agency) is legislatively appropriated. **(I-204.3)**

c. Operational budgets (system administration and operations, facilities administration and operations, and EMS administration and operations) are aligned with the trauma system plan and priorities. **(I-204.4)**

II. The financial aspects of the trauma systems are integrated into the overall performance improvement system to ensure ongoing fine tuning and cost-effectiveness. **(B-309)**

a. Collection and reimbursement data are submitted by each agency or institution on at least an annual basis. Common definitions exist for collection and reimbursement data and are submitted by each agency. **(I-309.2)**

Current Status

The Commonwealth of Virginia is very fortunate to have dedicated funding to support trauma centers, EMS regional councils, and the state trauma system infrastructure. Trauma center funds are tied to fees associated with reinstatement of driver's licenses and fines associated with impaired driving. EMS funds are associated with motor vehicle registration fees.

Since 2006, a total of $80 million has been collected and provided to trauma centers to support the costs of readiness. It is very significant that the state legislature has seen the value of the trauma system, and has sustained the level of funding support since 2006. All trauma centers receive 1% of the fund, which serves as an incentive for hospitals that have achieved Level III trauma center designation. The remainder of the funding is distributed to all trauma centers using a formula based on number of admissions for motor vehicle-related injuries.

Each year a small committee is selected to review the permissible uses of the trauma center fund that are included in trauma center contracts. Each trauma center presents a plan for use of funds to the OEMS and subsequently a report of actual fund use. Information from trauma center fund use is compiled and provided to the finance committee chairpersons in the Virginia House and Senate.

Funding for the OEMS, including the trauma system is provided through the EMS Four for Life fund generated by motor vehicle registration fees. The OEMS receives 10% of this fund to support infrastructure (administrative responsibilities, EMS registry, and trauma registry). The funds remaining are used for regional council contracts, training, and equipment by rural EMS agencies.

The state legislature authorizes the allocation of dollars from these funds each year. The OEMS had a prior experience in which the funds would be potentially diverted to other legislature priorities. In that case, one fee was increased so that the OEMS funding was not decreased. Threats to the trauma center funding and OEMS funding may still exist as the legislature must consider how to address rising Medicaid and Medicare payments. The trauma system program has not proactively prepared to address a potential threat to the established funding. Individuals from trauma centers have not expressed appreciation to elected officials regarding their ongoing support for trauma center funding and how that funding has improved the lives of Virginia citizens.

Trauma centers do not report the cost of care or charges associated with the care of injured patients. Such information would be valuable in demonstrating the need for trauma-readiness funding beyond what might be reimbursed by payers. Charge or cost data could be collected by adding a data field to the trauma registry, and this data could then be compiled for the trauma system annual report.

Recommendations

- **Use the information from the trauma program report to inform elected officials about the importance of the trauma system and support to trauma centers for their constituents.**
- Add a data field to the trauma registry to report the payer sources and charges for care for admitted individuals.
- Produce a report of the costs, the value of the trauma system and trauma care, and the importance of maintaining readiness to treat persons with severe injuries in the Commonwealth of Virginia.

Trauma System Assurance

Prevention and Outreach

Purpose and Rationale

Trauma systems must develop prevention strategies that help control injury as part of an integrated, coordinated, and inclusive trauma system. The lead agency and providers throughout the system should be working with business organizations, community groups, and the public to enact prevention programs and prevention strategies that are based on epidemiologic data gleaned from the system.

Efforts at prevention must be targeted for the intended audience, well defined, and structured, so that the impact of prevention efforts is system-wide. The implementation of injury control and prevention requires the same priority as other aspects of the trauma system, including adequate staffing, partnering with the community, and taking advantage of outreach opportunities. Many systems focus information, education, and prevention efforts directly to the general public (for example, restraint use, driving while intoxicated). However, a portion of these efforts should be directed toward emergency medical services (EMS) and trauma care personnel safety (for example, securing the scene, infection control). Collaboration with public service agencies, such as the department of health is essential to successful prevention program implementation. Such partnerships can serve to synergize and increase the efficiency of individual efforts. Alliances with multiple agencies within the system, hospitals, and professional associations, working toward the formation of an injury control network, are beneficial.

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

- A needs assessment focusing on the public information needed for media relations, public officials, general public, and third-party payers, thus ensuring a better understanding of injury control and prevention
- Needs assessment for the general medical community, including physicians, nurses, prehospital care providers, and others concerning trauma system and injury control information
- Preparation of annual reports on the status of injury prevention and trauma care in the system
- Trauma system databases that are available and usable for routine public health surveillance

Optimal Elements

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

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

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

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

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

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

b. The effect or impact of outreach programs (medical and community training and support and prevention activities) is evaluated as part of a system performance improvement process. **(I-306.3)**

Current Status

The Injury and Violence Prevention subcommittee of the TSO&MC was recently established. Its membership is composed of trauma program managers (TPMs) and injury prevention coordinators from the designated trauma centers, and the manager of the state's IVPP. Broadening the committee membership to include representatives from multiple agencies and associations that offer injury prevention programs should be considered, e.g., public health departments, fire, police, Mother Against Drunk Driving (MADD), and Students Against Destructive Decisions (SADD). This broadened membership would help to ensure an integrated, coordinated and inclusive approach to injury prevention.

The Injury and Violence Prevention subcommittee has identified its initial two focus areas, geriatric trauma and motorcycle safety. This subcommittee could be

charged with the responsibility of conducting an injury needs assessment, and preparing an annual report in collaboration with the epidemiologist. The annual report could be used as a valuable education outreach tool targeting the public, local constituencies, elected officials, and other policy makers.

The Trauma Critical Care Coordinator is charged with the responsibility of providing support to the TSO&MC, as well as its subcommittees. It is important to note that the Injury and Violence Prevention subcommittee work cannot be done by one person. Subcommittee members will need to ensure the committee work is appropriately assigned to members. Another potential option may be to have the IVPP manager to provide support and share in work responsibilities.

The PRQ contained an extensive list of injury prevention activities conducted throughout the state. It is not known how trauma centers identify interventions for their selected prevention focus. A clearinghouse of evidence-based injury prevention programs would be a valuable resource for trauma center injury prevention coordinators, EMS, and other organizations with an injury prevention focus.

No formal relationship was reported to exist between the VDH IVPP, the injury epidemiologist, and the state trauma program. Strengthening the informal relationship will help to ensure consistent and open lines of communications as the Injury and Violence Prevention subcommittee matures. The TPMs routinely use their trauma center registry data to identify target areas for local injury prevention activities. The epidemiologist reported that she is available to help with reports as needed. The TPMs are encouraged to tap into the state epidemiological data sources to validate their priorities, or to readjust priorities.

No current state injury prevention plan exists, and the one produced in 2011 is not made available on the IVPP website. The development of a new injury prevention plan could help direct the efforts of the newly formed Injury and Violence Prevention subcommittee. The plan could be the foundation for identifying target audiences, and prioritizing implementation of injury prevention programs in the regions.

The state trauma fund allows the trauma centers to use a portion of their allocated amount for injury prevention activities. However, no dedicated stable funding source exists to support injury prevention staff, programs, or ongoing activities from the OEMS.

In most instances, injury prevention activity at the trauma center level is the responsibility of the TPM. In order to more effectively contribute to meaningful injury prevention activities, consideration should be given to strengthening the requirements for dedicated personnel to perform the injury prevention activities required for trauma center designation.

Recommendations

- Encourage participation on the Injury and Violence Prevention subcommittee that extends beyond the trauma center representatives, e.g., state injury epidemiologist, emergency medical services, fire, police, public health, and injury prevention organizations.
- Identify injury prevention priorities based on state epidemiology data and develop a state injury prevention plan.
    - Complete the plan within 1 year.
    - Implement one statewide injury prevention initiative the following year.
- Strengthen the Virginia trauma center designation criteria specific to injury prevention requirements.
    - Require Level I trauma centers to have a dedicated full or part-time injury prevention position that is not the trauma program manager.
- Strengthen and maintain the relationship between the state trauma program and the Virginia Department of Health's Injury and Violence Prevention Program.
- Implement a web-based clearinghouse for the collection and maintenance of evidence-based injury prevention programs that can be accessed by the public.

Emergency Medical Services

Purpose and Rationale

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

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

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

review of triage and treatment decisions allows for continuing quality improvement of the triage and prehospital care protocols. A more detailed discussion of in-field (primary) triage criteria is provided in the section titled: System Coordination and Patient Flow (p 20) (White Book).

Human Resources

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

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

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

the form of quality improvement activities, training, clinical opportunities, and support to the system medical director.

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

Integration of EMS within the Trauma System

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

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

Optimal Elements

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

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

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

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

d. The trauma system medical director is actively involved with the development, implementation, and ongoing evaluation of system dispatch protocols to ensure they are congruent with the trauma system design. These protocols include, but are not limited to, which resources to dispatch, for example, ALS versus BLS, air-ground coordination, early notification of the trauma care facility, pre-arrival instructions, and other procedures necessary to ensure that resources dispatched are consistent with the needs of injured patients. **(I-302.4)**

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

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

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

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

a. In cooperation with the prehospital certification and licensure authority, set guidelines for prehospital personnel for initial and ongoing trauma training,

including trauma-specific courses and courses that are readily available throughout the state. **(I-310.1)**

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

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

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

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

Current Status

The COV 31.1-111.3 gives BOH the authority and duty to develop the state EMS system, including the state trauma system. The COV requires an EMS plan, and the current version is extensive. Virginia has long and robust history in EMS with some programs dating back to 1974. Virginia operates in a largely decentralized EMS system with most of the authority and control given by the OEMS to the 11 regional councils by contract. Regional councils were each created as 501(c) (3) non-profit entities with the ability to raise local funds in addition to state funding provided by contract Variation is found in their organizational structure and funding level. The COV states that the BOH is unable to change the regional borders or decrease the operating funds received from the VHD/OEMS.

Overall the EMS system is well funded with a fairly secure revenue source. One funding source created to help provide EMS education and equipment is the Four for Life program ($4 from each vehicle registration fee is designated by the COV for EMS agencies to help meet various needs). An additional $0.25 per vehicle was added to assist EMS education. Volunteer agencies throughout the Commonwealth, particularly in rural areas have access to significant funding via the rescue squad assistance fund, which help helps keep equipment up-to-date and provides for educational assistance.

Some ambulances, particularly basic life support (BLS) ambulances, are still lacking all recommended pediatric equipment. Only 25.3% of BLS and 43.9% of advanced life support (ALS) ambulances carry all nationally recommended pediatric equipment. But overall at the time surveyed, on average BLS vehicles carried 96% of the recommended pediatric equipment and ALS vehicles carried 97% of the equipment. The items to care for children are well supported, but a gap has been identified for the safe transport of children in the back of the ambulance – that of using recommended pediatric restraint devices. Issues arise when no car seat is available or cannot be used because of patient condition. Funding should be available to support making pediatric restraint devices more available.

Virginia has a long-standing and proud EMS volunteer history. The volunteer rescue squads are the backbone of this EMS system. EMS personnel are a valuable resource, and challenges exist regarding recruitment and training of EMS providers. Virginia has many innovative programs that focus on retention of EMS providers. The OEMS, Virginia Association of Volunteer Rescue Squads (VAVRS), and the Western Virginia EMS Council in Roanoke teamed together to contract with Renaissance Resources, a Richmond-based consulting firm, to develop strategies and to identify solutions to enhance the retention of volunteer and career EMS personnel. This effort resulted in the EMS Workforce Retention Tool Kit. Strategies were reported to be successful in recruiting enough new volunteers to cover attrition, a circumstance that is better than occurs in many states.

The EMS rules (12VAC5-31-1810) specify qualifications for EMS physician endorsement and delegation of responsibilities for the operational medical directors (OMD). The OEMS reported that the State EMS Medical Director position is considered a wage (or part-time) position with no benefits. It is limited to no more than 1500 hours a year or approximately 29 hours a week. The current State EMS Medical Director is a full time emergency physician who reported spending approximately 416 hours annually (0.2 FTE) to the EMS medical director role. OEMS reported that the State EMS Medical Director is challenged to address all urgent issues in a timely manner, such as patient care complaints, patient care investigations, and OMD issues due to limited hours. Additional hours for a State EMS Medical Director are desirable, and funding is available to support additional hours. The OEMS reported, “If the State EMS Medical Director position could become a full-time position, with full state benefits and competitive salary compensation, the workload could justify it and we would not have the issues of part-time medical direction when available.”

Virginia has no minimum statewide EMS protocols, and no mandate exists for the regions to include specific named protocols for use by all EMS agencies. The regions must have a set of protocols, but the TSC team found great variation in the depth and intricacy of these protocols. While the regional councils are

required to have a set of protocols, EMS agency OMDs can choose to modify them or develop EMS agency-specific protocols. Thus the standard of prehospital care is inconsistent region to region, and even within EMS regions. The federal EMSC program has established a national performance measure, which is a complete set of pediatric protocols. A TSC team review of the regional council protocols revealed few pediatric protocols.

The Prehospital and Inter-hospital State Trauma Triage Plan was last updated in 2011, and it currently is under review. As noted in the PRQ, a particular emphasis of the review is special populations, such as pediatric and geriatric trauma.

Stakeholders attending the TSC open session identified a lack of ground Critical Care Transport (CCT) ambulances, as well as a uniform definition of a CCT ambulance. Higher utilization of air medical transports often results when a lack of qualified ground CCT is found. Volunteer rescue squads in rural areas often must choose between leaving their area without EMS service, and calling air medical services for transport to a trauma center. Local facilities also rely on air medical services for interfacility transfer.

Recommendations

- Strengthen the language in 12VAC5-31-860 (48) to update of safe transport of children in back of ambulances
    - Use the NHTSA Best Practice Recommendations for Safe Transportation of Children in Emergency Ground Ambulances (Sept 2012)
    - Allocate funds to assist EMS services in purchasing necessary devices.
- **Establish minimum statewide destination guideline standards for each step of the state trauma triage criteria for both adult and pediatric populations.**
    - **Allow regions to adapt the destination guidelines to match trauma system resources but ensure adherence to the statewide minimum standards.**
- Increase the allocation for the state EMS medical director to 1.0 FTE. Use some of the FTE allocation for a state trauma medical director position.
- **Develop and implement of a minimum set of statewide trauma treatment protocols for adult, pediatric, and geriatric patients.**
- Sustain support for programs for the recruitment and retention of EMS providers.
- **Develop resources for ground critical care transport.**

Definitive Care Facilities

Purpose and Rationale

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

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

Trauma receiving facilities providing definitive care to patients with other than minor injuries must be specifically designated by the state or regional lead agency and equipped and qualified to do so at a level commensurate with injury severity. To assess and ensure that injury type and severity are matched to the qualifications of the facilities and personnel providing definitive care, the lead agency should have a process in place that reviews and verifies the qualifications of a particular facility according to a specific set of resource and quality standards. This criteria-based process for review and verification should be consistent with national standards and be conducted on a periodic cycle as

determined by the lead agency. When centers do not meet set standards, there should be a process for suspension, probation, revocation, or de-designation.

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

Human Resources

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

Integration of Designated Trauma Facilities within the Trauma System

Designated trauma facilities must be well integrated into all other facets of an organized system of trauma care, including public health systems and injury surveillance, prevention, EMS and prehospital care, disaster preparedness, rehabilitation, and system performance improvement. This integration should be

provided by the state and/or regional trauma plan and overseen by the lead agency.

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

Optimal Elements

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

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

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

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

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

a. As part of the established standards, set appropriate levels of trauma training for nursing personnel who routinely care for trauma patients in acute care facilities. **(I-310.3)**

b. Ensure that appropriate, approved trauma training courses are provided for nursing personnel on a regular basis. **(I-310.4)**

c. In cooperation with the nursing licensure authority, ensure that all nursing personnel who routinely provide care to trauma patients have a trauma training certificate (for example, Advanced Trauma Care for Nurses, Trauma Nursing Core Course, or any national or state trauma nurse verification course). As an alternative after initial trauma course completion, training can be driven by the performance improvement process. **(I-310.5)**

d. In cooperation with the physician licensure authority, ensure that physicians who routinely provide care to trauma patients have a current trauma training certificate of completion, for example, Advanced Trauma Life Support® (ATLS®) and others. As an alternative, physicians may maintain trauma competence through continuing medical education programs after initial ATLS completion. **(I-310.8)**

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

f. As new protocols and treatment approaches are instituted within the system, structured mechanisms are in place to inform all personnel about the changes in a timely manner. **(I-310-10)**

Current Status

The VDH has the authority to designate trauma centers, and now 15 designated trauma centers exist within the state: 5 Level I, 5 Level II and 3 Level III trauma centers. Virginia has developed its own criteria for designation of these trauma center levels. Virginia trauma center criteria are based upon the ACS verification criteria that have been modified. The state trauma program manages the site survey process using teams predominantly from within the state. The verification teams for Level I trauma centers include an out-of-state surgeon. Level II and III survey teams include surgeons from within Virginia subject to appropriate geographical and conflict of interest scrutiny. Once verification is achieved hospitals can remain verified for three years, subject to continued monitoring of trauma center performance. All costs associated with the site survey and designation process are borne by the OEMS.

The current application process for trauma center designation is permissive. Any hospital can apply for verification, and after a screening process and site survey can participate in the Virginia trauma system at the designated level. Once designated, the trauma center will receive a portion of the trauma center fund.

The permissive process increases the possibility that more hospitals might apply and receive trauma designation. It is also possible that such future trauma centers may not be designated in areas of need to improve services to severely injured Virginia patients. No financial or patient needs analysis has been performed to identify geographic areas where trauma services should be enhanced. It is unlikely that the existing statute could limit a potential proliferation of trauma centers. The TSC team is concerned that a proliferation of trauma centers might be detrimental to system integrity.

Information provided during stakeholder open sessions, revealed two rural areas where the population was less well served by Virginia trauma centers. In at least one of these areas Virginia patients have access to trauma facilities in an adjacent State. Additionally, some injured patients from adjacent States are served by Virginia trauma centers. It was also proposed by stakeholders that at least one Virginia hospital within one of the relatively underserved areas could, theoretically, achieve Level III trauma center (or even Level II) status and be situated well to serve injured Virginians.

No contract or written agreement exists between the Commonwealth of Virginia and out-of-state trauma centers used by Virginia residents. Additionally, no method for obtaining trauma outcome data for these patients exists so it may be entered into the Virginia trauma registry. Similarly, no information exists for the method Virginia patients pay for their out-of-state health care, and whether Virginia Medicaid and Medicare are billed for these services.

Guidelines were developed in 2011 to assist physicians in non-trauma hospitals to identify patients needing transfer to a designated trauma center. It is not known how much these guidelines are used and the compliance or adherence to these guidelines. It is also not known if refinement of the guidelines to determine which patients should be transferred to Level I facilities, as opposed to other level facilities, would help improve the trauma system.

It was reported that some of the trauma centers had limited intensive care unit (ICU) capacity at times. Stakeholders reported that in a majority of cases the facilities requesting trauma patient transfer to a designated trauma center had the patient readily accepted and the transfer occurred.

Anecdotally, stakeholders expressed concerns that some trauma patients enter hospitals undesignated at any level, and additionally, some of these patients (even if severely injured) are not transferred to a trauma center. The trauma system does not monitor over- and under-triage, so the magnitude of this problem is unknown. Some data regarding the magnitude of under-triage for patients with severe injuries could be a research or performance improvement project. However, the concerns expressed revealed that the Virginia trauma system is not working as the “inclusive system” envisaged.

Four Virginia trauma centers have made a commitment to manage the pediatric patient with severe injuries: Carilion Roanoke Memorial Hospital, Inova Fairfax Hospital, University of Virginia Health System, and Virginia Commonwealth University Health System. Children's Hospital of the Kings Daughters (CHKD) is not a designated trauma center, but it is on the same campus as Sentara Norfolk Hospital, a Level I trauma center. CHKD receives injured children under the age of 12 years from the Sentara Norfolk Hospital emergency department because Sentara is not licensed to admit children under 12 years old. In Northern Virginia some injured children may be transferred to Children's National Health System in Washington DC directly from Virginia health care facilities.

Virginia has only Level I designation for pediatric trauma. The designation criteria are new, and none of the pediatric capable facilities identified above has yet been designated as a pediatric trauma center. The TSC team perceived that the pediatric facilities available to the injured children in Virginia appear to adequately meet patient demand. No stakeholders shared concerns about an inability to obtain patient acceptance from any of the pediatric capable facilities by EMS field providers or Virginia hospitals. The four pediatric capable facilities are in the process of seeking Level I pediatric trauma designation; however the capabilities and resources at the pediatric trauma centers may differ. CHKD is investigating options for trauma center designation; however, current Level I pediatric trauma center criteria are a challenge due to the facility's low patient volume and surgical coverage limitations. A second level of pediatric trauma center verification has been discussed.

Virginia has three adult specialty burn centers: Sentara Norfolk Hospital, University of Virginia (UVA) in Charlottesville, and Virginia Commonwealth University Health System (VCUHS) in Richmond. CHKD also manages burns injuries in children. Many severe pediatric burns are transferred to Shriner's Hospital in Cincinnati. Some pediatric burns patients are also transferred to Washington DC from the Northern Virginia. The criteria for the burn center verification process are based upon ACS and American Burn Association (ABA) criteria, with some modification. The burn specialty centers are in the process of seeking Burn Center designation.

All five Level I adult trauma centers provide immediate management of severe brain injury and acute spinal cord injury. Norfolk transfers pediatric patient with these severe injuries to the adjacent CHKD. Some of the Level 2 trauma centers provide care to the adult patient with severe head injuries and some transfer patient to a higher level of care after initial management and stabilization. See the Rehabilitation Section for long-term management of these injuries.

Designated trauma centers receive funding, which supports readiness costs. The manner in which funds are disbursed has been structured so the facility's trauma service is assured of receiving a large component of these funds, rather than the funds being deposited into the facility's operating budget.

Virginia designation criteria include Levels I, II, and III trauma centers and a Level I pediatric trauma center. Within the Virginia Statewide Emergency Medical Services Plan 2013 – 2016 (page 10), mention is made of conducting an analysis to determine the benefits of adding a Level IV trauma center designation. No mention was made of analyzing the need for a second level of pediatric trauma center designation, as exists with the ACS Verification Program. A second level of designation may help the CHKD to achieve trauma center designation status.

Three of the Level I trauma centers (Inova Fairfax; VCUHS and UVA) have at their own expense requested and been verified as ACS Level I trauma centers. The other two Level I trauma centers (Carilion Roanoke Memorial and Sentara Norfolk) are in the process of requesting ACS Level I verification in 2016. One stakeholder reported that the ACS verification was “the Gold Standard” even though not required. Despite the expense of the ACS verification process, the verification enables his facility to be recognized as comparable to Level I trauma centers in the rest of the nation. The ACS verified trauma centers can also use the ACS National Trauma Data Bank to compare trauma outcomes with national benchmarks and to enable easier adoption of trauma best practices. VCUHS has also requested and received verification from the ABA as a Level 1 burn center.

These additional inspections by the ACS are concurrent with the verification process required by the Virginia for designation. These additional (voluntary) verification processes require these trauma centers to develop and submit comprehensive documents approximately every 18 months. The ACS allows and even encourages concurrent site surveys by the ACS and the designating authority.

Recommendations

- **Engage all acute care facilities in the trauma system.**
    - **Provide technical assistance and guidelines for treatment and transfer protocols.**
    - **Promote participation in statewide trauma system performance improvement.**
- **Place the trauma center designation criteria in administrative rule.**
- **Establish a process for designation of new trauma centers based on need.**
- Explore mechanisms used by other states to track trauma patient flow and outcomes for patients treated in out-of-state trauma centers for documentation in the state trauma registry, (e.g., Arkansas and Tennessee).
- Consider implementing concurrent site visits for facilities electing both American College of Surgeons and Virginia trauma center verification.
- Explore the potential for an additional level of pediatric trauma center designation.
- Establish statewide guidelines for inter-hospital transfers from non-designated facilities and lower level trauma centers to definitive care.

System Coordination and Patient Flow

Purpose and Rationale

To achieve the best possible outcomes, the system must be designed so that the right patient is transported to the right facility at the right time. Although on the surface this objective seems relatively straightforward, patients, geography, and transportation systems often conspire to present significant challenges. The most critically injured trauma patient is often easy to identify at the scene by virtue of the presence of coma or hypotension. However, in some circumstances, the patients requiring the resources of a Level I or II center may not be immediately apparent to prehospital providers. Primary or field triage criteria aid providers in identifying which patients have the greatest likelihood of adverse outcomes and might benefit from the resources of a designated trauma center. Even if the need is identified, regional geography or limited air medical (or land) transport services might not allow for direct transport to an appropriate facility.

Primary triage of a patient from the field to a center capable of providing definitive care is the goal of the trauma system. However, there are circumstances (for example, airway management, rural environments, inclement weather) when triaging a patient to a closer facility for stabilization and transfer is the best option for accessing definitive care. Patients sustaining severe injuries in rural environments might need immediate assessment and stabilization before a long-distance transport to a trauma center. In addition, evaluation of the patient might bring to light severe injuries for which needed care exceeds the resources of the initial receiving facility. Some patients might have specific needs that can be addressed at relatively few centers within a region (for example, pediatric trauma, burns, severe TBI, SCI, and re-implantation). Finally, temporary resource limitations might necessitate the transfer of patients between acute care facilities.

Secondary triage at the initial receiving facility has several advantages in systems with a large rural or suburban component. The ability to assess patients at non-designated or Level III to V centers provides an opportunity to limit the transfer of only the most severely injured patients to Level I or II facilities, thus preserving a limited resource for patients most in need. It also provides patients with lesser injuries the possibility of being cared for within their community.

The decision to transfer a trauma patient should be based on objective, prospectively agreed-on criteria. Established transfer criteria and transfer agreements will minimize discussions about individual patient transfers, expedite the process, and ensure optimal patient care. Delays in transfer might increase mortality, complications, and length of stay. A system with an excess of transferred patients might tax the resources of the regional trauma facility.

Conversely, inappropriate retention of patients at centers without adequate facilities or expertise might increase the risk of adverse outcomes. Given the importance of timely, appropriate interfacility transfers, the time to transfer, as well as the rates of primary and secondary overtriage basis, and corrective actions should be instituted when problems are identified. Data derived from tracking and monitoring the timeliness of access to a level of trauma care commensurate with injury type and severity should be used to help define optimal system configuration.

A central communications center with real-time access to information on system resources greatly facilitates the transfer process. Ideally, this center identifies a receiving facility, facilitates dialogue between the transferring and receiving centers, and coordinates interfacility transport.

To ensure that the system operates at the greatest efficiency, it is important that patients are repatriated back to community hospitals once the acute phase of trauma care is complete. The process of repatriation opens up the limited resources available to care for severely injured patients. In addition, it provides an opportunity to bring patients back into their local environment where their social network might help reintegrate patients into their community.

Optimal Elements

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

a. There are mandatory system-wide prehospital triage criteria to ensure that trauma patients are transported to an appropriate facility based on their injuries. These triage criteria are regularly evaluated and updated to ensure acceptable and system-defined rates of sensitivity and specificity for appropriately identifying a major trauma patient. **(I-302.6)**

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

c. There is a procedure for communications among medical facilities when arranging for interfacility transfers, including contingencies for radio or telephone system failure. **(I-302.9)**

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

a. When injured patients arrive at a medical facility that cannot provide the appropriate level of definitive care, there is an organized and regularly monitored system to ensure that the patients are expeditiously transferred to the appropriate system-defined trauma facility. **(I-303.4)**

Current Status

The lead agency has identified and partially addressed several important issues relating to trauma system coordination and patient flow.

Virginia has identified two issues for attention that relate to public safety answering points (PSAPs) and emergency medical dispatch (EMD). PSAPs, which use scripted interrogation and pre-arrival medical instructions, allow for immediate patient assessment and the support for bystander-applied care. This aspect of prehospital care is a frequently neglected component in system coordination and patient flow.

This issue is addressed in general terms in the Virginia Statewide Emergency Medical Services Plan 2013-2016 in strategic initiatives 3.3.2 “Promote Emergency Medical Dispatch standards and accreditation among 911 PSAPs in Virginia” and 3.3.2.1 “Support concept of accredited PSAPs, operating with EMD standards, and assist agencies in achieving accreditation, and/or adopting EMD as standard operating procedure.” At the time of the TSC visit, specific milestones and accomplishments for these initiatives have not been realized.

Virginia has made significant progress related to prehospital trauma triage criteria. The OEMS uses the CDC *Field Triage Decision Scheme: The National Trauma Triage Protocol* and its companion document *Guidelines for Field Triage of the Injured Patients: Recommendations of the National Expert Panel on Field Triage* as a basis for EMS triage. These guidelines provide a framework for EMS providers to assure that the most severely injured patients are taken to Level I and Level II trauma centers. At the time of the TSC visit, the regions individualize these guidelines, and current data systems are not in place to measure compliance with either individualized regional guidelines or the state recommended guideline. This regional variation and compliance with trauma triage guidelines, in combination with the absence of reporting Step 1 criteria (e.g., Glasgow Coma Score and systolic blood pressure) seriously inhibits understanding of over- and under- triage rates for EMS. This issue may potentially impact both patient outcomes (under-triage) and the efficient use of trauma center resources (over-triage).

The OEMS has guidelines for inter-hospital transfer, based upon the ACS document *Resources for the Optimal Care of the Injured Patient*. These guidelines serve to expedite the referral of adult, pediatric, and burn patients from non-designated facilities to Level I and Level II trauma centers. The need for trauma transfer often requires the use of critical care ground assets or air medical services (helicopters) to safely move these severely injured patients. A significant problem exists when arranging for transportation resources in rural areas since local EMS agencies are not capable of providing critical care transport. Compounding the issue are the loosely defined criteria for utilization of air medical services and the unknown availability of ground critical care transport resources. As with the use of trauma triage criteria by EMS providers, the level of compliance from non-designated hospitals with trauma transfer guidelines is not known. This has particular significance when the trauma system must identify delays to definitive care.

Recommendations

- Perform an assessment of all public service answering points (PSAPs) in the Commonwealth to determine the penetrance of emergency medical dispatch (EMD) utilization and accreditation.
    - Develop a plan to achieve EMD and accreditation for PSAPs.
    - Implement this plan.
- Assess the compliance of emergency medical services agencies with trauma triage guidelines
    - Determine if disparities in the application of field triage exist based upon geography or patient type (pediatrics, geriatrics, etc.).
- Assess the compliance of non-designated hospitals with trauma transfer guidelines.
    - Determine if disparities in the application of transfer guidelines exist based upon geography or patient type (pediatrics, geriatrics, etc.).
    - Identify critical care ground and air medical services that may expedite trauma transfers.
    - Communicate compliance rates with trauma transfer guidelines to stakeholders, and determine a strategy to improve compliance, if necessary.

Rehabilitation

Purpose and Rationale

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

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

Optimal Elements

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

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

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

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

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

Current Status

A disconnect seems to exist between the rehabilitation community and the state trauma program, the TSO&MC and its subcommittees. However, two representatives from the rehabilitation professional community were present and engaged during the TSC stakeholder open session. They provided valuable insight into some of the challenges for injured patients in Virginia. Various levels of rehabilitation facilities, the criteria for admission, funding issues, and the variation of services available at the skilled nursing facilities (SNFs) were described.

At the state and regional level a lack of understanding exists related to trauma center discharge delays, limitations in access and availability of post-discharge services for the trauma patient (in-patient rehabilitation, SNFs, long-term care, etc.), and repatriation to the patient's home community. Stakeholders reported that the criteria used to accept patients from a trauma center to an inpatient rehabilitation facility seem to change frequently. As a result, the trauma centers find it difficult to navigate the transition and transfer process. Preventable prolonged lengths-of-stay are often the result. It was also reported that acute inpatient rehabilitation beds are usually not available for uninsured trauma patients, also causing prolonged lengths-of-stay. A trauma system performance improvement (PI) focused audit could be undertaken to identify the severity of this issue, and appropriate corrective actions could be identified and implemented.

No rehabilitation position exists on the TSO&MC. With the reported challenges in identifying rehabilitation information and issues with timely transfers from trauma centers to rehabilitation facilities, rehabilitation representation on the TSO&MC is important. Ideally, both clinical and administrative representatives holding a leadership position within the state professional organization could be appointed to facilitate communication between the TSC&MC and the physical medicine and rehabilitation constituents. A rehabilitation subcommittee may also be beneficial so that more input into decision making is possible. Consider having one or more

physiatrists, a rehabilitation center administrator, and representatives from outpatient rehabilitation on a subcommittee with trauma center representatives.

One approach to strengthen and maintain relationships between the trauma centers and rehabilitation stakeholders is to conduct collaborative educational sessions. These could be events such as case presentation prior to the quarterly TPM meeting, or the TSO&MC meeting. Other forums may be a preconference session, webinar, on site visit to rehabilitation facilities.

As reported in the PRQ, one trauma center has developed a trauma survivor program that includes peer support groups and educational forums for patients. It would be beneficial to replicate this best practice, or the fundamental concepts of trauma survivor support, at all trauma centers. This could potentially be a special project that the TPM group could coordinate in collaboration with the rehabilitation leadership, case managers, and social workers.

When writing the new state trauma plan, it is important to include a rehabilitation focus. Involve a physiatrist on the team tasked with writing the state trauma plan. This would provide an opportunity for the trauma system stakeholders to the embraces the rehabilitation community.

Recommendations

- Perform a focused audit using trauma center data to measure prolonged lengths-of-stay associated with transfer delays from trauma centers to in-patient rehabilitation, and identify reasons for the delays.
    - Create an action plan at the Trauma System Oversight and Management Committee (TSO&MC) Trauma Performance Improvement Committee level.
    - Implement the plan and reevaluate for effectiveness.
- Ensure the TSO&MC has representation from in-patient rehabilitation (both clinical and administrative).
- Identify barriers to trauma center patient discharge especially as it relates to special populations (pediatrics, geriatrics, traumatic brain injury, spinal cord injury, out-of-state, unfunded, etc.).
    - Perform ongoing assessment of availability and utilization of post-discharge resources (in-patient rehabilitation, skilled nursing facilities, long-term care, etc.)
    - Work with trauma centers to identify appropriate post-discharge resources and expedite timely discharge.

    - Work with specialty agencies and hospitals to match resource availability with hospital need.

- Create data linkages to obtain trauma patient rehabilitation information for the state trauma registry.
- Conduct biannual or annual education pertaining to trauma patient rehabilitation targeting the multidisciplinary trauma system stakeholders
    - Assign this task to the trauma program manager group who should collaborate with rehabilitation experts.
- Obtain and maintain a comprehensive list of rehabilitation and skilled nursing facilities that treat injured patients within the state, including the level of care provided.
    - Include transfer / acceptance criteria (screening criteria).
- Ensure the integration of rehabilitation components into the state trauma plan.

Disaster Preparedness

Purpose and Rationale

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

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

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

Mass casualty events and disasters are chaotic, and only with planning and drills will a more organized response be possible. Simulation or tabletop drills provide an opportunity to test the emergency preparedness response plans for the

trauma system and other systems and to train the teams that will respond. Exercises must be jointly conducted with other agencies to ensure that all aspects of the response plan have the trauma system integrated.

Optimal Elements

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

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

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

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

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

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

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

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

Current Status

In the VDH disaster response agency is the Office of Emergency Preparedness (OEP), a sister agency of OEMS. OEP has the responsibility of administering the Assistant Secretary for Preparedness and Response (ASPR) federally funded Hospital Preparedness Program.

The Hospital Preparedness Program requires states to assist hospitals in the development of comprehensive disaster plans and to assess and plan for medical surge capacity, bioterrorism, and other multi-hazards that could affect hospital capabilities in times of disaster. Determining medical surge capabilities are essential in the state's preparation for managing an MCI. The Virginia OEP has developed an excellent guide for hospitals to assist them in disaster preparedness efforts.

The EMS and trauma system are a critical component of any medical surge planning, as they serve a crucial role when responding to the medical surge needs of the state during a disaster. Although great work has been done by the OEP in creating its guide for hospitals, none of the trauma centers or prehospital providers present during open stakeholder sessions reported being involved in the planning efforts, and they were not aware that the guide existed. Training and exercises are an important part of the state's disaster preparations. All medical response agencies, hospitals, and especially trauma centers should be included in the planning and response capability assessments, exercises, and after action reports.

The Virginia ASPR funding is provided to hospitals through the six coalitions that have been established, but no evidence of collaboration or coordination with the EMS or trauma system community was noted.

The 11 EMS regions do not easily conform to the six OEP regions where coalitions have been established. Re-aligning EMS regions with the six OEP regions would have the benefit of improving collaboration and coordination. This would also result in fewer variations in application of the trauma triage and transfer guidelines. An additional benefit would likely be opportunities to share regional office administrative costs.

Recommendations

- Strengthen the relationship with the Office of Emergency Preparedness (OEP) to ensure the trauma program is engaged in the state disaster planning process
- **Decrease the number of regional councils, and align the new regions with the current emergency preparedness regions.**
- Collaborate with the OEP and provide disaster preparedness education to trauma centers, regional councils, and local emergency medical services (EMS) providers
- Collaborate with the OEP to develop a disaster preparedness guide for the EMS and trauma systems similar to the Hospital Emergency Operations Guide
- Collaborate with the OEP to assess and maximize the use of Assistant Secretary of Preparedness and Response (ASPR) funding to enhance the medical surge capabilities of the state's trauma centers.

System-wide Evaluation and Quality Assurance

Purpose and Rationale

The trauma lead agency has responsibility for instituting processes to evaluate the performance of all aspects of the trauma system. Key aspects of system wide effectiveness include the outcomes of population based injury prevention initiatives, access to care, as well as the availability of services, the quality of services provided within the trauma care continuum from prehospital and acute care management phases through rehabilitation and community reintegration, and financial impact or cost. Intrinsic to this function is the delineation of valid, objective metrics for the ongoing quality audit of system performance and patient outcomes based on sound benchmarks and available clinical evidence. Trauma management information systems (MISs) must be available to support data collection and analysis.

The lead agency should establish forums that promote inclusive multidisciplinary and multiagency review of cases, events, concerns, regulatory issues, policies, procedures, and standards that pertain to the trauma system. The evaluation of system effectiveness must take into account the integration of these various components of the trauma care continuum and review how well personnel, agencies, and facilities perform together to achieve the desired goals and objectives. Results of customer satisfaction (patient, provider, and facility) appraisals and data indicative of community and population needs should be considered in strategic planning for system development. System improvements derived through evaluation and quality assurance activities may encompass enhancements in technology, legislative or regulatory infrastructure, clinical care, and critical resource availability.

To promote participation and sustainability, the lead agency should associate accountability for achieving defined goals and trauma system performance indicators with meaningful incentives that will act to cement the support of key constituents in the health care community and general population. For example, the costs and benefits of the trauma system as they relate to reducing mortality or decreasing years of productive life lost may make the value of promoting trauma system development more tangible. A facility that achieves trauma center verification/designation may be rewarded with monetary compensation (for example, ability to bill for trauma activation fees) and the ability to serve as a receiving center for trauma patients. The trauma lead agency should promote ongoing dialog with key stakeholders to ensure that incentives remain aligned with system needs.

Optimal Elements

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

a. The lead trauma authority ensures that each member hospital of the trauma system collects and uses patient data, as well as provider data, to assess system performance and to improve quality of care. Assessment data are routinely submitted to the lead trauma authority. **(I-301.1)**

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

III. The financial aspects of the trauma system are integrated into the overall performance improvement system to ensure ongoing fine tuning and cost-effectiveness. **(B-309)**

a. Financial data are combined with other cost, outcome, or surrogate measures, for example, years of potential life lost, quality-adjusted life years, and disability adjusted life years; length of stay; length of intensive care unit stay; number of ventilator days; and others, to estimate and track true system costs and cost- benefits. **(I-309.4)**

Current Status

The stakeholders, particularly the trauma center representatives, have a keen interest in participating in systemwide trauma performance improvement activities. In 2012, the Trauma Performance Improvement Committee (TPIC) was created as a subcommittee that reports to the TSO&MC. The membership of this committee is trauma-hospital centric. Consideration should be given to altering the standing membership to ensure multidisciplinary trauma system representation, e.g., rehabilitation (clinical and administrative), pediatric trauma surgeon, and EMS providers. The TPIC meetings are closed to the public. At the time of the TSC visit this committee is not evaluating care or performing case reviews.

The Virginia Trauma Critical Care Coordinator is charged with the responsibility of staffing the TPIC, the TSO&MC committee, and all other subcommittees. Virginia has inadequate state trauma program staff to support a state trauma system PI process. State trauma registry staff members provide the data and reports, which are the foundation of the trauma PI process. The statisticians fulfilling the role of state trauma registrar have different responsibilities and do

not have the expertise to manage the PI process. One FTE trauma PI position should be secured. A nurse with trauma clinical and PI experience would be best to support state and regional trauma system PI processes and activities. The PI nurse in this role could also provide education to the regions and other stakeholders on trauma PI processes.

Each of the regional councils is obligated by contract to perform PI. It is unclear from information provided by stakeholders whether or not all regional councils are in compliance with the reporting requirements. Stakeholders reported that the regional trauma PI activity is either not being reported to the TPIC or TSO&MC, or that the reporting is sporadic. The process of completing meaningful trauma PI at the regional level should be strengthened. Regional trauma PI reporting requirements should be enforced. Regional reports should be reviewed by both the TPIC and TSO&MC.

One strategy that would help advance the statewide trauma PI process would be to ensure that all trauma stakeholders are educated in trauma system PI. This could be accomplished through seminars, local/regional/state conferences, webinars, template trauma PI master plans, and ad hoc meetings tagged onto existing scheduled trauma stakeholder meetings such as the TSO&MC meetings. Historically, the state has hosted the Trauma Outcomes & Performance Improvement Course twice.

Preliminary discussions have occurred related to implementing a trauma system risk-adjusted benchmarking program either at the regional or state level. At present, all the Level I trauma centers are enrolled in the ACS Trauma Quality Improvement Project (TQIP). Three of the 5 Level II trauma centers are also enrolled in TQIP. The TPIC would like to explore including the Level III trauma centers in TQIP. The TPIC chairperson recently visited the State of Michigan, and obtained information from their State TQIP Coordinator. Participation in a risk-adjusted benchmarking program could be implemented within 1 to 2 years if all trauma hospitals (Levels I, II, and III) would commit to submitting data to the National Trauma Data Bank (NTDB), and becoming members of the TQIP. Perhaps the TPIC could consider making this a priority project. The TPM group could ensure that their trauma center registry data are NTDB compliant, and become members of TQIP. This would allow for trauma system reports within the next 1 to 2 years.

At the time of the TSC visit, no report could be produced from the state trauma registry that would support trauma PI activity. It was reported that the new trauma system database may not be available for approximately one year. The foundation for performing trauma PI is data. Efforts should be made to move quickly and aggressively toward completing data transition, integration, and validation processes.

Rather than delay embarking on any trauma PI projects, the TPIC should seek alternate data sources. These sources could potentially include obtaining data / reports directly from the trauma centers. Or, a Virginia-specific dataset could be obtained from the NTDB. When the state trauma registry is up and running efficiently, the TPIC can advance their trauma PI activity accordingly, e.g., start to look at audit filters more specific to the regional or state trauma system.

To direct the trauma system PI activity, a trauma PI master plan should be developed and approved. This plan can act as a compass keeping the TPIC, and the trauma stakeholders on track, focusing on the goals and objectives. This plan could potentially include an appendix that lists specific audit filters to be collected and analyzed.

It was reported that most of the trauma stakeholders have a comfort level with adequate peer review protection in statute for participating in regional trauma PI. However, it was also reported that a few stakeholders have been directed by their facility's legal counsel not to share protected health information / peer review information. The TPIC and TSO&MC should work to reduce these concerns by collaborating with the state trauma program to have the program's legal counsel review the peer review protection statute. The legal counsel should provide a written statement for distribution to the trauma stakeholders, and embed the statement in the TPIC and TSO&MS meeting minutes to ensure this information is disseminated and retained. This should make it possible for the TPIC and the regional trauma PI meetings to perform actual clinical and system case reviews.

Examples of prehospital education tied to trauma PI issues were provided in the PRQ and during the TSC visit. In many instances, this educational activity has fallen under the purview of the trauma center TPMs. The state trauma program should identify other options for the delivery of PI education to the prehospital providers to augment the TPM's efforts. It was noted that some of the trauma centers have a prehospital liaison that participates in trauma education for the prehospital providers.

It was reported that the OEMS does not have specific outcome measures (or trauma audit filters) outlined for the regional councils or local EMS agencies. The regional councils are only required to have a trauma PI plan. A plan is a good start, but does not ensure that the standard PI cycle of monitoring, e.g., Plan-Do-Study-Act is actually being performed. As part of a new state trauma plan, regional trauma PI should be clearly articulated ensuring a functional process.

The concept of trauma PI conducted by the regional councils is good. This allows the region to focus on PI issues and opportunities specific to their area. However, it is noted that by contract, each Region is required to review at least one trauma patient care or trauma system issue each quarter. Although this takes into consideration volunteer prehospital care providers, limited resources, and the

limited time of each regional council's leadership to focus on trauma PI activities, requiring only one trauma case per quarter is concerning. This requirement does not support a culture of safety. Nor does it support timely identification and correction of issues.

Recommendations

- Review the Trauma Performance Improvement Committee membership to ensure multidisciplinary representation from the full trauma system continuum of care.
    - Formalize new membership categories.
    - Fill these positions.
- Create a full time position for a state trauma performance improvement coordinator.
    - Have this person report to the Trauma Critical Care Coordinator.
    - Dedicate 100% time to conducting state trauma system performance improvement (PI), to support regional PI activities, and to educate trauma system stakeholders on PI structure and processes.
- Implement a statewide risk-adjusted benchmarking initiative to include the Level I, II, and III trauma centers.
- Develop a State Trauma Performance Improvement Master Plan that will act as a compass for PI activities at the state, regional and local areas.
- Strengthen the reporting requirements of the regional PI committees, ensuring they routinely report up to the Office of Emergency Medical Services, TPIC and Trauma System Oversight and Management Committee.
    - Ensure that each regional council fulfills its contractual obligations pertaining to trauma PI.

Trauma Management Information Systems

Purpose and Rationale

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

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

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

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

Optimal Elements

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

a. There is an established injury surveillance process that can, in part, be used as an MIS performance measure. **(I-102.1)**

b. Injury surveillance is coordinated with statewide and local community health surveillance. **(I-102.2)**

c. There is a process to evaluate the quality, timeliness, completeness, and confidentiality of data. **(I-102.4)**

d. There is an established method of collecting trauma financial data from all health care facilities and trauma agencies, including patient charges and administrative and system costs. **(I-102.5)**

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

a. The lead trauma authority ensures that each member hospital of the trauma system collects and uses patient data, as well as provider data, to assess system performance and to improve quality of care. Assessment data are routinely submitted to the lead trauma authority. **(I-301.1)**

b. Prehospital care providers collect patient care and administrative data for each episode of care and not only provide these data to the hospital, but also have a mechanism to evaluate the data within their own agency, including monitoring trends and identifying outliers. **(I-301.2)**

c. Trauma registry, ED, prehospital, rehabilitation, and other databases are linked or combined to create a trauma system registry. **(I-301.3)**

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

Current Status

The OEMS and its trauma stakeholders are in a state of change as it pertains to data collection from their information systems. Recent transitions to a new software vendor for both the prehospital and trauma registry system have resulted in data challenges. Hopefully, these challenges are time limited and eventually data will be combined and accessible for analyses.

Virginia code establishes the Emergency Medical Services Patient Care Information System (PCIS). It further specifies that PCIS shall include the EMS Registries and the Virginia Statewide Trauma Registry (VSTR). All prehospital agencies are required to submit data to the Virginia Pre Hospital Information Bridge (VPHIB). A customizable commercial software vendor (ImageTrend, Inc.) serves as the primary data repository for the VPHIB, and it was implemented in 2011.

ImageTrend, Inc. is also the vendor for the VSTR. Implementation of the VSTR within the new software framework began in 2014. Refinements and validation of the VSTR are ongoing. The transaction language and submission details that will allow for ease of transmission from individual trauma centers are among the remaining challenges for implementation.

Having a common software vendor for both the prehospital and trauma registry should promote data linkage between the two systems. This linkage has not yet been realized. Additional linkage opportunities are also possible. These include, among others, the violence and injury prevention database, Fatal Accident

Reporting System (FARS), medical examiner data, rehabilitation data, and hospital discharge dataset.

Two staff persons are assigned to support the VPHIB and VSTR. Additional analytical support is anticipated from a statistician (posted but not yet hired).

While the current data are not in a “perfect state,” sufficient data exist from a number of sources

Recommendations

- **Contract with an expert in data system implementation to accelerate the installation, testing, and linkage of the prehospital and trauma registry products.**
- Identify other potential data sources for linkage such as vital records, violence and injury prevention database, fatal accident reporting system, medical examiner, rehabilitation data, hospital discharge dataset, and others.
- **Develop a reporting mechanism for the routine aggregation, interpretation, and presentation of data to stakeholders, the public, and policy officials, including legislators.**
- Create a strategic plan for implementation of the trauma data reports necessary to support trauma system performance improvement activities.
    - Use whatever data are currently available to begin simple performance improvement processes.

Research

Purpose and Rationale

Overview of Research Activity

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

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

Trauma Registry–based Research

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

threats. For example, a recent surge in death and disability related to off -road vehicles can be identified and the scope of the problem defined in terms of who, where, and how riders are injured, and then, through presentations and publications, the public can be informed of a new threat.

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

Population-based Trauma System Research

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

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

Participation in Research Projects and Primary Data Collection

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

Measures of Research Activity

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

Optimal Elements

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

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

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

a. The trauma system has developed mechanisms to engage the general medical community and other system participants in their research findings and performance improvement efforts. **(I-306.1)**

b. The effect or impact of outreach programs (medical community training/support and prevention activities) is evaluated as part of a system performance improvement process. **(I-306.3)**

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

a. The trauma system implements and regularly reviews a standardized report on patient care outcomes as measured against national norms. **(I-307.2)**

Current Status

The lead agency (VDH/OEMS) has identified research as an area of focus for the EMS system. This interest is articulated in general terms in the Virginia Statewide Emergency Medical Services Plan 2013-2016. Specifically *Strategic Initiative 2.1.1* states the BOH will "Sponsor research and other projects that contribute to high quality EMS and improve patient outcomes utilizing data collected by the EMS registries." Also *Strategic Initiative 2.1.3.2* states the BOH will "Establish funding program for EMS research." At the time of the TSC visit specific achievements in these two areas have not been realized.

Tangible evidence of the state's support of research was noted. A well-defined policy and process to access the EMS and Trauma registries, as well as a template request document for targeted, de-identified searches of these datasets exist. When the statistician resigned, six months prior to the TSC visit, no staff member in the lead agency was available to assist investigators with these inquiries. Simultaneously, the data platform for the EMS and Trauma registries is migrating to a single vendor. Over the long term the new data system will likely facilitate and enhance quality assurance and research efforts, but in the short term data collection and linkages are hampered. It is estimated to be a year before the dataset is ready for use and training can be provided to promote proficiency with the new data system.

State support for research is further exemplified by the state's provision of *Standard Operating Procedures and Guidelines for Obtaining Review* for the Institutional Review Board (IRB) of the VDH. This document provides detailed guidance for investigators to obtain identifiable or potentially identifiable data from the registries. This opportunity permits research, which may be directly applicable to specific regions or patient populations, potentially allowing for improved patient care.

It is note-worthy that academic trauma centers in Virginia (VCU, UVA, Fairfax, Norfolk, and Roanoke) have not been leveraged to promulgate and lead trauma research. While each academic institution is engaged in research (as required by the Commonwealth of Virginia and the ACS Verification Review Process), the state trauma program and TSO&MC have not utilized their expertise to develop an overarching trauma research agenda. This represents a missed opportunity for the development of a meaningful trauma systems research.

Recommendations

- Develop a trauma research agenda that focuses on the leading causes of injury morbidity and mortality in the Virginia.
    - Leverage the expertise at the academic trauma centers to develop the research agenda and to implement systemwide research.
    - Provide funding support from the Office of Emergency Medical Services.
- Facilitate the integration of all data repositories (Public Service Answering Points, emergency medical dispatch, emergency medical services, emergency department, trauma center, medical examiner, etc.) to develop and inform the research agenda.
- Use research outcomes to identify system gaps and to institute performance improvements in the trauma system.
- Use research outcomes to inform the public and stakeholders about trauma system performance.

Pediatric Focus Questions

Just the recognition and request for a pediatric focus in the Commonwealth of Virginia trauma system consultation (TSC) is a significant step in the process of improving the emergency care of children. Although pediatrics is always considered during an ACS TSC, Virginia is the first state to ask for pediatric-specific content reviewer.

Virginia has a strong interest in pediatric emergency readiness. An excellent response rate (96.8%) was obtained from hospital emergency departments for the National Pediatric Readiness Project 2012 survey. Only military and federal hospitals did not respond. A few of the highlights from the Virginia responses include:

- The state median score was 77 out of 100 compared to the national median of 69 out of 100.
- The Average Section scores for the state were all above the national section scores.
- Interfacility transfer guidelines were not in place for 27% of emergency departments.
- Although better than the national average, only 57.8% of the emergency departments had a pediatric care review process.

Pediatric specific continuing education is required at each EMS provider level except emergency medical responder.

The Virginia EMSC program is housed in the OEMS, and good collaboration between the program and OEMS was apparent to the TSC team. The EMSC program manager is a full time position, funded completely from the OEMS budget rather than supported by the federal EMSC state partnership grant. This is very positive and protects the position should federal funding be reduced. This funding structure provides stability to the program, and it makes the federal funds available for equipment or program support. Funds are also allocated for a pediatric specific operational medical director (OMD) for consulting work to the OEMS.

Additional issues were heard during stakeholder open sessions.

- One challenge is the lack of inpatient pediatric rehabilitation in Virginia, and many children go out of state for trauma inpatient rehabilitation. See the Rehabilitation Section of the main report for more information.
- Children's Hospital of the King's Daughters expressed frustration about the difficulty it faces to become a Level I pediatric trauma center (the only pediatric level of designation in Virginia). Additional information about this issue is included in the Definitive Care Section of the main report for more information.

Pediatric Focus Question 1: **Advise on the wisdom and feasibility of statewide pediatric trauma & EMS protocols with built-in performance measures like North Carolina and Pennsylvania.**

The national EMSC program recommends that all EMS services have pediatric-specific protocols for both medical and trauma emergencies. In a sampling of the regional EMS protocols, the number of pediatric-specific protocols is highly variable. The Commonwealth of Virginia should develop a core list of pediatric EMS protocol topics that each region must include in the regions. Additionally, statewide treatment protocols should be developed for each of these pediatric topics that all regions must implement as the minimal standard of care. Operational medical directors (OMDs) should only be able to modify the protocols and raise the treatment expectations, not lower them. The pediatric protocols should be evidence-based when possible (e.g., pediatric seizure, pediatric pain management, etc.). See the special issue: Evidence-based guidelines in EMS, *Prehospital Emergency Care*, Volume 18, Supplement 1, 2014.

The use of performance measures for each EMS protocol provides a good guideline for monitoring patient safety and for performance improvement. As statewide minimal pediatric EMS protocols need to be developed and adopted, it is reasonable to include performance measures to support regional council and OMD performance improvement processes. EMS performance measures are on the horizon (EMS COMPASS initiative), so building them in now would put Virginia ahead of the curve. Established Model EMS guidelines, including performance measures, are available at http://www.nasemso.org

As the state trauma registry is being converted to a new software vendor at the time of the TSC visit, data regarding EMS trauma triage and transfer decisions to the appropriate facility for severity of pediatric injury were unavailable. Similarly data were not available to identify cases in which interfacility transfer to a pediatric trauma center were delayed.

The Virginia EMSC program and OEMS should support the development of interfacility triage criteria for injured children and written interfacility transfer agreements between hospitals and pediatric trauma centers. As outlined in the 2009 Consensus Pediatric Guidelines for Emergency Departments, the interfacility transfer process needs to be carefully considered to ensure that children receive the best trauma care feasible. The interfacility transfer agreements are an established EMSC performance measure. The federal EMSC program website has a resource toolkit for interfacility transfer agreements that may assist the hospitals to develop these agreements.

Recommendations

- **Establish minimum statewide destination guideline standards for each step of the state trauma triage criteria for both adult and pediatric populations.**
    - **Allow regions to adapt the destination guidelines to match trauma system resources but ensure adherence to the statewide minimum standards.**
- **Develop and implement of a minimum set of statewide trauma treatment protocols for adult, pediatric, and geriatric patients.**
- Assess the compliance of EMS agencies with trauma triage and destination guidelines
    - Determine if disparities in the application of field triage exist based upon geography or patient type (pediatrics, geriatrics, etc.).
- Assess the compliance of non-designated hospitals with trauma transfer guidelines.
    - Determine if disparities in the application of transfer guidelines exist based upon geography or patient type (pediatrics, geriatrics, etc.).

Pediatric Focus Question 2: How should Virginia proceed to improve the patient quality/patient safety in the EMS environment for pediatrics, i.e. weight-based treatment, under-utilization of pain medications for pain control, vital sign documentation, and the value of a thorough patient assessment.

As described in the EMS Section, equipment for the safe transport of children in an ambulance is a challenge for some EMS agencies. See that section for more information.

Each EMS agency designates a provider who has some expertise or interest in pediatrics, a pediatric advocate. This individual should take a proactive role in performance improvement (PI) for pediatric runs. These pediatric advocates should take advantage of PI education to better understand the process. Performance measures integrated in future EMS protocols could serve as audit filters to identify issues in the care process that need attention (such as incomplete vital sign documentation necessary for Trauma Triage.

Ideally at the regional level, the EMS provider pediatric advocate should be integrated into the Trauma PI processes at the referral pediatric trauma center. Trauma PI feedback from the pediatric trauma center may help identify opportunities to improve pediatric EMS care. The pediatric trauma centers could reflect on the past year to identify EMS care issues that could be a focus for regional PI. When possible, the EMS provider pediatric advocate should be invited to PI meetings at the pediatric trauma center. Another opportunity for PI could be the development of a pediatric PI committee within each regional council. This would provide opportunities for the EMS provider pediatric advocates to conduct case reviews and identify the need for education of all EMS providers that could improve care to children.

An EMSC targeted issue grantee from Michigan focused on EMS medication administration and common causes of error. A specific tool to assist EMS providers was developed. Information on the study Michigan Pediatric Errors and Excellence Discovery with Simulation (MI-PE2DS) may be found at: http://www.emscresources.org/historicalgrants/searchResults.php?stateSearch=MI.

Information regarding the tool to assist EMS providers to more accurately administer medications was discussed during an EMSC Town Hall meeting that can be found at: https://emscnrc.adobeconnect.com/p68fcuiuws6/?launcher=false&fcsContent=true&pbMode=normal. The tool is patented, but it might be provided free to state EMSC programs in the future.

Recommendations

- Strengthen the language in 12VAC5-31-860 (48) to update of safe transport of children in back of ambulances
    - Use the NHTSA Best Practice Recommendations for Safe Transportation of Children in Emergency Ground Ambulances (Sept 2012)
    - Allocate funds to assist EMS services in purchasing necessary devices.
- Identify opportunities for EMS agency pediatric advocates to obtain education about performance improvement processes.
- Work with the pediatric trauma centers to select a small number of performance improvement priorities to be addressed by EMS providers in the region.
- Identify opportunities for EMS agency pediatric advocates to collaborate on pediatric performance improvement activities at the regional level.

Pediatric Focus Question 3: Would the Virginia trauma and EMS system benefit from categorization of all hospitals for capabilities to care for children? What would be the key elements for this categorization (i.e. equipment, training, PI, transfer protocols and agreements)?

Categorization of hospital capabilities for pediatric care benefits children with serious injuries and acute medical conditions. Specialty pediatric resources are limited, e.g., pediatric subspecialists, pediatric surgeons, pediatric intensive care units, and burn care. Knowing where these resources are located in the state can be helpful when EMS providers and hospitals have a child with severe injuries needing these resources. Identifying where these resources are located would also be important during a disaster event.

A recognition or categorization process provides opportunities to identify the capabilities of all hospitals and emergency departments in the state. Criteria for categorization establish a standard of care that can be monitored, which should improve care. Categorization should assist in getting children in need to the right resources, in the right amount of time. Not all children with an injury need a children's hospital, but all children with a pediatric emergency need a facility with a Pediatric Ready Emergency Department as defined by the 2009 Pediatric Guidelines for Emergency Departments.

Two EMSC performance measures focus on recognition or categorization of hospitals capable of providing care to 1) injured patients (trauma systems in place typically meet this measure's intent as long as pediatrics are addressed specifically) and 2) the second recognition is related to capabilities to treat pediatric medical emergencies.

These PMs may be found at:
http://www.emscnrc.org/EMSC_Resources/Publications.aspx and scroll down to EMSC Performance Measure Implementation Manual for State Partnership Grantees.

Several states have implemented facility recognition or categorization programs. Presently 10 states have formal categorization processes in place, but all of them began with the 2009 Pediatric Guidelines for Emergency Departments as a foundation. Making these guidelines the criteria for lower level of recognition or categorization is a reasonable beginning. Two important recommendations would be weighing and recording weight in Kg. Facilities could also be assisted in developing a policy for reduced-dose radiation for computed tomography (CT) scan and x-ray based on pediatric age or weight.

Additional levels of recognition or categorization have been developed depending on the resources at the hospital. Higher levels involve the presence of a pediatric intensive care unit or Level I or II pediatric trauma center. Consider adding an additional level of pediatric trauma center designation. This would help create a

more coordinated system of care for the pediatric trauma patient, and it might make it possible for the Children's Hospital of the King's Daughters (and potentially other facilities) to apply for pediatric trauma center designation.

States have often started with a voluntary recognition program. Consider communicating with other state EMSC program managers where a recognition program has been implemented for strategies to gain support for the program, such as Tennessee, Delaware, and Arizona. The EMSC committee should consider what process might be most acceptable in Virginia and if criteria should be formalized in administrative rule.

Interfacility transfer agreements are a performance measure for the EMSC program. As outlined in the 2009 Consensus Statement Guidelines for Care of Children in the Emergency Department, the interfacility transfer process must be well thought out so that children get optimal trauma care when needed for severe injuries. A facility recognition or categorization process could require interfacility transfer agreements and guidelines. The referral trauma centers for injured children could work to identify which referring hospitals they have no agreements with. Trauma centers could do outreach to these facilities, to help them establish both the agreement and guidelines for transfer for children. The incentive could be better safer transfer, assistance in resuscitation of the child and packaging for transfer, and ideally better patient outcomes. An agreement could also provide an opportunity for better assurance of follow up information on the patient, outcomes, and PI conversations. This initiative could also be a project for the trauma program manager group in collaboration with the EMSC advisory committee.

Recommendations

- Collect information about various state pediatric hospital recognition programs for review by the EMSC committee.
- Identify the best process for formalizing a recognition or categorization program in Virginia.
- Consider adding a Level II Pediatric Trauma Center designation category.
- Identify a strategy and process for implementation of a recognition or categorization program.
- Task the trauma program managers group to collaborate with the EMSC advisory committee to develop a strategy to encourage all hospitals to develop and adopt transfer agreements and guidelines for injured children.

Pediatric Focus Question 4: How could Virginia improve the minimum level of pediatric readiness in all emergency departments?

The best way for each emergency department to improve its minimal level of readiness is to have a designated pediatric champion team (nurse and physician) who will be in charge of education and PI. Many hospitals have a nurse career ladder program, and this could be one strategy for creating a formalized process to support the nurse pediatric champion. Consider working with a few nurses representing small, medium, and large hospital emergency departments to create a model job description for a nurse pediatric champion. Responsibilities could include pediatric readiness and coordination of pediatric PI. The nurse could potentially identify and team with an emergency physician interested in pediatric PI. This could be an incentive for nurses to become pediatric champions.

Consider establishing an interest group for nurse and physician pediatric champions for each region, and encourage face-to-face meetings each quarter. The group's purpose could be pediatric readiness problem solving and a case review to promote the PI process. Such a process could encourage learning about pediatric patient safety challenges and solutions implemented at other facilities. Members of the group can be supportive of each other in their efforts to foster change within the emergency department setting.

The presence of a pediatric readiness recognition or categorization program, pediatric emergency care coordinator, and a performance improvement plan for pediatric emergency care has been associated with higher levels of pediatric readiness. See Remick, K et al. Ann Emerg Med. 2015:in press, http://dx.doi.org/10.1016/j.annemergmed.2015.07.500

Recommendations

- Encourage each hospital emergency department to designate a nurse and physician to be pediatric champions.
- Collaborate with emergency nurses to develop a list of responsibilities associated with the pediatric champion role.
- Encourage the development of a nurse and physician pediatric champion interest group in each region.

Pediatric Focus Question 5: How could the patient quality/patient safety in the emergency department be monitored and improved across all facilities not just trauma centers?

The 2012-2013 Pediatric Readiness survey revealed that only 58% of the Virginia's emergency departments reported having a pediatric patient care review process. Of the emergency departments that reported having a pediatric patient care process, only 67% of them had identified quality indicators for children.

A first step is to identify the emergency departments that have no pediatric patient care review process and work with them to initiate this process. Identification of pediatric champions is the next reasonable step so that someone in the emergency department will take responsibility for this process.

As recommended in question 4, regional meetings of pediatric champions can be very supportive of the patient safety/quality improvement process. The EMS agency pediatric champions should also be invited. Regional and state pediatric quality improvement meetings are taking place in some states for pediatric trauma and emergency care, e.g. Illinois and Delaware.

Issues identified by Virginia's Child Death Review Committee might also provide guidance regarding patient safety concerns associated with preventable deaths. The EMSC program manager should communicate with the coordinator of the state's Child Death Review Committee to determine how information about patient safety concerns could be shared with the EMSC advisory committee and pediatric champions. An opportunity to submit a nomination for appointment to this committee from the EMSC advisory committee should also be considered.

Trauma centers are expected to have a Patient Safety/PI process in place that includes loop closure. The pediatric trauma centers have expertise to help educate the pediatric champions about PI processes. The pediatric trauma center trauma program managers (TPMs) have information about patient safety issues identified related to children transferred to their facilities. A discussion with the TPMs about their process of loop closure, the individual receiving information about issues identified, and guidance provided would be valuable to the pediatric champions. The TPMs of the pediatric trauma centers could facilitate case reviews at the regional meetings of the pediatric champions and help problem solve.

Recommendations

- Approach the coordinator of the Virginia Child Death Review Committee to learn about patient safety concerns that could be shared with pediatric champions.
- Work with pediatric trauma center trauma program managers to support the pediatric champion performance improvement process.

Focus Questions

Focus Question 1: Would there be a benefit to aligning the current EMS Council Regions with the VDH Health Districts?

As noted in the main report sections Lead Agency and Human Resources and System Coordination, it is difficult to provide oversight for 11 regional council contracts, provide appropriate technical assistance to meet each region's particular challenges, and ensure that each region is achieving all deliverables. In addition, the current alignment structure of the regional councils is not consistent with the Virginia's health districts or the Hospital and Healthcare Association Regions (Emergency Preparedness Regions). This results in fragmentation of planning and response efforts.

Virginia is not a large state by landmass. Reducing the number of regional councils will improve the state's ability to better manage system coordination, provide assistance as needed to individual regions, and monitor the regional contract deliverables. Greater support could potentially be provided through outreach from trauma centers in urban areas to the more rural areas within newly defined regions. It would also reduce the number of inconsistencies in the provision of EMS services by reducing the number of EMS Triage and Transfer Guidelines.

Alignment with the 6 Virginia Hospital and Healthcare Association Regions provides a reasonable approach to system performance and improvement. One benefit to this approach is all of the emergency responder organizations are familiar with this regional structure and regional emergency response relationships already exist. In addition, by aligning the regions with the Hospital and Healthcare Association Regions, at least one higher-level trauma center will be located in five of the six regions. While the southwestern district would not have a trauma center, one does exist just across the border in Bristol, TN, and this trauma center currently collaborates with the Virginia trauma system. This structure offers many benefits and will certainly assist the state in the coordination and standardization of care for all the citizens and visitors to the Commonwealth of Virginia.

Recommendation

- Reduce the number of EMS regional councils from eleven (11) to six (6).

Focus Question 2: Should VDH / OEMS pursue regulatory support / enforcement for the criteria in the trauma designation manual? If so, around what types of criteria?

The VA DHS/OEMS should work to ensure the trauma center designation criteria are contained in the EMS Trauma Regulations. The trauma center criteria manual is essentially just a manual used for designation decisions without enforcement power. Most states have the trauma center criteria contained within the rules, and a few have the criteria in statute. Either option allows the state to hold trauma centers accountable. *This is in the best interest of the patient.* This should be a high priority issue for the OEMS.

Virginia needs a way to legally ensure that trauma centers maintain the minimum standards for which they are designated. Having the criteria formalized in the regulations adds to their importance, and allows for an enforcement process should any trauma center have difficulty sustaining all required resources. The annual contract for disbursement of the trauma fund does not substitute for having criteria formalized in rule. The contract deliverables for Trauma Fund disbursement relate only to how the funds are used, not to sustaining all trauma center resources and readiness.

Trauma centers should be required to notify the state trauma program if a change in status occurs (e.g., reduced number of surgeons or other key personnel that limit 24-hour availability). The criteria should clearly identify how the Virginia trauma program would notify trauma centers regarding of concerns about performance, the possibility of and process for investigations, process and time provided for trauma centers to address identified problems, process for reducing the designation level or terminating trauma center designation, and the appeals process.

The timeline for formalizing the trauma center designation criteria in Rule should be determined quickly, with a target completion date of one year. A relatively efficient strategy may be to reference the trauma center designation manual in Rule, rather than to include all the trauma center criteria in rule. This could potentially allow the state trauma program and the OEMS to update the designation manual while avoiding a lengthy administrative rule approval process for each criterion. Some states reference the trauma center criteria in statute and list all the criteria in rule. Virginia should determine which process would be most effective for its legal process. It is important to keep in mind that the trauma center designation manual does need to be updated every few years to be consistent with the national standards for trauma centers.

Recommendations

- Seek legal counsel to determine the appropriate strategy for formalizing the trauma center designation criteria in Rule.
    - Develop the administrative rule language.
    - Define the enforcement process.
    - Seek appropriate approval from the EMS Board.
- Seek the administrative rule change for formalizing the trauma center designation criteria within one year.

Focus Question 3: Regional Programs.

Although strategic vision and planning for the state trauma program occurs at the state level, much of the function and implementation of these plans are performed at the local (regional) level by the regional councils. Each of the 11 regional councils is a 501(c) 3 organization, and each functions under contract with the state. Contract terms are for 5 years, and it is renewable for an additional 2 one-year periods under certain conditions. However, the contract can be cancelled upon 60 days notice.

The contract delineates the scope of work to be performed, the general terms and conditions, special terms and conditions, and method of payment and pricing schedule. The documents outline specific work to be performed, such as hiring a regional medical director, development of regional medical protocols, development of a regional EMS plan, a regional stroke plan, surge plans, hospital diversion plans, an EMS process improvement (PI) plan, and plans associated with the improvement of care to the traumatized patient. This implementation strategy has worked well for Virginia, allowing oversight and direction to be established at the state level, while still allowing the each region to adjust its EMS program to more closely meet local needs. This model appears to be stable and to be serving the state well. It also appears that the regions are well staffed and operate with considerable independence. However, there appears to be variability among the regions as to how well these goals are accomplished. For example, the TSC team reviewed several regional EMS protocols, and considerable variation was found in expectations for EMS performance between regions.

Regional stakeholders reported during open sessions that they wanted more information about their regional performance, including the use of regular reports. This will become possible once the new EMS and trauma registries are fully operations, sometime in 2016.

The TSC team recommends that the OEMS and the EMS Board be involved in establishing a “floor” (minimal standards for EMS treatment and performance), but allow the regions to act as “living laboratories” for improvements. For example Virginia could mandate that trauma patients meeting specific criteria be resuscitated by intravenous fluids to for a certain blood pressure, but allow (with the appropriate approvals and oversight) the use of tranexamic acid in other regions. The opportunity for EMS research is obvious.

The TSC team considered that the contact between the state and regional councils could be used with advantage in implementation of the future statewide trauma plan. For example, future statewide minimal adult, pediatric, and geriatric trauma protocols could the basis for development of revised regional protocols that maintain the minimal requirements.

The TSC team suggests that the regional council contracts could be improved and offers the following for consideration:

- Outline a timeframe for certain prioritized deliverables, e.g. have one year for the development of pediatric trauma treatment protocols, a second year for the dissemination and education associated with the protocols, and in years 3 and 4 PI analysis of the protocol use of such protocols (adherence to the protocols and (hopefully) improved outcomes.
- Allow the state trauma program to be more prescriptive in the PI projects. For example, a project that focuses on regional application of the EMS triage and destination guidelines.
- Be more vigorous in monitoring appropriate data to track regional performance. This will allow the Virginia to better track the performance of regional staff, regarding compliance with the contract, detect early deviation from performance targets, and enable corrective action.
- Mandate that the regions perform certain projects that have direct linkage to trauma patient outcome. For example: perform random tracer analysis on a small number of severely injured trauma patients to determine the time from accident/injury to time of arrival at the designated trauma center, together with analysis of any delays. Collation of data from several regions might lead to corrective strategies (if needed) statewide.

Recommendations

- Convene a meeting of representatives from the regions to identify which regular reports should be generated by the EMS and trauma registries, and how often (monthly; quarterly) such reports should be generated.
    - Select the content of these reports so that requests for ad hoc reports will be minimized.
- **Establish minimum statewide destination guideline standards for each step of the state trauma triage criteria for both adult and pediatric populations.**
    - **Allow regions to adapt the destination guidelines to match trauma system resources but ensure adherence to the statewide minimum standards.**
- **Develop and implement of a minimum set of statewide trauma treatment protocols for adult, pediatric, and geriatric patients.**
- Identify priority contract deliverables with timelines for reporting and completion.

Focus Question 4: Enhancing Rehabilitation Care

A comprehensive trauma system plan incorporates rehabilitation at all levels of care. Integration of representatives in rehabilitation, especially at the level of the TSO&MC and the regional councils will certainly benefit the trauma system in Virginia. See the Rehabilitation Section for more information.

Full engagement of rehabilitation into trauma systems planning and coordination may be approached in several ways.

- First, a meeting involving the TPMs from all designated trauma centers (Levels I, II, and III) would facilitate the identification of gaps in service lines and barriers to obtaining rehabilitative services for their trauma patients. The impact of difficulties in timely hospital discharge and repatriation is critical for patient care, and also for system patient flow. Importantly, these TPMs can identify the Director of Rehabilitation Services at the inpatient rehabilitation centers where they transfer patients.
- Next, a meeting with the identified rehabilitation directors may assist the state in understanding the rehabilitation professional organizations, providers, and service agencies. This group could potentially be engaged in a statewide assessment of the rehabilitation resource capability and capacity across all regions. Such a statewide assessment could also inform the state trauma program about issues related to patient acceptance criteria, financing rehabilitation, and shared services across state lines.
- Consider a more in-depth evaluation of pediatric inpatient trauma rehabilitation resources in the state. Develop a list of facilities and their capabilities, and share that information with all the trauma centers. Consider developing pediatric rehabilitation triage guidelines and look at possible solutions to keep more pediatric patients closer to home for their inpatient rehabilitation.

Recommendations

- Convene a meeting of trauma program managers to discuss the issues associated with inpatient rehabilitation challenges for trauma patients.
- Convene a meeting of rehabilitation directors and trauma program managers to promote understanding of issues related to rehabilitation challenges for trauma patients.
- Ensure the TSO&MC has representation from in-patient rehabilitation (both clinical and administrative)
- Identify barriers to trauma center patient discharge, especially as it relates to special populations (pediatrics, geriatrics, TBI, SCI, out-of-state, unfunded, etc.).
- Obtain and maintain a comprehensive list of rehabilitation and skilled nursing facilities that treat injured patients within the state, including the level of care provided, and transfer / acceptance criteria (screening criteria).

Appendix A: Acronyms

ABA – American Burn Association
ACS – American College of Surgeons
ALS – Advanced Life Support
ASPR – Assistant Secretary for Preparedness and Response

BLS – Basic Life Support
BOH – Board of Health

CCT – Critical Care Transport
CDC – Centers for Disease Control and Prevention
CHKD – Children's Hospital of the King's Daughters
COV – Code of Virginia

EMD – Emergency Medical Dispatch
EMS – Emergency Medical Services
EMSC – Emergency Medical Services for Children

FTE – Full-Time Equivalent

HRSA – Health Resources and Services Administration

ICU – Intensive Care Unit
IVPP – Injury and Violence Prevention Program

MADD – Mothers Against Drunk Driving
MCI – Mass Casualty Incident
MTSPE - *Model Trauma System Planning and Evaluation*

NTDB – National Trauma Data Bank

OEMS – Office of Emergency Medical Services
OEP – Office of Emergency Preparedness
OFHS – Office of Family Health Services
OMD – Operational Medical Director

PCIS – Patient Care Information System
PI – Performance Improvement
PRQ – Pre-Review Questionnaire
PSAPs – Public Safety Answering Points

SADD – Students Against Destructive Decisions
SNFs – Skilled Nursing Facilities

STEMI – ST elevation myocardial infarction

TPIC – Trauma Performance Improvement Committee
TPM – Trauma Program Manager
TQIP – Trauma Quality Improvement Program
TSC – Trauma System Consultation
TSO&MC – Trauma System Oversight and Management Committee

UVA – University of Virginia

VAVRS – Virginia Association of Volunteer Rescue Squads
VCUHS – Virginia Commonwealth University Health System
VDH – Virginia Department of Health
VPHIB – Virginia Pre Hospital Information Bridge
VSTR – Virginia State Trauma Registry

YRBSS – Youth Risk Behavior Surveillance System

Appendix B: Methodology

The Virginia Department of Health (VDH) requested this trauma system consultation, which was conducted under the auspices of the American College of Surgeons (ACS), Trauma System Consultation (TSC) program. The multidisciplinary trauma system consultation team consisted of: two trauma/general surgeons, one emergency physician, a state EMS/trauma director, a trauma program manager, a trauma systems consultant, a pediatric specialty trauma/EMS physician and the ACS trauma systems program manager. Biographical sketches for team members are included as Appendix C of this report.

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

The TSC team convened in Glen Allen, VA, on September 1 – 4, 2015, to review the Virginia trauma system. The meetings during the four-day visit consisted of plenary sessions during which the TSC team engaged in interactive dialogue with a broad range of representative trauma system participants. There was also an opportunity for informal discussion with the participants and time devoted to questions and answers. During the survey, the TSC team also met in sequestered sessions for more detailed reviews and discussion, and for the purpose of developing team consensus on the various issues, preparing a report of their findings, and developing recommendations for future development of the trauma system in Virginia. This report was developed independently of any other trauma system consultations or assessments.

Appendix C: Review Team Biographical Information

ROBERT J. WINCHELL, MD, FACS
Role: Surgeon, Team Leader

Dr. Winchell is currently Chief of Trauma, Burn, Critical and Acute Care at Weill Cornell Medical College, and the Director of the Trauma Center at New York-Presbyterian Weill Cornell Medical Center. Previously, Dr. Winchell served as the Professor of Surgery and Chief of Trauma at the University of Texas Health Science Center at Houston and Memorial Hermann, Texas Medical Center.

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

Dr. Winchell has been involved in trauma center and trauma system design and operation in a wide variety of settings covering the spectrum of system development. He was instrumentally involved with both the day-to-day operations and ongoing development of the San Diego County trauma system for over ten years and served as chair of the San Diego and Imperial County Committee on Trauma. He participated in the operation and ongoing development of the Washington state trauma system, serving on the state advisory board, and as chair of the Southwest EMS region. During Dr. Winchell's tenure in Maine, he worked to develop the Maine state system, serving as a member of the state advisory board and as a chairman of the Maine State Committee on Trauma. Dr. Winchell is Chair of the Trauma Systems Evaluation and Planning Committee of the American College of Surgeons and also serves as a senior site reviewer for the trauma center verification program of the College. He has led 11 state trauma system consultations. Dr. Winchell has been involved in international trauma systems development and was a founding representative to the World Health Organization's Global Alliance for the Care of the Injured.

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

ALASDAIR K.T. CONN, MD, FACS
Role: Surgeon

Dr. Conn recently stepped down as Chief of Emergency Services at the Massachusetts General Hospital in Boston and now teaches surgical residents and Harvard Medical School students, among his other duties.

After receiving his medical degree in Edinburgh, Scotland and his surgical training in Toronto, Canada, Dr. Conn became a staff surgeon at the Maryland Institute of Emergency Medical Services Systems (MIEMSS) in Baltimore. In addition, he was the EMS Director for the State of Maryland and the Medical Director of the Maryland State Police Aviation program.

In 1985, he transitioned to Boston where he initially worked at Boston Medical Center as a trauma and general surgeon, as well as Medical Director of a newly initiated consortium hospital-based helicopter program (Boston MedFlight). In 1988, Dr. Conn moved to the MGH to his new position as Chief of Service; and he continued to take trauma call.

He is still actively involved in pre-hospital issues; he continues to work with Boston MedFlight; and has worked with the Commonwealth of Massachusetts as Trauma Director, helping to draft the initial trauma legislation that was signed into law in the year 2000. He is an active participant in the drafting of regulations for the Massachusetts Trauma System. Dr. Conn has also served as Chairman of the American College of Surgeons Massachusetts Committee on Trauma and as Chief of Region I (New England) ACS Committee on Trauma.

KATHY J RINNERT, MD, MPH, FACEP
Role: ED Physician

Dr. Rinnert began her career in emergency medicine and emergency medical services (EMS) in the early 1980's as a Nationally Registered Paramedic in a five-county, rural EMS agency in the Allegheny Mountains of Southeast Ohio. She completed medical school at the Ohio State University, followed by an internship in Internal Medicine at Loyola University, and residency training in Emergency Medicine at the University of Chicago. Following residency, Dr.

Rinnert completed a two-year fellowship in Emergency Medical Services (EMS) at the University of Pittsburgh. She simultaneously obtained a Master's in Public Health at the Graduate School during her tenure in Pittsburgh.

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

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

HEIDI A. HOTZ, RN
Role: Trauma Program Manager

Ms. Hotz is the Trauma Program Manager at Cedars-Sinai Medical Center, a Department of Health designated and ACS verified Level I Trauma Center. She is also the President of the Los Angeles Association of Trauma Program Managers as well as the Immediate Past President of the American Trauma Society (ATS), Past President of the Society of Trauma Nurses (STN), and Past President of the Trauma Managers Association of California (TMAC).

Ms. Hotz has extensive experience in all aspects of trauma including clinical care, program management, trauma data, trauma performance improvement and patient safety, trauma systems, injury prevention, consultation for trauma centers and systems, educational curriculum development, conference and event planning and all trauma related issues across the continuum of care.

Additionally, Ms. Hotz is the recipient of the STN's Trauma Leadership Award. She has been a survey team member for the ACS Trauma Systems and

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

DREXDAL PRATT
Role: State EMS Director

Mr. Pratt is Director of the Division of Health Service Regulation (DHSR) in the North Carolina Department of Health and Human Services. His division manages the all healthcare facility regulatory activities within the DHHS and includes the Office of Emergency Medical Services and Trauma and the Assistant Secretary for Preparedness and Response (ASPR) Hospital Preparedness Cooperative Agreement.

Mr. Pratt is a graduate of the Institute of Government at the University of North Carolina at Chapel Hill, the EMS Management Institute at the University of North Carolina at Charlotte, and Forsyth Technical Community College. He is also a Certified Emergency Manager (CEM) and a Certified Public Manager (CPM).

Mr. Pratt joined the North Carolina Office of Emergency Medical Services in 1987 as a Regional Coordinator. He was promoted through the ranks, first to Regional Supervisor, and then to Chief of the agency in 1999. In August 2010 Mr. Pratt was promoted to his current position as Director of DHSR.

Mr. Pratt served two terms as Chair of the Region I EMS Advisory Council. He received the National Association of County Commissioner's Achievement Award for coordinating the development of the Stokes County NC computer-aided dispatch program.

He has served as a Commissioner on the Governor's State Emergency Response Commission and served as Chairman of the Commission's Homeland Security Medical Committee. Currently, Mr Pratt serves as a Secretary of the

North Carolina Medical Care Commission, and Commissioner on the North Carolina Radiation Protection Commission.

In October 2009 Mr. Pratt received the North Carolina Medical Society's John Huske Anderson Award. This award recognizes individuals for whose contributions have made a positive impact on the medical profession and the public health. In addition, Mr. Pratt was presented the Order of the Long Leaf Pine in October 2010 from Governor Beverly Perdue. This is the highest civilian honor presented by the Governor and is presented to individuals who have a proven record of extraordinary service to the state.

JANE W. BALL, RN, DRPH
Role: Technical Advisor

Dr. Ball has served as a consultant to the Trauma Systems Evaluation and Planning Committee of the American College of Surgeons Committee on Trauma since 2006. As such, she has participated on more than 20 state and regional trauma system consultations. She was the Director of the National Resource Center (NRC) at the Children's National Medical Center in Washington, D.C. from 1991 through 2006. The NRC provided support to two Federal Programs in the U. S. Department of Health and Human Services' Health Services and Resources Administration (HRSA): the Emergency Medical Services for Children (EMSC) Program and the Trauma-Emergency Medical Services Systems Program. As director of the NRC, she participated in the development of the HRSA *Model Trauma Systems Evaluation and Planning* document. She also provided technical assistance to states regarding strategic planning, providing guidance in securing funding, developing and implementing grants, developing injury prevention plans and programs, building coalitions, shaping public policy, conducting training, and producing educational resource materials.

Dr. Ball has authored numerous articles and publications as well as several health care textbooks, including *Mosby's Guide to Physical Examination* (8 editions), *Child Health Nursing* (3 editions), *Pediatric Nursing: Caring for Children* (6 editions), *Maternal and Child Nursing Care* (4 editions), and *Pediatric Emergencies: A Manual for Prehospital Care Providers* (2 editions). One of these texts, Pediatric Nursing: Caring for Children, received the1999 and 2001 Robert Wood Johnson Foundation Last Acts Coalition Outstanding Specialty Book Award. *Child Health Nursing* was recognized as an American Journal of Nursing Book of the Year in 2010. As an expert in the emergency care of children, Dr. Ball has frequently been invited to join committees and professional groups that address the unique needs of children.

Dr. Ball served as the President of the National Academies of Practice, an organization composed of distinguished health care practitioners from 10

disciplines that promote education, research, and public policy related to improving the quality of health care for all through interdisciplinary care.

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

BRIAN R. MOORE, MD, FAAP
Role: Pediatric Specialty Physician

Dr. Moore is currently an Associate Professor of Emergency Medicine at the University of New Mexico in Albuquerque, New Mexico. He also serves as the State EMS Medical Director for New Mexico. He received both his undergraduate and MD degrees from the University of New Mexico in Albuquerque. He did his internship and residency at Phoenix Children's Hospital/Maricopa Medical Center Pediatric Residency Program and then Pediatric Emergency Medical Fellowship at The Children's Hospital in Denver, CO. After fellowship, Dr. Moore accepted a faculty position as Assistant Professor of Pediatrics and Emergency Medicine at the Mayo Clinic in Rochester, Minnesota. While at Mayo, he provided EMS medical direction for ground and air EMS services. Also, he was appointed by the Governor of Minnesota to serve on the MN EMS Regulatory Board. He returned as faculty to the University of New Mexico to start the first Pediatric Emergency Medicine Fellowship Program for the Department of EM.

Dr. Moore was appointed as State EMS medical in 2012, the only Pediatric Emergency Medicine trained physician in the country to hold that position. In his role as State EMS Medical Director, he works with his office on Trauma center verification and accreditation as well as trauma systems funding. He sits on a number on national committees such as the AAP Committee on Pediatric Emergency Medicine (AAP-COPEM), National Association of State EMS Officials (NASEMSO), and National Association of EMS Physicians where he currently serves as the Pediatric committee chairman. Through his affiliations with AAP and NASEMSO, he has served on NHTSA grant funded projects such as the EMS Model Clinical Guidelines and currently on the EMS COMPASS project's steering committee. He serves as a content expert on many subjects for the AAP-COPEM. He is currently one of the two primary co-authors on a collaborative policy statement between the AAP, ACEP, ENA, NAEMSP, and NAEMT entitled Pediatric Prehospital Readiness.

Dr. Moore is Board Certified in Pediatrics and Pediatric Emergency Medicine. In his personal time, Dr. Moore is an Ironman Triathlete completing numerous

triathlons including a full Ironman triathlon race in Arizona last year. He is currently training for two more Half-Ironman Triathlons this year.

NELS D. SANDDAL, REMT, PHD
Role: ACS Staff (Manager of Trauma Systems and Centers VRC Programs)

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

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

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

Appendix D: Participant List

#	First Name	Last Name	Title	Organization
1	Lindley	Aberbathy	Trauma Program Manager	Johnston-Willis Hospital
2	Michel	Aboutanos	Chief of Acute Care Surgery/ COT Trauma Medical Director	VCU Health Systems
3	Marcus	Almorode	Director of Emergency Services	Rockingham Memorial Medical Center
4	Emory	Altizer	Trauma Program Manager	Lewis Gale Hospital Montgomery
5	Sheldon	Barr	VP of Emergency & Cardiovascular Services	HCO Corporate
6	Samuel	Bartle	Advisory Board Member/ EMS for Children Chair/ Pediatric EM Physician	VCU Health Systems
7	Sid	Bingley	Captain	Blacksburg Vol. Rescue Squad
8	Heather	Board	Office of Fam Health Srvs, Inj Viol Prev Program Admin Manager III	Virginia Department of Health
9	Thomas	Boro	General Surgeon	Danville Regional Medical center
10	Beth	Broering	Trauma Program Manager	VCU Health Systems
11	Gary	Brown	Gen Admin Manager/ State EMS Director	Virginia Office of EMS
12	Vicki	Burton	Trauma Registrar	Mary Washington Hospital
13	Kathy	Butler	Trauma Program Manager	University of VA Medical Center
14	J. Forrest	Calland	Trauma Medical Director	University of VA Medical Center
15	Bryan	Collier	Trauma Medical Director/ Director of Surgical Nutrition	Carilion Roanoke Memorial Hospital
16	Jay	Collins	Trauma Surgeon	Sentara Norfolk General Hospital
17	Sonia	Cooper	Trauma Coordinator	Sentara VA Beach General Hospital
18	Gary	Critzer	Regional EMS Director/ EMS Advosory Board Chair	Waynesboro Dept of Emergency Management
19	John	DaVanzo	Rehabilitation Director	Bon Secours Maryview Medical Center
20	Mark	Day	Trauma Program Manager	Sentara VA Beach General Hospital
21	Richard	Decker	Member of ODEMSA Board of Directors	Old Diminion EMS Alliance
22	Todd	Dickerson	Emergency Department Director	Augusta Health
23	John	Duval	CEO	VCU Health Systems
24	David	Edwards	EMS for Children Program Manager/ Pediatric Emergency Care Coordinator	Virginia Office of EMS
25	Michael	Elliot	Trauma Center Administrator	Centra Health Lynchburg General Hospital
26	Michael	Feldman	Assistant Professor/ Burn Medical Director	VCU Health Systems
27	Jason	Fowlkes	Trauma Medical Director	Lewis Gale Hospital Montgomery
28	Carol	Gilbert	General Surgeon	Carilion Roanoke Memorial Hospital
29	Aaron	Glenn	Director of Nursing	Carilion Stonewall Jackson Hospital
30	Margaret	Griffen	Trauma Acute Care Surgeon	Inova Fairfax Hospital
31	Kelly	Guilford	Trauma Performance Improvement Manager	Chippenham Medical Center
32	Melissa	Hall	Trauma Program Manager	Mary Washington Hospital

33	Branden	Haushalter	CEO	Johnston-Willis Hospital
34	Barbara	Hawkins	Retired Nurse	n/a
35	Scott	Hickey	ACEP/ Advisory Board Committee/ Emergency Medical Director	Chippenham Medical Center
36	Marian	Hunter	Public Information Officer	Virginia Department of Health
37	Sudha	Jayaraman	Assistant Professor of Acute Care Surgical Services/ Advisory Board Member	VCU Health System
38	Elizabeth	Johnson	RN, Trauma Registrar	Southside Regional Medical Center
39	Donald	Kauder	Trauma Medical Director	Mary Washington Hospital
40	Gary	Kavit	System Medical Director, ED	Riverside Regional Medical Center
41	Marcia Ann	Kuhn	Medical Director of Trauma and Burns	Children's Hospital of the Kings Daughter
42	Amanda	Lavin	Asst Attorney General, Health Services Section	Office of the Attorney General
43	George	Lindeck	State EMS & Trauma Systems Medical Director	Virginia Office of the EMS
44	Raymond	Makhoul	Trauma Medical Director	Chippenham Medical Center
45	Nancy	Malhotra	Director of Trauma Services	Chippenham Medical Center
46	Ajai	Malhotra	Former COT Chair/ Former Chair, Trauma System Oversight Committee Chief/ Division of Acute Care Surgical Services	University of Vermont
47	Matt	Mathias	COO	Lewis Gale Hospital Montgomery
48	Genemarie	McGee	CNO	Sentara Norfolk General Hospital
49	Marilyn	McLeod	Operational Medical Director	Lynchburg General Hospital
50	Tim	McManus	CEO	Chippenham Medical Center
51	Lou Ann	Miller	Trauma Program Manager	Riverside Regional Medical Center
52	Charles	Miller	Nuero Surgery	Chippenham Medical Center
53	Corri	Miller-Hobbs	Safe Kid Virginia Program Coordinator	Children's Hospital of Richmond at VCU
54	Anne	Mills	Director of Emergency Department	Danville Regional Medical Center
55	Veleria	Mitchell	Trauma Program Manager	Sentara Norfolk General Hospital
56	Sherry	Mosteller	Trauma Program Manager	Carilion New River Valley Medical Center
57	Daniel	Munn	Director, Trauma & Acute Care Surgery	Riverside Regional Medical Center
58	Melinda	Myers	Trauma Division Director	Inova Fairfax Hospital
59	Timothy J.	Novosel	Assistant Professor / General Surgery/ Trauma	Sentara Norfolk General Hospital
60	Martin	O'Grady	General And Vascular Surgeon	Sentara VA Beach General Hospital
61	Kelly	Parker	Hospital Preparedness Intern / Disaster	Virginia Department of Health
62	Christopher	Parker	RN / Paramedic	Lynchburg General Hospital/ Centra One
63	Robin	Pearce	Trauma Critical Care Coordinator	Virginia Office of the EMS
64	Debra	Perina	ED Physician	University of Virginia Health System
65	Anita	Perry	Director of Flight Services	Wellmont One
66	Peter	Ploch	Trauma Medical Director, General Surgery	Lynchburg General Hospital/ Centra Health
67	Melissa	Porrey	Trauma Survivors Network Coordinator	Inova Fairfax Hospital
68	Dynette	Rombough	Coorporate Vice President and President of Sentara	Sentara Northern Virginia Medical Center

69	John	Potter	Medical Director, Emergency Department	Winchester Medical Center
70	Faiqa	Qureshi	Division Director, Pediatric Emergency Medicine	Children's Hospital of the Kings Daughter
71	Bob	Ramsey	Executive Director	Virginia College of Emergency Physicians
72	Robert	Rasmussen	Program Admin Manager III/ Traffic Engineering	Virginia Department of Transportation
73	Morris	Reece	Disaster Coordinator / Technical Advisor	Virginia Hospital and Healthcare Association/ WVEMS Regional Council
74	Karen	Rice	Admin & Office Specialist III	Virginia Office of the EMS
75	Kelly	Rumsey	Nurse Clinician/ Program Manager	Children's Hospital of Richmond at VCU
76	Shawn	Safford	Section Chief, Pediatric Surgery	Carilion Clinic Children's Hospital
77	Gary	Scott	Vice President	Carilion Roanoke Memorial Hospital
78	Paul	Sharpe	Trauma/ Critical care Manager	Virginia Office of the EMS
79	Macon	Sizemore	Director of Rehabilitation Services	VCU Health Systems
80	Kelly	Southard	Chief/ REMS Board of Director President	Orange County Volunteer Rescue Squad
81	Greg	Stanford	Trauma Medical Director/ General Surgery	Winchester Medical Center
82	Keith	Stephenson	Trauma Medical Director/ General Surgery	Carilion New River Valley Medical Center
83	Adam	Stevens	Co-director for Trauma Services	Lynchburg General Hospital/ Centra Health
84	Eric	Stone	Associate Administrator/ VP of Clinical Operations	Riverside Regional Medical Center
85	Marcus	Stone	Director of Emergency Services and Business Health Services	Memorial Hospital of Martinsville
86	Wanda	Street	Administrative & Office Specialist II	Virginia Office of the EMS
87	Lynn	Taylor	Curriculum Development Instructor	United Network for Organ Sharing
88	Dallas	Taylor	Director of Trauma Services	Lewis Gale Medical Center Salem
89	Robert	Teaster	Administrator for Transplant Services	University of Virginia Medical Center
90	Sadie	Thurman	System Director of Emergency Services	Riverside Regional Medical Center
91	David	Trump	Chief Deputy Commissioner for Public Health and Preparedness	Virginia Department of Health
92	Amanda	Turner	Trauma Coordinator	Lynchburg General Hospital/ Centra Health
93	Linda	Watkins	Injury Prevention Coordinator	Inova Fairfax Hospital
94	Leonard	Weireter	Professor of Surgery	Eastern Virginia Medical School
95	Lisa	Wells	Trauma Program Manager	Winchester Medical Center
96	Scott	Winston	Program Admin Manager III	Virginia Office of the EMS
97	Greg	Woods	Executive Director	Southwest EMS Regional Council
98	Andrea	Wright	Director, Trauma Services	Carilion Roanoke Memorial Hospital
99	Jeffery	Young	Director, Trauma Center/ Professor of Surgery/ Chief Patient Safety Officer	University of Virginia Medical Center
100	Anne	Zehner	Program Admin Specialist II	Virginia Department of Health/ Office of Family Health Services