



STATE OF WEST VIRGINIA
DEPARTMENT OF HEALTH AND HUMAN RESOURCES

Joe Manchin III
Governor

Patsy A. Hardy, FACHE, MSN, MBA
Cabinet Secretary

June 15, 2010

Enclosed you will find a copy of the final report of the American College of Surgeons Committee on Trauma Systems Consultation Team following their visit to West Virginia in December, 2009. In the beginning of this report there is a summary of major points by the consulting team. I have also taken the liberty of writing for you the following summary points having reviewed the report multiple times.

Going forward there will be a need to construct a five and a ten year plan for the West Virginia State Trauma System as a part of the West Virginia State Trauma & Emergency Medical System. This will require a considerable amount of work on the part of all stakeholders involved. It is hoped that this ongoing effort will indeed provide a foundation for ongoing performance improvement and continued quality care of the trauma patients and citizens of West Virginia.

Summary Points:

Injury Epidemiology:

The initial effort will require coordination of multiple databases to obtain a comprehensive picture of injuries within the state of West Virginia and the demographics associated with them. Based on these efforts a focused injury prevention program then can be developed. Public health epidemiology will need to be involved at a consulting level.

Indicators as a Tool for System Assessment:

The BIS (Benchmarks, Indicators and Scoring) evaluation will need to be extended to encompass all 113 indicators. This will require a facilitator and a one or two day (at a minimum) workshop for all stakeholders to complete the evaluation. This should be done in 2010.

Statutory Authority and Administrative Rules:

The consultation team has recommended that the defining Rule for the WV STEMS be amended to reflect the current structural organization of WV STEMS under the Bureau of Public Health. The stakeholder committees that currently advise OEMS and Trauma should be coordinated/integrated and serve a stronger advisory role. The membership

BUREAU FOR PUBLIC HEALTH
WV State Trauma & Emergency Medical Systems
NOROP
190 Hart Field Road
Morgantown, West Virginia 26505
Telephone: (304) 581-2900 Fax: (304) 285-3148

of the committees should be selected by the stakeholders from their constituent bodies so that they might advise freely without political influence.

System Leadership:

The State Trauma Advisory Council (STAC) should become a more influential committee in the organizational structure and also contribute significant work effort in the development of the five and ten year plans. STAC should also advise the performance improvement process.

Coalition Building and Community Support:

By expanding STAC, coalition building could be increased. A concerted public relations effort should be undertaken involving the media. This public relation effort should inform the public and legislators of the work done by the State Trauma System and provide an important tool in injury prevention both through education and legislation.

Lead Agency and Human Resources within the Lead Agency:

This organizational restructuring is already in process with the hiring of a Medical Director and an Administrator in WV STEMS. Job descriptions, roles and responsibilities within the trauma system need better definition and in all likelihood increased staffing.

Trauma System Plan:

The Systems Consultation Team has recommended a consultant be involved in developing the future state trauma system plan based on the BIS workshop and the efforts of STAC. This consultation report should provide a foundation for those efforts. Obviously, the trauma registry data will provide a strong foundation for developing that plan.

System Integration:

Improved coordination between EMS, Disaster Preparedness, Prevention and Rehabilitation must be developed.

Financing:

Ongoing emphasis on financial data accumulation in the state trauma registry must be ensured. A financial subcommittee should be assigned the task of assessing the cost burden of trauma in West Virginia. Particular funding sources including grants (both state and federal) and potentially a dedicated funding stream must be identified to reduce that burden.

Prevention and Outreach:

Injury prevention needs to be focused through analysis of the state trauma registry and prevention programs developed under a prevention coordinator. Subsequent analysis of the impact of those programs on the incidence of injury must be performed.

Emergency Medical Services:

A prehospital care resources assessment and gap analysis must be undertaken. Coordination of prehospital resources including helicopters and critical care transport should be integrated with the SMART system to provide access of the injured patient to the right facility in the appropriate amount of time.

National Highway Traffic Safety Administration (NHTSA) should conduct an EMS reassessment. Performance improvement must be formalized and coordinated throughout the system.

Definitive Care Facilities:

Analysis of the state trauma registry to determine if indeed the right patients are being treated at the facilities appropriate to their injuries should be conducted. Tertiary trauma facilities should be involved in the analysis of this data and the role of Telemedicine and Teleradiology connectivity should be explored in refining transfer criteria i.e. which patients can be managed safely at the initial receiving facility or transferred immediately.

System Coordination and Patient Flow:

Prehospital Destination Field Triage Criteria have just been implemented. The impact of these criteria for destination from the field will be analyzed going forward and this will be coupled with analysis of trauma patients transferred between facilities. This information will be combined with the gap assessment in EMS to plan resource deployment throughout the state system i.e. critical care transport, etc.

Rehabilitation:

Rehabilitation has been a neglected step-child in the State Trauma and Emergency Medical System. A more active role must be planned as there are obvious gaps in rehabilitation availability for under/uninsured trauma patients. Outcomes must be measured.

Disaster Preparedness:

A fresh approach to the involvement of state trauma system in disaster preparedness must be undertaken. This will require ongoing workshops, credentialing, education, integration of the SMART system, and formal registration/credentialing of health care providers.

System wide Evaluation and Quality Assurance:

A trauma system performance improvement plan which encompasses multiple factors such as injury, mortality/morbidity, over/under triage, transfer times, resource utilization, cost, etc. must be developed. The state trauma registry will provide a strong foundation for this. The position for a medical review coordinator has been posted and applicants

have been interviewed. This will facilitate the process going forward. Additional outside consultation should be entertained.

Trauma Management Information Systems:

The most immediate challenge is to integrate the prehospital electronic patient care record and the trauma registry information. Linkage of these databases will require purchase of new hardware/software systems. The shared data manager who works for EMS and Trauma will be assigned a significant role in this process.

Research

A research subcommittee within the state trauma system should develop well defined questions to frame research. These questions should be focused on performance improvement of the system. Regular reports of their efforts should be distributed to stakeholders.

Sincerely,

David A. Kappel, MD, FACS



**Trauma System Consultation
State of West Virginia
Roanoke, West Virginia**

**December 13th-16th, 2009
American College of Surgeons
Committee on Trauma**

A multidisciplinary working group prepared this document based on the consultation visit that took place on December 13th-16th, 2009 in Roanoke, WV and included the following members:

Team Leader:

*Thomas J. Esposito, MD, MPH, FACS
Professor, Department of Surgery
Chief, Division of Trauma, Surgical Critical Care & Burns
Loyola University Medical Center
Maywood, IL*

Team:

*Jane Ball, RN, DrPH
Technical Advisor TSC
American College of Surgeons
Director, National Resource Center (EMS-C & Trauma) – Retired
Washington, DC*

*Amy Eberle, RN, BSN, EMT
State Trauma Coordinator
North Dakota Department of Health
Division of EMS and Trauma
Bismarck, ND*

*Ronald F. Maio, DO, MS, FACEP
Professor, Department of Emergency Medicine
Director of the Office of Human Research Compliance Review (OHRCR)
Department of the Office of the Vice President for Research of the University (OVPR)
University of Michigan
Ann Arbor, MI*

*Drexdal Pratt
Chief
North Carolina Office of Emergency Medical Services
Raleigh, NC*

*Charles F. Rinker II, MD FACS
Director of Surgical Quality and Patient Safety
Bozeman Deaconess Hospital
Bozeman, MT*

*Nels D. Sanddal, MS, REMT-B
Technical Advisor TSC
President, Critical Illness and Trauma Foundation
Bozeman, MT*

ACS Staff:

*Holly Michaels
Program Administrator
Trauma Systems Consultation
American College of Surgeons*

*Carol Williams
Manager, Trauma Programs
American College of Surgeons*

Table of Contents

TABLE OF CONTENTS.....	3
EXECUTIVE SUMMARY	5
ADVANTAGES AND ASSETS OF THE WEST VIRGINIA TRAUMA SYSTEM.....	6
CHALLENGES AND VULNERABILITIES OF THE WEST VIRGINIA TRAUMA SYSTEM.....	7
PRIORITY RECOMMENDATIONS SUMMARY.....	8
TRAUMA SYSTEM ASSESSMENT	10
INJURY EPIDEMIOLOGY	10
OPTIMAL ELEMENTS	11
CURRENT STATUS	12
RECOMMENDATIONS.....	13
INDICATORS AS A TOOL FOR SYSTEM ASSESSMENT	14
OPTIMAL ELEMENT.....	14
CURRENT STATUS	14
RECOMMENDATIONS.....	15
TRAUMA SYSTEM POLICY DEVELOPMENT	16
STATUTORY AUTHORITY AND ADMINISTRATIVE RULES	16
OPTIMAL ELEMENTS	16
CURRENT STATUS	17
RECOMMENDATIONS.....	19
SYSTEM LEADERSHIP	21
OPTIMAL ELEMENTS	22
CURRENT STATUS	22
RECOMMENDATIONS.....	24
COALITION BUILDING AND COMMUNITY SUPPORT	25
OPTIMAL ELEMENT.....	25
CURRENT STATUS	26
RECOMMENDATIONS.....	27
LEAD AGENCY AND HUMAN RESOURCES WITHIN THE LEAD AGENCY	28
OPTIMAL ELEMENTS	28
CURRENT STATUS	29
RECOMMENDATIONS.....	30
TRAUMA SYSTEM PLAN.....	31
OPTIMAL ELEMENT.....	32
CURRENT STATUS	32
RECOMMENDATIONS.....	33
SYSTEM INTEGRATION	34
OPTIMAL ELEMENTS	34
CURRENT STATUS	35
RECOMMENDATIONS.....	36
FINANCING	37
OPTIMAL ELEMENTS	37
CURRENT STATUS	38
RECOMMENDATIONS.....	39
TRAUMA SYSTEM ASSURANCE	40
PREVENTION AND OUTREACH	40
OPTIMAL ELEMENTS	41
CURRENT STATUS	41
RECOMMENDATIONS.....	42
EMERGENCY MEDICAL SERVICES.....	44

<i>OPTIMAL ELEMENTS</i>	46
<i>CURRENT STATUS</i>	48
<i>RECOMMENDATIONS</i>	50
DEFINITIVE CARE FACILITIES	51
<i>OPTIMAL ELEMENTS</i>	53
<i>CURRENT STATUS</i>	54
<i>RECOMMENDATIONS</i>	57
SYSTEM COORDINATION AND PATIENT FLOW	59
<i>OPTIMAL ELEMENTS</i>	60
<i>CURRENT STATUS</i>	61
<i>RECOMMENDATIONS</i>	62
REHABILITATION	64
<i>OPTIMAL ELEMENTS</i>	64
<i>CURRENT STATUS</i>	65
<i>RECOMMENDATIONS</i>	66
DISASTER PREPAREDNESS	67
<i>OPTIMAL ELEMENTS</i>	68
<i>CURRENT STATUS</i>	68
<i>RECOMMENDATIONS</i>	69
SYSTEMWIDE EVALUATION AND QUALITY ASSURANCE.....	71
<i>OPTIMAL ELEMENTS</i>	72
<i>CURRENT STATUS</i>	72
<i>RECOMMENDATIONS</i>	73
TRAUMA MANAGEMENT INFORMATION SYSTEMS.....	75
<i>OPTIMAL ELEMENTS</i>	76
<i>CURRENT STATUS</i>	77
<i>RECOMMENDATIONS</i>	78
RESEARCH	80
<i>OPTIMAL ELEMENTS</i>	82
<i>CURRENT STATUS</i>	83
<i>RECOMMENDATIONS</i>	83
FOCUS QUESTIONS	85
APPENDIX A: METHODOLOGY	101
APPENDIX B: REVIEW TEAM BIOGRAPHICAL SKETCHES	103
APPENDIX C: STATE PUBLIC HEALTH BUDGETS	110
APPENDIX D: CONSULTATION PARTICIPANT LIST	112

Executive Summary

American College of Surgeons Trauma System Consultation Visit

Overview

West Virginia was formally admitted to the Union as the 35th state in 1863. Nestled between Ohio, Pennsylvania, Virginia, Maryland, and Kentucky, it is known as the Mountain State, as its borders encompass hilly and rugged terrain having a mean altitude of 1,500 feet. It rests on the Allegheny Plateau and fronts the Appalachian Ridge. It also boasts a number of important rivers that drain into the Ohio River. A variety of industries support the state economy such as management and professional services, sales, farming and fishing, mining, construction, production, and transportation. The topography and natural resources make the state a recreation haven for residents and visitors.

West Virginia is home to just over 1.8 million citizens. The Mountaineers, as the residents like to call themselves, are free. But with that freedom comes a price – and that price is injury. Trauma significantly impacts the lifestyle of its citizens and tourists. Unintentional injury deaths rank fourth as a cause of death in the state. Unintentional injury deaths are on the rise. Motor vehicle crash-related fatalities are the greatest cause of death for young adults aged 15-24 years, accounting for 38% of deaths in this age group.

The state has a long history of addressing injury care. Recognizing this public health problem early on, state medical leadership took steps to acknowledge and fight this epidemic. A \$50,000 line item for trauma center development first appeared in the 1979-80 budget cycle for the purpose of allowing a hospital to dedicate one bed specifically for trauma care. Despite early resistance from hospitals and staff, the surgical leadership from the state chapter of the American College of Surgeons Committee on Trauma (ASC-COT) submitted a strategic plan to the office of EMS. In 1983, the ACS-COT's *Hospital and Prehospital Resources for Optimal Care of the Injured Patient* was adopted by the Department of Health and Human Resources and the Office of Emergency Medical Services (OEMS), and it was added to emergency legislative rules in 1984. A statewide trauma registry was initiated in 1989. The State Trauma Audit Review meetings were also started providing a foundation for system performance improvement and provider education.

System development proceeded through 1995 when the issues of hospital designation were further refined and expanded and the issue of funding was broached. A fact finding tour by trauma system leadership served as a needs assessment, a resource survey provided information to help direct further system

development, and a “plan to make a plan” was developed in 2000. The medical malpractice crisis of 2002 threatened the fledgling trauma care system. Legislation was passed in 2003 that provided limited liability for all providers treating emergency conditions at designated trauma centers. A legislative rule enacted in 2008, served as enabling legislation for future trauma system development and identified OEMS as the lead agency.

West Virginia has 52 acute care facilities, and 31(60%) have attained full and current designation at some level: 2 level I; 4 level II; 3 level III; and 25 level IV. Six additional facilities are reportedly moving toward provisional designation and are submitting data to the trauma registry.

The 206 emergency medical services (EMS) agencies are licensed as follows: first responders 18%; basic life support (BLS) 54%; and advanced life support (ALS) 28%. These EMS agencies have 1074 EMS vehicles, and 65% are licensed for ALS service. Twenty vehicles are licensed for critical care transport (CCT), nine are ambulances, and 11 are helicopters. Air ambulances are based at 8 locations. The state has approximately 10,500 EMS providers, including first responders, 5000 miners certified at a BLS level, and 1400 paramedics.

The West Virginia trauma system has initiated and completed many aspects of the infrastructure development, such as a lead agency, personnel, and a statewide trauma registry. Only recently has useful data from the trauma registry become available to begin addressing performance improvement.

West Virginia has many interested stakeholders, as evidenced by the number of participants in the trauma system consultation. However, these stakeholders are not being effectively utilized to plan and help the system develop to the next stage. The trauma and emergency medical services programs are in the same division, but effective communicating and collaboration is not apparent to the consultation team. Trauma stakeholders, until recently, have had little input.

The Commissioner of the Bureau of Public Health has directed the trauma program to develop a strategic plan. The state intends to use information from this consultation to identify and formulate the next stages of trauma system plan development.

Advantages and Assets of the West Virginia Trauma System

- Enabling legislation
- Identification and empowerment of a lead agency in statute
- A well described and functioning designation and de-designation process
- An enthusiastic and dedicated STECS staff
- An engaged group of emergency medicine physicians and trauma surgeons at the leadership and advisory level
- Liability protection for trauma care providers

- A variety of useful data sources including a statewide trauma registry
- Presence of a Centers for Disease Control funded Injury Control Research Center and a School of Public Health at West Virginia University
- Active participation in the trauma system by level I and II trauma centers
- The State Medical Asset Resource Tracking Tool and centralized medical communication center
- State Trauma Audit Review process for education of health professionals
- The new Mountain State Injury Prevention Coalition

Challenges and Vulnerabilities of the West Virginia Trauma System

- Determination of ownership and a clear vision for the development and operation of an inclusive trauma system
- Recognition and integration of the many components and stakeholders in a trauma system
- Defining the roles, responsibilities, relationships, and accountabilities of the many leadership positions and advisory and regulatory bodies in the lead agency organizational structure
- Recruitment and retention of hospitals and physicians to participate in the trauma system
- Maintenance of liability protection for trauma care providers
- Acquisition of sustained dedicated trauma system funding for programmatic development, operations, system operation, and uncompensated care
- Development and implementation of a comprehensive trauma system plan which is broad in scope
- Formulation and implementation of a robust system-wide performance improvement plan
- Development of a coordinated and concerted public information and education (PI & E) plan
- Utilization of telemedicine and teleradiology for clinical resource management and education
- Formulation of a research agenda
- Assessment of collar state and patient flow issues within the state
- Integration of rehabilitation services and data into the trauma system
- Clarification of the relationship between the EMS system and the trauma system programs
- Movement in the direction of an Emergency Care System that integrates trauma, EMS, stroke, and ST elevation myocardial infarction (STEMI)

Priority Recommendations Summary

Statutory Authority and Administrative Rule

- Revise the West Virginia Code 16-4C-5 to expand the membership of the Emergency Medical Services Advisory Council (EMSAC) to be more representative of the emergency care system to include trauma and pediatric emergency representatives.
- Revise the organizational structure of the Lead Agency (Office of Emergency Medical Services [OEMS]) to be consistent with the West Virginia Legislative Rule.
- Revise the Legislative Rule to establish all committees in the trauma and emergency care system as subcommittees of the EMSTAC

System Leadership

- Identify a mechanism for trauma leadership to provide input and advice for trauma system development at a higher level of state government, for example:
 - Establish a trauma subcommittee (STAC) of the EMSTAC with the expertise to make recommendations regarding the policies and procedures for trauma system development.
 - Clearly specify the roles, responsibilities, and accountabilities of the STAC.

Lead Agency and Human Resources within the Lead Agency

- Ensure that the state organizational structure is in compliance with existing code until such time as it is changed.

Trauma System Plan

- Assign the STAC the task of trauma system plan development.
 - Set firm timelines for completion of the process.

Emergency Medical Services

- Complete a prehospital care resources assessment and gap analysis that includes air medical transport resources.
- Request that the National Highway Traffic Safety Administration (NHTSA) conduct an EMS technical re-assessment.

Definitive Care

- Amend level IV trauma center physician coverage criteria to be consistent with the current ACS criteria.

System Coordination and Patient Flow

- Formulate standard and uniform interfacility transfer criteria based on patient needs and receiving hospital resources.

Rehabilitation

- Conduct an assessment of rehabilitation needs and resources for the injured patient (both insured and uninsured).

Disaster Preparedness

- Pursue inclusion of the trauma system in the activities of hospital disaster preparedness (e.g. burn care, Emergency Systems for Advance Registration of Volunteer Health Professionals [ESAR-VHP], surge capacity).

System-wide Evaluation and Quality Assurance

- Develop a trauma system performance improvement (PI) plan to include ongoing evaluation of structure, process, and outcomes within the trauma system.

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 West Virginia (WV) trauma system trauma registry has more than 130,000 records. Injury data from the trauma registry was provided for 2008 in the Pre Review Questionnaire (PRQ). Summary statistics with data stratified by age and mechanism of injury were reported. No stratification by injury severity or geographic location was provided, but is accessible.

No current population-based injury data were provided. The trauma system has recently partnered with the WV Bureau of Public Health's (BPH) Health Statistics Center in order to obtain population-based injury mortality and hospital discharge data in the future. In addition to vital statistics and hospital discharge data, the Behavioral Risk Factor Surveillance System (BRFSS) and the Youth Behavioral Risk Factor Surveillance System (YBRFSS) data are also available. Another important population-based data set is that of the WV Child Fatality Review Team (CFRT). These databases will help guide the trauma system's pediatric injury prevention efforts, as well as identify when failures in appropriate acute care (secondary prevention) have a role to play in the child's death. The trauma system should encourage the development of and contribute to biennial reports on the status of injury in WV.

The Office of Emergency Medical Services (OEMS) will provide access to, and linkage with, the Trauma and Emergency Medical Information System (TEMIS). TEMIS will eventually combine the prehospital care electronic record, the medical command electronic record, and trauma registry data. The WV Department of Transportation (DOT) will facilitate providing crash data. Thus, the WV Trauma System will eventually be able to link crash data, prehospital care data, and in-hospital care data.

The WV trauma system has partnered previously with investigators and staff from WVU Injury Control Research Center (ICRC) to conduct population-based injury assessments, the most notable being a study on all-terrain vehicle (ATV) injuries. The WV trauma system should re-establish its partnership with WVU ICPC to assist in database linkage and injury surveillance at the system and population-based level.

The WV trauma system has a 0.5 full time equivalent (FTE) position for a program analyst. This individual's time is shared with OEMS. The individual currently filling this position is an experienced database programmer and analyst. He will be particularly helpful in managing the TEMIS database, though he is not an epidemiologist. An epidemiologist would be especially helpful in identifying questions to assess the status of injury and trauma care and to analyze injury patterns. Perhaps the trauma system can obtain some support for an epidemiologist from within the BPH.

The WV trauma system should consider forming an Injury Data Committee or Group to determine the data needs for the trauma system, as well as the methods and resources needed to obtain that data. This committee should ensure that appropriate epidemiology support is obtained, either through the assistance of its state government or academic partners, or by hiring a consultant.

RECOMMENDATIONS

- Collaborate with other public health officials and the WVU Injury Control Research Center (ICRC) and/or the WVU School of Public Health to assess the status of injury in the state.
 - Use trauma system and population-based data to conduct an extensive analysis of injury including age, morbidity and mortality, mechanism, and trends over time for the state and each of the seven EMS regions. Ideally make analyses at the county level.
 - Analyze injuries of special populations, e.g. pediatrics, geriatrics, and ethnic/cultural groups.
- Contribute to the development of a biennial report on the status of injury in WV.
- Encourage the assignment of an epidemiologist in the BPH or hire a consultant to assist the trauma program to determine injury data needs and to develop strategies to obtain that data in a timely and efficient manner.

Indicators as a Tool for System Assessment

Purpose and Rationale

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

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

OPTIMAL ELEMENT

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

CURRENT STATUS

Few of the stakeholders assembled for the trauma system consultation (TSC) visit knew about the existence of the Health Resources and Services Administration (2006) *Model Trauma Systems Planning and Evaluation* document. Fewer were familiar with the Benchmark, Indicators, and Scoring (BIS) tool contained in that document. The BIS is one tool to enable a trauma system to conduct self-analysis, priority setting and benchmarking.

West Virginia's trauma stakeholders have not had an opportunity to complete all 113 indicators in the BIS. However, 26 physicians, nurses, and registrars did complete the 16 indicators used as part of the TSC evaluation process. The indicators were completed individually or in groups of two or three individuals from the same institution. Because these indicators were not discussed as one group, the stakeholders did not have the opportunity to benefit from a consensus building process or to hear varying opinions about the status of the state's trauma system. Without the benefit of a facilitated consensus-building process, a wide variation on several indicators was noted. Trauma system managers provided an aggregate scoring summary in the PRQ submitted prior to the site visit.

An interest in completing the entire BIS assessment was noted. When asked who would be assembled to complete the analysis, trauma system managers indicated that it would, primarily, be completed as an internal staff project. It is uncertain whether the trauma program managers have the breadth of expertise to accurately score all indicators in the tool. It is also unlikely that the synergistic learning effect of a multi-disciplinary perspective could be achieved using this approach.

RECOMMENDATIONS

- The state trauma advisory committee (STAC) should serve as the core group of stakeholders to complete the benchmarks, indicators, and scoring (BIS) tool.
 - Additional representatives from other government agencies, geographic regions, and disciplines should be recruited for the specific purpose of completing the BIS. (Total group size STAC plus invited participants] should not to exceed 40)
 - Complete the BIS in its entirety.
- Identify and retain a qualified facilitator to assist with the consensus-building process when conducting the BIS assessment and analysis.
- Identify several indicators for priority attention for trauma system development during the subsequent two to three years.
- Re-assess the entire BIS with specific emphasis on the priority indicators every two to three years as a method of benchmarking system development.

Trauma System Policy Development

Statutory Authority and Administrative Rules

Purpose and Rationale

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

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

OPTIMAL ELEMENTS

- I. Comprehensive state statutory authority and administrative rules support trauma system leaders and maintain trauma system infrastructure, planning, oversight, and future development. **(B-201)**
 - a. The legislative authority states that all the trauma system components, emergency medical services (EMS), injury control, incident management,

and planning documents work together for the effective implementation of the trauma system (infrastructure is in place). **(I-201.2)**

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

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

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

CURRENT STATUS

A significant strength of the state's trauma and emergency care system is its well written code and legislative rule with sufficient authority for trauma system development and for administrative and regulatory oversight. The current senior leadership within the Department of Health and Human Resources (DHHR) is supportive and provides guidance for the continued review and improvement of the state's trauma and emergency care system. With the statutory authority and departmental support, the OEMS and trauma system have an opportunity to identify and collaborate with numerous stakeholders, including the West Virginia Hospital Association, prehospital provider organizations, health professional organizations, and numerous governmental and non-governmental entities.

The OEMS Division is created in WV Code §16-4C-4. The OEMS is designated as the lead agency for the trauma/emergency care system in Legislative Rule 64-27-9, section 9.2. OEMS has the responsibility to "develop and implement policies and procedures necessary to carry out the operation and management of the state trauma/emergency care system", including but not limited to:

- trauma center designation
- facility categorization
- system design and operation
- medical review and audit for performance improvement and quality assurance
- development and enforcement of triage, transfer, and emergency procedures guidelines

The current organizational structure does not reflect the WV Legislative Code that clearly places the OEMS in the lead agency for the trauma system. The organization and operation of the state trauma care system must be integrated with the emergency medical services system in accordance with Legislative Rule 64-27-9.1. The current organizational structure was reported to be the State Trauma Emergency Care System (STECS), which is not established in the Legislative Code. Consideration should be given to modifying the lead agency's (OEMS) name in legislative code, to a division name that reflects agency responsibility for the development of a comprehensive emergency care system,

rather than focusing only on the prehospital aspects of the emergency care system.

West Virginia Code §16-4C-5, establishes the Emergency Medical Services Advisory Council (EMSAC). The council has fifteen members appointed by the Governor and with the advice and consent of the Senate. EMSAC's charge is to advise the Commissioner in all matters pertaining to his or her duties and functions in relation to carrying out the purposes of the article regarding the emergency medical services system. Membership of the council includes representatives from the following state organizations: County Commissioners' Association of WV, WV State Firemen's Association, WV Hospital Association, WV Chapter of the American College of Emergency Physicians (ACEP), WV Emergency Medical Services Administrators Association, WV Emergency Medical Services Coalition, Ambulance Association of West Virginia, and the State Department of Education. Currently, the EMSAC has no representation from trauma or other time-sensitive disease stakeholders such as stroke, ST elevation myocardial infarction (STEMI), or pediatrics. Although the EMSAC has sufficient statutory authority, it seems to be addressing only the EMS operational issues. To meet the needs of an ever changing and complex healthcare system, the state should consider seeking a revision in the code to expand the EMSAC membership and possibly rename the council to be more representative of the broader trauma and emergency care system. The EMSAC should expand its current focus to address the policy advisory role specified in the legislative code. In addition, the current trauma system committees, the State Trauma Advisory Committee (STAC), and the Medical Review Committee (MRC) should be formally identified as subcommittees of the expanded EMSAC.

The STAC is established in Legislative Rule 64-27-9.3 and is charged with advising the OEMS and Commissioner in all matters relating to the trauma/emergency care system. Membership is comprised of various stakeholders representative of healthcare professionals and the public (64-27-9.3.b.1), and members are appointed by the State EMS Medical Director. The STAC has specific responsibilities to advise the OEMS in sections 9.3, c.1 through section 9.3, c.8 of the rule, and it is required to meet at least twice each year.

Section 9 of the legislative rule authorizes the OEMS to do the following:

- establish trauma and emergency care regions,
- provide medical direction for all aspects of the trauma and emergency care system, and
- have the EMS Medical Director appoint members to the Medical Policy and Care Committee (MPCC) to assure input from specific specialists or agencies for the proper integration of the trauma and EMS system statewide.

In section 9.5.c of the legislative rule, the MPCC is charged with the development and recommendation of written protocols specifying the standards for triage and emergency healthcare procedures for the trauma/emergency care system.

The OEMS is charged with developing policies and procedures to ensure system accountability in Legislative Rule 64-27-10. This section also provides authority to develop and maintain a trauma and emergency medical information system to include the state trauma registry, State Medical Command Record, and the EMS Patient Care Record. The rule also requires all designated trauma centers, medical command centers, and licensed EMS agencies to collect and provide information as required in the policies and procedures governing the operation of the trauma/emergency medical system. The legislative rule in section 10.3 authorizes the establishment of medical review and quality improvement committees at the local, regional, and state level and defines membership. The OEMS is charged with the development of policies and procedures for the operation of these committees.

The state has a clearly defined process in Legislative Rule 64-27 for the establishment of standards, criteria, and methods for designating healthcare facilities that meet levels of care capabilities, as well as the identification of facilities best equipped and staffed to care for patients experiencing emergency injuries or illness. This section also authorizes the OEMS to designate and categorize healthcare facilities.

Another significant strength of the state's trauma and emergency care system is the enactment in 2003 of §55-7B-9c. Limit on liability for treatment of emergency conditions for which patient is admitted to a designated trauma center; exceptions; emergency rules. This legislation provides liability protection for the injury to or death of a patient as a result of health care services or assistance rendered in good faith and necessitated by an emergency condition for which the patient enters a health care facility designated by the OEMS as a trauma center. Also included is the liability protection for health care services or assistance rendered in good faith by a licensed EMS agency or an employee of a licensed EMS agency. The total amount of civil damages recoverable is not to exceed \$500,000. OEMS and associated advisory committees should continue to work diligently to ensure ongoing compliance with this statute as it provides a significant incentive for facilities to participate in the trauma system.

RECOMMENDATIONS

- **Revise the West Virginia Code 16-4C-5 to expand the membership of the Emergency Medical Services Advisory Council (EMSAC) to be more representative of the emergency care system to include trauma and pediatric emergency representatives.**
 - Consider renaming the EMSAC as the Emergency Medical Services and Trauma Advisory Committee (EMSTAC).
 - Allow for the future inclusion of representatives for time critical conditions (e.g., stroke and ST Elevation Myocardial Infarction [STEMI]).

- **Revise the organizational structure of the lead agency (Office of Emergency Medical Services [OEMS]) to be consistent with the West Virginia Legislative Rule.**
 - Consider renaming the OEMS to become the Office of Emergency Care to reflect the broader scope of time-sensitive emergency conditions.
- **Revise the Legislative Rule to establish all committees in the trauma and emergency care system as subcommittees of the EMSTAC.**
 - Authorize the EMSTAC chair to make all appointments.
 - Ensure that all the pertinent stakeholder agencies and the public are represented.
- Continue to ensure that all sections of the liability code 55-7B-9C are met.
- Update the rule requiring a specific edition of the *Resources for Optimal Care of the Injured Patient* for designation criteria, to “the most current edition.”

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

West Virginia has a large number of interested and committed individuals with a long history of support and interest in developing the state's trauma system. The STAC is established, with appointments made by the state EMS medical director. Membership is multidisciplinary, but heavily weighted toward medical directors of the trauma centers. Other representatives include an emergency physician, hospital administrator, a Healthnet medical director, a nurse trauma program manager, a trauma registrar, a pediatric surgeon, a paramedic, and a consumer. Other representatives can be recommended by the STAC and appointed by the state EMS medical director. In contrast, the EMSAC has members appointed by the governor and approved by the Senate.

The STAC has the following responsibilities as listed in rule:

- Recommend procedures and guidelines for the formation and administration of a state trauma/emergency care system
- Recommend policies and procedures governing the evaluation, designation, and re-designation of state trauma centers
- Establish credentials and serve as the central resource pool of individuals for appointment by the state EMS medical director to serve on site visit teams
- Recommend and evaluate data collection needs for quality improvement, medical reviews, and planning purposes for the system
- Serve as the main liaison for activities between the West Virginia chapter of the American College of Surgeons Committee on Trauma (ASC-COT) and OEMS
- Explore and seek additional funding sources to continue the development and maintenance of the state trauma/emergency care system

- Recommend policies and procedures necessary to carry out its duties
- Undertake other duties as assigned by the OEMS director or medical director.

By legislative rule, the STAC has adequate responsibilities identified for advising the state EMS medical director and OEMS for trauma system development. However, the STAC has not assumed these responsibilities to the extent possible. It is unclear whether this has been the result of inertia within the STAC membership or whether STAC development and activity was not encouraged by previous leadership. The MRC was developed to address trauma peer review. Rather than making this a subcommittee of the STAC, the MRC was established as a separate committee with no obligation to share findings with the STAC, even when the findings might be beneficial in recommending policies or guidelines for trauma system development or improvement. The MPCC by rule addresses trauma and EMS protocols and policy, but no trauma representative from the STAC has been appointed. This lack of information hinders the STAC from fulfilling its responsibility to make policy and procedure recommendations for EMS aspects of trauma system development.

No evidence was provided that the STAC developed by-laws or procedures necessary to carry out its duties. The STAC assembles twice a year for an evening meeting, and agenda items appear to be educational and information sharing. Minutes provided from a sample of the meetings do not reflect any administrative, policy, regulatory, or performance improvement initiatives. In reviewing the STAC meeting minutes available, the STAC appears to have no role in making formal recommendations for policies and procedures for the designation of trauma centers, which is counter to its charge in legislative rule. However, STAC members do offer opinions on policies and procedures, and they serve on site visit teams for the designation process.

The STAC, as it currently functions, appears to have no assigned tasks and no accountability for accomplishing the responsibilities assigned in legislative rule. STAC has a very limited advisory role as members are appointed by the state EMS medical director, to whom they report. The TSC team is concerned that this selection process might not provide for alternate points of view. The TSC team was provided with no assurance that formal recommendations, if made by the STAC, would be passed to higher leadership within the Bureau of Public Health (BPH) or DHHR for consideration.

STAC members have not demonstrated a consistent strong and visible advocacy role in the education of legislators and the public about the trauma system, why it is important, and the resources needed.

Representatives on the STAC continue to be engaged in the trauma system, despite frustrations related to their lack of an active role in promoting statewide trauma system development. They appear to be working in their local catchment

areas and collaborating with regional trauma centers to improve trauma care. STAC appears to have capable leaders who could help support statewide trauma system development if given the opportunity to fulfill the responsibilities outlined in legislative rule, and if the invitation to assume those responsibilities is accepted.

RECOMMENDATIONS

- **Identify a mechanism for trauma leadership to provide input and advice for trauma system development at a higher level of state government, for example:**
 - **Establish a trauma subcommittee (STAC) of the EMSTAC with the expertise to make recommendations regarding the policies and procedures for trauma system development.**
 - **Clearly specify the roles, responsibilities, and accountabilities of the STAC.**
- Develop by-laws or procedures for the STAC so that its performance can be evaluated.
 - Develop a formal mechanism to submit recommendations to the EMSTAC.
- Integrate the responsibility for trauma system performance improvement into the STAC, potentially making the Medical Review Committee (MRC) one of its subcommittees. Use information gained to recommend policy and procedure modifications for the trauma system.
 - Conduct performance improvement review in closed executive session.
- Increase the frequency and length of meetings of the trauma subcommittee to permit time to conduct the business for which it is accountable.

Coalition Building and Community Support

Purpose and Rationale

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

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

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

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

OPTIMAL ELEMENT

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

CURRENT STATUS

The STAC is one group that represents a coalition of trauma stakeholders. It is composed of members interested in trauma system development and injury prevention. Current members of the STAC represent the following:

- WV ACS-COT chair
- WV ACS-COT past chair
- Level I trauma centers
- Level II trauma centers
- Level III trauma centers
- WV ACEP
- Hospital administrator
- HealthNet air medical director
- Level IV/V trauma centers (currently vacant)
- Rural hospitals
- Trauma coordinators
- Trauma registrars
- Pediatrics
- Emergency Medical Services (EMS)
- General public (currently vacant)
- At-large members

According to information provided to the TSC team, stakeholders not specified in legislative code from other organizations, e.g., representatives of injury prevention, health system payers, rehabilitation, medical examiners, policy makers, and the media have never been included in STAC. The state EMS medical director is authorized to appoint additional members on the advice of the STAC according to legislative rule.

The STAC holds face-to-face meetings twice a year. Meeting minutes from 2005 were provided to the TSC team, so the nature of more recent business is unknown. Members from the STAC stated that they have no authority to make decisions on trauma system development or standards of care, and they feel disconnected from the system. Frustrations by STAC members present were clearly expressed, and participation by these stakeholders may become problematic if the STAC is not utilized more effectively for trauma system development.

The State Trauma Audit Review (STAR) represents a larger group of stakeholders, and includes physicians, nurses, and EMS providers involved in the trauma system. STAR meets twice yearly. STAR has an organizational structure for networking and education through case presentations. The STAR meeting is open, but only advertised to trauma system stakeholders. It is a voluntary group of stakeholders not included in trauma system regulation. STAR

has no organized structure, such as by-laws that could prohibit members of the public or media from attending its meetings. This meeting format concerned the TSC team regarding the potential for confidentiality and discoverability issues.

Little effort at the state or regional level has been made to provide outreach regarding trauma system development beyond the initial development of the trauma system and during the malpractice crisis in 2002. No community outreach, media campaigns, or education has been provided to the public about the importance of the trauma system and challenges it currently faces.

The trauma program is to be commended on its initiative to recognize legislators for their leadership in injury prevention and trauma system development and in publicizing that recognition.

The Mountain State Trauma Injury Prevention Coalition is a newly organized coalition formally known as the WV American Trauma Society (ATS) Chapter Injury Prevention Coalition. This coalition is currently seeking 501c3 status, establishing by-laws, electing officers, and determining membership fees. This coalition will hopefully serve as the umbrella for injury prevention activities throughout the state.

RECOMMENDATIONS

- Expand the membership of the STAC to include representation from the media, state hospital association, medical examiners, policy makers, rehabilitation, injury prevention, and health system payers, who can further advocate for trauma system development.
- Develop a process using media campaigns to routinely educate the public on trauma system development and statewide injury prevention efforts.
- Continue using STAR as a venue for networking and education, but eliminate any peer review activities.
- Expand electronic communication (e.g. website, interactive listserve) to improve collaboration and communication between trauma system stakeholders.
- Create and distribute an annual trauma system report for the education of stakeholders and the public, including state legislators.

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 role of the OEMS in the integration of the trauma system with EMS is clearly stated in state legislative rule; however, it appeared to the TSC team that OEMS has a minimal role in the trauma system. The trauma system program currently is organizationally placed in the STECS with OEMS as a parallel program. It is the consensus of the TSC team that the STECS has no statutory authority to lead the trauma system program. The trauma system program also does not have statutory authority to be the lead agency for the trauma system. Given the existing statutory authority, the TSC team encourages the state to comply with existing legislative rule until an organizational change is mandated in legislative rule or code.

The trauma system office currently has 8.5 FTE funded positions. The program is managed operationally by the Deputy State Trauma Medical Director (part-time employee), 1.0 FTE program manager, 0.5 FTE trauma registrar, 1.0 FTE nurse designation coordinator, 1.0 FTE nurse IV position (vacant), and 4.0 FTE administrative support staff. The OEMS has 14 budgeted position but none are providing assistance in the trauma program.

The number of employees dedicated to manage the trauma system program is a strength, and the state is commended for allocating these resources to improve the trauma and emergency care for its citizens. The trauma system program does not currently have staff with experience in grant writing and may want to consider seeking a person to meet this need as opportunities become available in the future. For example, grant funding from federal DOT 408 funding could potentially be sought to enhance the trauma registry and TEMIS.

Given the existing organizational structure, the TSC team perceives a lack of vision and clear direction for staff. Qualified staff with the appropriate skill set will be necessary to lead and support the next stages of development for the statewide trauma system. The TSC team believes that, currently, a disproportionately large ratio of administrative support personnel to personnel

with the professional skill set needed to manage a large and complex trauma program exists. Analysis of the technical skill set needed for the next stage of trauma system development should be the first step when considering the reclassification of existing positions. The OEMS has contracted with the Technical Support Network (TSN) to provide some services for the EMS system. It is unclear to the TSC team if this is a viable option that should be considered to carry out some of the responsibilities for the trauma system.

The OEMS Medical Director has most of the responsibility for the development and oversight of the system but delegates some of the daily operations to the Deputy Trauma Medical Director. It is difficult for the Medical Director to manage both the clinical aspects of a trauma and emergency care system, as well as the administrative responsibilities, especially when programs will be in the planning and development phase.

Although the organizational structure provides for three state agency divisions under STECS -- Trauma, OEMS, and Medical Command Communications -- they appear to be functioning independent of each other for system planning, development, and operations. A staff utilization assessment in all 3 programs may be helpful to enhance the efficiency and productivity of existing resources, and to facilitate program integration.

RECOMMENDATIONS

- **Ensure that the state organizational structure is in compliance with existing code until such time as it is changed.**
- Redefine the role of the State Trauma and Emergency Care System Medical Director to reflect oversight responsibilities for OEMS, including trauma systems.
 - Consider a full-time Administrative Director to manage daily operations and planning of the Office.
- Conduct an assessment of current personnel in the lead agency and develop a plan to capitalize on the staff's abilities and skills.

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

A trauma system plan currently exists and is contained in legislative rule. The legislative rule also serves as enabling legislation giving authority to the lead agency (OEMS) to design and develop the trauma system. A corollary document, produced in 2003, serves as a rudimentary outline of a "plan to make a plan". This document describes a six phase process leading to the creation of a plan which ultimately will culminate in the re-write of the current legislation and implementation of the updated trauma system plan. It was reported that having the trauma system plan contained in statute is a positive factor; however, changes to legislative rule will take at least one year. The Commissioner of the BPH has directed the lead agency to develop a new five-year plan for the trauma system; however, the timeline for completion of this task was not provided.

Phases I and II of the original plan were reported to be finished -- dealing with identity of current activities, personnel and resources, and the development of a formal structure to identify and implement the trauma system objectives. Useful trauma registry data have only recently become available to address phases III, IV, and V, which deal with data acquisition and analysis such that a true needs assessment and analysis can be performed. The TSC team could not determine if a needs assessment for phase I was accomplished.

It was stated that phase II, providing a formal structure or infrastructure for system development, was completed, but the TSC team is uncertain about this. For example, no clear entity or advisory body with appropriate stakeholder representation and empowerment to "take ownership" of the trauma system and its ongoing development appears to exist. The intent of legislative rule may have been to have the STAC serve in this role, but STAC has never fully assumed the role. While the STAC may be viewed as the most logical group to assume this responsibility, its current composition may not be broad enough for the task.

Additionally, its empowerment to truly effect change across all phases and components of the trauma system is not perceived to be adequate.

Further, while the participants and trauma program managers appeared to have a great deal of enthusiasm for further system development, the TSC team is uncertain if there is sufficient understanding, skill, and expertise to conduct the process. Consultation and education should be sought to help the STAC develop the skills needed, to identify the appropriate selection of data (e.g., trauma registry, vital statistics, crash data, and hospital discharge data), to answer important questions, and to apply the information gained from data analysis for trauma system development.

Participants expressed a concern about revising or reopening legislative rule or code because of the fear of losing the liability protection, which is perceived as a significant incentive in the recruitment and retention of hospitals and providers to participate in the trauma system. The TSC team was unable to determine if these fears are well founded.

In summary, the current trauma system plan is dated and not comprehensive. For example, it does not address all phases of care, as well as prevention, financing, performance improvement (PI), and disaster preparedness, among others. The existing plan does not conform to a public health approach advocated by the federal Health Resources and Services Administration (HRSA). Designation is the only process with sufficient detail. The trauma system design and how the plan integrates with the EMS system, the public health system, emergency preparedness, and incident management is not addressed. Finally, the TSC team is concerned that the current plan was not developed in collaboration with a representative contingent of current community partners and stakeholders.

RECOMMENDATIONS

- **Assign the STAC the task of trauma system plan development.**
 - **Set firm timelines for completion of the process.**
- Use a consultant to assist in the process of developing the trauma system plan.
- Use the *HRSA Model Trauma System Planning and Evaluation* document as a resource and guide for development of the trauma system plan.
- Use the trauma registry and other pertinent data to assist in the planning process.
 - Formulate a list of questions to guide system design.

System Integration

Purpose and Rationale

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

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

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

OPTIMAL ELEMENTS

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

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

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

CURRENT STATUS

The OEMS is the lead agency for the trauma system. As described in the enabling legislation (Title 64, Legislative Rule, Bureau for Public Health) two committees (EMSAC and STAC) are to be established to advise OEMS and the Commissioner “in all matters relating to the trauma/emergency care system.” While legislative rule seems to indicate that these committees are co-equals, in practice the STAC appears to have assumed a subsidiary and peripheral role in the administration of the trauma system. The dominant role played by the EMSAC, which is populated by representatives of emergency medicine and the prehospital arena, has resulted in a system which focuses on the retrieval and delivery of injured patients to the various hospitals in the state. The STAC does not participate in the deliberations of the EMSAC, and the two committees appear to be uninformed about the activities, interests, and programs of each other. A lack of integration of EMS and the trauma system, as required by legislative rule has resulted. Because the EMS and trauma system activities and functions are not integrated, they are unable to take advantage of each other’s resources, data, and liaisons. It is not possible for either division to carry out its mandates without cooperation from the other, and this divide must be bridged if they are to succeed.

The STAC meets twice a year, and has no input from representatives of mental health, social services, law enforcement, child protective services, rehabilitation medicine, or public safety. The committee structure provides for lay representation, but the position is currently vacant. In the absence of a state injury prevention coordinator, information on prevention activities is provided to STAC by the trauma program manager. A new, grass-roots group of prevention stakeholders, the Mountain State Injury Prevention Coalition, is in the formative stage.

The Division of Threat Preparedness coordinates the state’s response to a mass casualty incident. Despite the division’s acknowledgement that 90% of such incidents are trauma-related, the trauma community has virtually no involvement in the division’s activities. It was unclear to the TSC team whether the lack of involvement of the trauma community is a result of the division’s lack of awareness of the resources that trauma surgeons can contribute, or if trauma surgeons have made an insufficient effort to become involved.

RECOMMENDATIONS

- **Pursue inclusion of the trauma system in the activities of hospital disaster preparedness (e.g. burn care, Emergency Systems for Advance Registration of Volunteer Health Professionals [ESAR-VHP], surge capacity).**
- Develop, under the aegis of the EMSTAC and STAC
 - Combined performance improvement activities
 - Linkages with pertinent data sets
 - Liaisons with multiple stakeholders, including among others:
 - Rehabilitation
 - Public safety
 - Mental health
 - Child protective services
- Partner with EMS and other stakeholders to develop a truly inclusive trauma system

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

West Virginia is fortunate to have state appropriations through the General Fund to support the infrastructure for trauma system planning and development. The budget submitted to the TSC team reflected a budget of \$513,822 for the trauma system program from the appropriation of \$1,813,822.00. Of the remaining funds, \$950,000 is allocated for the operation of the Centralized Hospital and Emergency Medical Triage and Coordination Center (CHEMTAC), recently renamed the Medical Command Center (MCC). The 2009 OEMS budget is \$4,221,100. While each division has its own budget lines, divisions assist each other as needed.

The Benedum Foundation provided a grant of \$300,000.00 in 2009 towards the development of the MCC. This was combined with a \$120,000.00 grant from the state, and some of this funding provided support for a 0.5 FTE state trauma registrar.

Additional funding was received from the Assistant Secretary of Preparedness and Response (ASPR) for the purpose of establishing a hospital resource tracking tool. The West Virginia OEMS collaborated with the North Carolina OEMS and North Carolina's EMS Performance Improvement Center to purchase the State Medical Asset Resource Tracking Tool (SMARTT). The SMARTT system was implemented in the recent months, and the OEMS is now receiving daily information on available hospital resources from many of the hospitals.

No plan or strategy was described to seek continued funding support for the trauma and emergency care system. Only one staff person in STECS has grant writing experience and this individual would benefit from additional personnel support to enable the trauma system program to seek federal and private foundation funding. The state should be aggressive in seeking any available funding, especially federal funding from agencies such as the Office of Rural Health Policy and the DOT.

The total funding needed to fully support the trauma and emergency care system is unknown, and no effort is in process to obtain the financial data from the hospitals that could help determine those funding needs. Since the trauma registry includes a mechanism to collect some financial data regarding trauma patients, it is essential that all the participating hospitals submit the actual costs of uncompensated care and to support the trauma system in financial planning.

Because the OEMS has the authority to develop and implement a statewide trauma and emergency care system by legislation, the STECS organizational structure may prohibit the trauma system from obtaining some available funding designated by federal guidelines to pass through the state EMS offices for the development of an emergency care system.

The trauma program and OEMS should develop a strategy for maximizing the financial resources to support the vision of reducing injury morbidity and mortality statewide. Many of the current funding sources only provide short term assistance. Federal grant programs can help, but they are also short term funding options; however, they are beneficial until more sustainable state resources are available.

RECOMMENDATIONS

- Conduct an assessment of the costs associated with the operation of the trauma and emergency care system.
- Develop a vision and strategy to seek all available revenue resources to support and sustain the trauma system.
- Create a grant writing position to assist in seeking funding from both federal agencies and private foundations.
- Ensure that all hospitals are submitting financial data to the trauma registry

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 systemwide. 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
- A 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

West Virginia has implemented several injury prevention programs and has the opportunity for an even greater involvement in prevention and outreach. Currently, many prevention activities are conducted by the trauma centers, such as all-terrain vehicle (ATV) safety, bicycle rodeos, Trauma Nurses Talk Tough, and the annual prevention program selected each year for implementation statewide. The state has chapters of some national safety organizations, such as Mothers Against Driving Drunk (MADD), Students Against Destructive Decisions (SADD), and SafeKids. Other organizations such as the West Virginia Extension (4H clubs) and scouting programs emphasize safety and prevention. Several state agencies have a prevention focus and provide resources, such as the state's DOT and the Fire Marshal. The BPH has an injury prevention committee and an injury prevention program, but, at present, its injury prevention coordinator position is vacant.

The trauma program director is a key participant in many prevention meetings conducted by state agencies (e.g., the DOT Injury Prevention and Safety Committee, Key Players in Rape Prevention, the BPH Motorcycle Safety and Awareness Committee, and the BPH Injury Prevention Committee). She also works with the Fire Marshal's Office for Awareness Campaign. By participating on these committees, the trauma program director is able to collect information about prevention programs to share with the trauma centers.

Injury prevention and outreach are a significant interest in the state, as demonstrated by the formation of the Mountain State Injury Prevention Coalition. Health professionals and institutions will pay a membership fee to MSIPC that will be used to support prevention efforts. As this group is currently developing by-laws and getting organized, it is not possible to predict its impact.

Resources for prevention and outreach activities are limited. The state has an Injury Prevention website with numerous resources and contacts, but it has not been updated since 2005. As the BPH injury prevention coordinator position is vacant, linkages with state resources (e.g., WV ICRC and the WVU School of Public Health), and the coordination of resources available through the state agency programs are not occurring. Such collaboration could help with the analysis of injury data that could support the selection of priority injuries for statewide prevention and outreach.

The majority of prevention programs coordinated by the trauma centers are education focused, often with packaged programs, such as Traumaroo and the WV ATV safety program. No current resource of scientifically proven effective injury prevention programs exists for prevention outreach by the trauma centers. Current local and many state injury prevention initiatives do not appear to be based on state injury data or evaluated for efficacy. Very few trauma centers reported that they evaluated their injury prevention programs for efficacy.

RECOMMENDATIONS

- Integrate injury prevention into the trauma program by adding an injury prevention representative to the State Trauma Advisory Committee.
- Encourage the Bureau of Public Health to hire an injury prevention coordinator to manage the injury prevention program.
 - Identify websites that have on-line programs to educate trauma center injury prevention coordinators about using injury data for injury prevention planning and how to implement and evaluate effective injury prevention programs.
- Develop a web-based resource center of injury programs with demonstrated efficacy, organized by type of injury or target population.

- Establish linkages between the trauma program and West Virginia University School of Public health and West Virginia Injury Control Research Center to identify injury prevention resources.

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.

Human Resources

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

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

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

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

Integration of EMS within the Trauma System

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

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

OPTIMAL ELEMENTS

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

(B-302)

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

- b. There is a clearly defined, cooperative, and ongoing relationship between the trauma specialty physician leaders (for example, trauma medical director within each trauma center) and the EMS system medical director. **(I-302.2)**
- c. There is clear-cut legal authority and responsibility for the EMS system medical director, including the authority to adopt protocols, to implement a performance improvement system, to restrict the practice of prehospital care providers, and to generally ensure medical appropriateness of the EMS system. **(I-302.3)**
- d. The trauma system medical director is actively involved with the development, implementation, and ongoing evaluation of system dispatch protocols to ensure they are congruent with the trauma system design. These protocols include, but are not limited to, which resources to dispatch, for example, ALS versus BLS, airground coordination, early notification of the trauma care facility, prearrival instructions, and other procedures necessary to ensure that resources dispatched are consistent with the needs of injured patients. **(I-302.4)**
- e. The retrospective medical oversight of the EMS system for trauma triage, communications, treatment, and transport is closely coordinated with the established performance improvement processes of the trauma system. **(I-302.5)**
- f. There is a universal access number for citizens to access the EMS/trauma system, with dispatch of appropriate medical resources. There is a central communication system for the EMS/trauma system to ensure field- to-facility bidirectional communications, interfacility dialogue, and all-hazards response communications among all system participants. **(I-302.7)**
- g. There are sufficient and well-coordinated transportation resources to ensure that EMS providers arrive at the scene promptly and expeditiously transport the patient to the correct hospital by the correct transportation mode. **(I-302.8)**

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

- a. In cooperation with the prehospital certification and licensure authority, set guidelines for prehospital personnel for initial and ongoing trauma training, including trauma-specific courses and courses that are readily available throughout the state. **(I-310.1)**
- b. In cooperation with the prehospital certification and licensure authority, ensure that prehospital personnel who routinely provide care to trauma patients have a current trauma training certificate, for example,

Prehospital Trauma Life Support or Basic Trauma Life Support and others, or that trauma training needs are driven by the performance improvement process. **(I-310.2)**

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

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

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

CURRENT STATUS

The STECS is located within the BPH, a bureau of the DHHR. STECS, through its assumed authority, is led by a medical director and has three divisions -- Trauma, OEMS, and Communications, a division that addresses communication equipment issues relevant to EMS. The trauma system program has a medical director (who also serves as the Deputy State Trauma Medical Director) and a trauma program manager. The trauma system program convenes the STAC and the MRC. The Commissioner convenes the EMSAC and the EMS Medical Director convenes the MPCC. The EMSAC addresses EMS operational issues other than medical control. The MPCC advises the STECS medical director on medical control issues, including treatment protocols. The MCC Office also has a Director.

The state is divided into 7 EMS regions. Each region has a medical director selected by the STECS medical director. Each EMS agency is required to have a local medical director, who is approved by the local regional medical director. Each region also has a regional EMS advisory board, usually led by the regional EMS medical director. TSC team discussions with participants revealed that the structure and function of these boards are quite variable. On-line medical control for all 7 EMS regions is provided by 5 Regional Medical Command centers. These centers are also responsible for coordinating scene response for air ambulances. The directors of these centers are approved by the regional medical director.

A particular strength of the OEMS is that it oversees licensing of *all* aspects of EMS: agency, vehicle, personnel and EMS training entities. OEMS makes no distinction between private or public EMS agencies. The STECS medical director and OEMS can discipline EMS agencies and personnel if necessary.

EMS personnel can also be disciplined by regional medical directors and local EMS agency medical directors.

An additional strength of the state's EMS system is that all treatment protocols are developed and approved at the state level by the STECS medical director (with input from the MPCC). These treatment protocols cannot be altered locally without special authorization from the STECS medical director.

The state has no clear destination protocols for the transport of trauma patients. In general, patients are taken to the nearest appropriate hospital, as directed by the regional medical command center. This may require bypassing the nearest hospital. Additionally, no protocols are available that facilitate trauma triage by specific, anatomic, physiologic, or other injury characteristics.

The OEMS recently mandated that all EMS agencies must submit prehospital patient care data electronically in a standardized fashion or risk having their license suspended or terminated. This EMS database and its linkage to other data (e.g., state crash data and the trauma registry), when fully operationalized, will become an invaluable resource for EMS and trauma system planning and PI.

OEMS is currently in the final stages of developing a statewide medical command center (MCC, formerly CHEMTAC). A major responsibility for this center will be to provide on-line medical direction for prehospital care (including air medical activation), as well as coordinating inter-facility transport of trauma patients. Although regional medical command centers can continue to operate, it is anticipated that many may eventually cease to operate. A particular challenge of the implementation of the MCC will be the development of appropriate protocols that can facilitate quality prehospital care throughout the state, and yet be appropriately adaptive to local EMS and hospital resources.

Approximately 10,500 individuals are certified as first responders and various levels of emergency medical technicians (EMTs) in the state. Of the basic level EMTs, approximately 5000 are miners permitted to function at a basic EMT level, but only at a mining site. The state also has 1400 paramedics. Of the 206 licensed EMS agencies, 18% are first responders, 54% provide BLS, and 28% ALS. The state has 1074 licensed EMS vehicles, with almost 65% of them licensed for ALS service. Participants stated that only a few counties do not have an ALS service within their boundaries. Twenty vehicles are licensed for critical care transport (CCT), with 9 of these being air ambulances.

Two air medical services licensed in the state have air ambulances based at 8 locations. Protocols are in place for activation of air medical response by prehospital care providers. However, no assessment has been conducted regarding how appropriately these services are being used. The current state EMS medical director reported that such an assessment is underway.

Except for limited data regarding the number and nature of EMS agencies and air medical services, no data were provided regarding the quantity, characteristics, and distribution of prehospital care resources. The most recent NHTSA EMS Technical Assessment was conducted in 1992. In-depth and current information regarding prehospital care and interfacility transport is essential to determine if the number and level of resources are sufficient and appropriately coordinated to ensure timely and appropriate care for injured patients.

A limitation of the OEMS oversight and protocol development is the lack of input from trauma surgeons for trauma protocol development or prehospital provider certification and training. Furthermore, no clear-cut structure for trauma surgeons or designated representatives to be part of PI at the local or regional level was noted. Currently, trauma surgeon feedback/input to the EMS system at a local or regional level is being done in a variable and ad hoc fashion.

RECOMMENDATIONS

- **Complete a prehospital care resources assessment and gap analysis that includes air medical transport resources.**
 - Determine if sufficient and well coordinated transportation resources exist to ensure that EMS providers arrive at the scene promptly and expeditiously transport the patient to the right hospital by the correct transportation mode.
 - Close gaps as they are identified.
- **Request that the National Highway Traffic Safety Administration (NHTSA) conduct an EMS technical re-assessment.**
- Encourage trauma surgeons to assist in trauma protocol development and prehospital trauma training.
- Provide guidelines for the structure and function of regional EMS advisory boards.
 - Encourage trauma surgeon participation in performance improvement at the local level.

Definitive Care Facilities

Purpose and Rationale

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

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

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

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

Human Resources

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

Integration of Designated Trauma Facilities Within the Trauma System

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

Each designated acute care facility should participate, through its trauma program leadership, in all aspects of trauma system design, evaluation, and

operation. This participation should include policy and legislative development, legislative and public education, and strategic planning. In addition, the trauma program and subspecialty leaders should provide direction and oversight to the development, implementation, and monitoring of integrated protocols for patient care used throughout the system (for example, TBI guidelines used by prehospital providers and nondesignated transferring centers), including region specific primary (field) and secondary (early transfer) triage protocols. The highest level trauma facilities should provide leadership of the regional trauma committees through their trauma program medical leadership. These medical leaders, through their activities on these committees, can assist the lead agency and help ensure that deficiencies in the quality of care within the system, relative to national standards, are recognized and corrected. Educational outreach by these higher level 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 trauma system plan has clearly defined potential roles and responsibilities for all acute care facilities treating trauma patients. Designation at levels I, II, and III use ACS criteria and the ACS verification process as a prerequisite for designation. Designation at level IV and V hospitals use criteria developed by the lead agency, and the designation process conducted by trauma system program officials and in-state reviewers. It is not known if facility designation is associated with a formal contract or memorandum of understanding (MOU), a legally binding document that defines the relationship, roles, responsibilities, and accountabilities of the designated facility and the lead agency. The roles of the specialty hospitals (e.g., pediatrics and burn) and their designation criteria and process are not as clearly defined.

A de-designation and sanction process for noncompliance is described and apparently operational. At least 2 hospitals are listed as being suspended and several others are on probation. It is not clear whether trauma patient flow to these hospitals is restricted as a result of sanctions.

The state reported 52 acute care facilities, with 31(60%) having attained full and current designation at some level. According to the PRQ, the distribution of facility levels is: 2 level I; 4 level II; 3 level III; and 25 level IV. No level V centers are designated. An additional 6 hospitals are reported to be moving towards provisional designation and submitting data to the trauma registry. Two centers are on suspension, but one continues to submit data to the trauma registry. Based on this information, 38 (73%) of 52 acute care hospitals participate in the trauma system in some way.

The Jon Michael Moore trauma center is designated as a level I trauma center and has achieved ACS verification as a level II pediatric trauma center. Specialized pediatric trauma services are also available in Charleston and Huntington, although no formal recognition or verification by the ACS as a pediatric trauma center exists for those facilities. The facility in Charleston is also designated as a level I trauma center. The level II center in Huntington has a burn unit, but this has not been verified by the American Burn Association (ABA). No specifically recognized traumatic brain injury (TBI) or spinal cord injury (SCI) specialty centers were reported to be part of the trauma system.

Participants did not express concern about the geographic distribution of trauma centers. The TSC team could not assess this issue because specific information on patient flow, as well as transport and transfer to definitive care and outcome was not provided.

Even with much of the above information, the TSC team was not provided with adequate data to be certain that the acute care facilities are integrated into a resource efficient and inclusive network, continually maintaining compliance with designation criteria, and consistently providing optimal care for all injured patients. Methods used by the trauma program managers to monitor compliance and outcomes in the three-year interval between the reverification/designation site visits were not well described, other than data submission to the trauma registry. No performance or compliance reports are requested or required from the trauma centers, and no reports are generated from the trauma registry to evaluate data such as mortality by injury severity score (ISS). No routine benchmarking against national (e.g., National Trauma Data Bank [NTDB] or hospital discharge data) or aggregate state data is conducted to assess performance. Overall, the TSC team feels that inconsistent monitoring and enforcement of trauma center standards and designation criteria is occurring between reverification intervals.

Recruitment of all hospitals to participate in the system and to participate at a level commensurate with their capabilities and resources, has presented challenges. The legislature, which limits the liability of hospitals and physicians treating trauma patients by capping settlements at \$500,000 per occurrence is generally seen by those queried as a clear incentive to participate at some level. A few participants voiced the opinion that the issue of true commitment to optimal trauma care may be clouded, as some facilities may desire the liability protection with less regard for the quality of care rendered.

A factor in hospital participation at the appropriate level appears to be related to subspecialty coverage, particularly neurosurgery, orthopedic surgery, hand surgery, and maxillofacial surgery. Participants reported that some subspecialists demand and receive stipends as high as \$3600 per day to provide coverage, allowing the hospital to maintain compliance with designation criteria. It is not clear whether specialists are honoring these contractual agreements in level II

and III facilities, as level I center representatives reported a high degree of over-triage to their facilities. Data provided suggest that the over-triage rate approaches 40% when an ISS of 9 or less is used as an indicator. However, the over-triage rate may be considerably higher if the ISS value of less than 16 is used for this analysis.

With specific reference to level IV centers, the physician coverage (general surgical, surgical specialists, and emergency medicine physicians) requirements far exceed the most recent criteria for a level IV center verification promulgated by the current edition of the ACS' *Resources for Optimal Care of the Injured Patient* guide. While not seen as particularly onerous by one general surgeon working in a designated level IV center, the TSC team believes that this requirement represents a disincentive to participate for a number of otherwise level IV capable hospitals.

Ambivalence was expressed by participants with regard to development of level V center criteria and designation. The cost benefit ratio of this process appears to favor abandonment of this initiative.

Midlevel providers (physician assistants and nurse practitioners) are employed by several orthopedic and neurosurgical practice groups. These health professionals evaluate and treat trauma patients under the direction of the surgeons who employ them. The trauma system has no standardized provision for evaluating training requirements, trauma care credentialing, or performance monitoring of these providers in the criteria for trauma center designation for any level trauma center.

Telemedicine and teleradiology are increasingly being used in rural areas to provide real-time specialty and trauma consultation to improve care and to reduce unnecessary transfers, over-triage, or mis-triage to level I centers (e.g., appropriate for a level II center rather than a level I). Telemedicine has also been used for educational and PI activities. The availability of the appropriate equipment and software across the system, as well as the feasibility of using such technology, has not been assessed by the trauma system. The implications for verification based on the interpretation of and acceptability of specialty physician availability by "telepresence" versus physical presence remains to be determined.

Strict adherence to the ACS criteria for verification/designation purposes presents some clear advantages with regard to standardization and, perhaps, cost efficiency of the designation process. However, the ACS criteria may have some disadvantages and limitations with regard to development and implementation of novel methods of allocating varied and sometimes sparse resources to match patient needs. Selectively and thoughtfully modifying the ACS criteria eliminates the challenges and frustrations of attempting to "force fit" hospitals, providers, and practices into one mold. For example, modification of

the ACS criteria might permit some interesting opportunities without concern for criterion deficiency assignments from ACS reviewers, such as:

- Using telemedicine and teleradiology for trauma patient assessment and disposition,
- Credentialing of acute care trauma surgeons to perform limited management of select orthopedic injuries and TBI,
- Allowing properly trained and credentialed emergency physicians or physician assistants, practicing under mutually agreed upon protocols, which are closely monitored for compliance and outcome, to act as proxy for the trauma surgeon,
- Designation based on self declared commitment of resources to care for certain injuries of certain severity and monitoring of compliance with those commitments.

West Virginia has no prehospital destination criteria. It is acknowledged that in many rural areas only one local initial destination is feasible. Internal trauma team activation criteria are multi-tiered. These internal activation criteria are apparently captured as data elements in the trauma registry and could be evaluated for the over and under use of trauma team activation resources. Such an evaluation may lead to change in the activation guidelines for priority 1 and priority 2 cases, or even the total elimination of some criteria as a team activation trigger.

Educational opportunities seem to be available for all clinical care provider disciplines. The use of distance learning technology was not assessed and cannot be commented upon. A shift from Continuing Medical Education (CME) to Maintenance of Competency (MOC) to maintain consistency with the education initiatives of the American Board of Surgery (ABS) and the ACS has not yet occurred.

RECOMMENDATIONS

- **Amend level IV trauma center physician coverage criteria to be consistent with the current ACS criteria.**
- Formulate prehospital destination criteria for use in areas where they are appropriate and monitor compliance and outcomes.
- Establish the proper roles for mid-level providers if they are included in the trauma care system.
 - Set standards for training, credentialing, and scope of practice
 - Formulate a standard systemwide process for performance monitoring of physician assistants and nurse practitioners
 - Monitor compliance and outcomes

- Explore the role of telemedicine and teleradiology in the management of trauma patients and its potential implications for resource conservation.
- Seek grant funding to increase the use of telemedicine and teleradiology for clinical as well as educational purposes.
- Continue recruitment of non-designated facilities into the trauma system.

System Coordination and Patient Flow

Purpose and Rationale

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

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

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

The decision to transfer a trauma patient should be based on objective, prospectively agreed-on criteria. Established transfer criteria and transfer agreements will minimize discussions about individual patient transfers, expedite the process, and ensure optimal patient care. Delays in transfer might increase mortality, complications, and length of stay. A system with an excess of transferred patients might tax the resources of the regional trauma facility. Conversely, inappropriate retention of patients at centers without adequate

facilities or expertise might increase the risk of adverse outcomes. Given the importance of timely, appropriate interfacility transfers, the time to transfer, as well as the rates of primary and secondary overtriage and undertriage, should be evaluated on a regular 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 systemwide 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 EMS system is well designed and directed. It consists of both ground and air medical transport services which are licensed and supervised by the OEMS. The administrative structure, comprised of the EMSAC, the MPCC, and the Director, provides the division with the ability to make the necessary rules and regulations, maintain oversight, and report to the Commissioner of the BPH. Unfortunately, the division operates at arm's length from the trauma division.

Communications equipment and policies are the responsibility of the Director of the Communications Division, who reports separately to the Director of the STECS.

Ground ambulance units are staffed by a mix of EMT-Bs (54%) and paramedics (29%). In rural counties most of the EMS agencies are staffed by volunteers. Two flight services, AirEvac and HealthNet, operate out of a combined eight bases distributed around the state. Air medical services perform 15% of interfacility transfers and approximately 11% of scene evacuations. Requests for helicopter scene rescue must come from the senior EMT involved, and must be approved by the regional dispatch center. Lack of availability of critical care transport units, both ground and air, can significantly delay delivery of the trauma patient to a definitive care facility. A needs assessment, followed by appropriate corrective action, is desirable in order to assure that all citizens have access to critical care transport.

The OEMS has stipulated that Priority I trauma team activation criteria (as developed by ACS-COT) be used by all transporting services; Priority II criteria have not been agreed upon. Uniform interfacility (secondary) criteria have not been instituted, despite the fact that such criteria are mandated by the legislative rule. The EMS regional medical directors have the responsibility of developing and monitoring compliance with these guidelines, but no evidence was provided that they do so. In reality, the rural nature of the state, combined with narrow mountain roads and adverse weather conditions, often results in a practice of taking all patients who do not qualify for air medical transport to the nearest hospital capable of at least initial stabilization. In some areas the receiving hospital will not be a designated trauma center. The reviewers were not provided with any statistics which would indicate the following:

- Compliance with priority I activation criteria
- Appropriate scene times and interventions
- Timely transport to an appropriate facility

Such information, if it exists, is not routinely provided to the trauma office, and could only be obtained in conjunction with verification / designation visits by the designation coordinator. With the advent of the new WV EMS data system, all state ambulance services are required to submit an electronic prehospital patient care record. The resultant database will be a valuable resource for monitoring the EMS system and EMS agency performance.

E-911 access is available in all but two counties, which have basic 911 access. Adequate equipment is available at all designated centers to allow for communication with field personnel (geographic impediments notwithstanding) and with higher level trauma centers.

Information regarding the timeliness and appropriateness of interfacility transfers can be found only within the PI activities of the individual trauma centers. These data are made available to trauma program personnel during site visits and through the state trauma registry, however, no state data analysis of interfacility transfers presently occurs. Additionally, little information was provided about the movement of patients across state lines, either by air or ground.

Little information exists regarding the repatriation of trauma patients back to their community hospital when their condition permits. Transfer of trauma patients from definitive care to their home community is desirable to ensure the availability of acute care beds at the level I and II trauma centers. Repatriation may be confounded by financial considerations, particularly across state lines. The trauma system should identify obstacles to repatriation, and establish criteria to guide the process.

STECs is aggressively pursuing establishment of a unified dispatch center (MCC) to be located near the center of the state, and to supplant the existing five regional dispatch centers. OEMS envisions a well-staffed facility (about 40 persons). The SMARTT system will provide a daily updated and accurate statewide catalogue of resources (e.g., beds, key medical and surgical personnel, and equipment) to assist decisions regarding triage and transport. Start-up and maintenance funding, and willing participation by all facilities, is not yet assured. Involvement of the STAC leadership in planning this center has not been extensive.

RECOMMENDATIONS

- **Formulate standard and uniform interfacility transfer criteria based on patient needs and receiving hospital resources.**
- Formulate standard and uniform repatriation criteria.
 - Monitor compliance and outcome

- Establish a robust system of critical care transport including both ground and air medical resources.

- Use the trauma registry and WV EMS database to
 - Monitor prehospital performance
 - Evaluate over- and under-triage
 - Assure appropriate and timely transfers
 - Monitor critical care transport activities (ground and air)

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

According to the PRQ, “currently rehabilitation centers are not under the jurisdiction of the trauma system.”

The state is blessed with 318 inpatient rehabilitation beds, the majority of which are located in Morgantown adjacent to the WVU Medical Center. Charleston Area Medical Center has 40 licensed beds, and Peterson has 22 beds. Health South, a private corporation operates 80% of these beds; 10% are owned by the WVU; and 10% are under other ownership and operation.

Insured trauma patients who are candidates for inpatient rehabilitation experience little or no delay in obtaining a bed. State law mandates that Medicaid pay for rehabilitation for children up to the age of 21 years. Medicare will cover patients over the age of 65 years. Uninsured patients between these age ranges in need of rehabilitation do not have access. These patients must be treated either on the inpatient trauma service or transferred to a skilled nursing facility (SNF). In either setting, limited service up to one hour per day may be provided by physical, occupational, or speech therapists. For the majority, this limited service does not meet their needs, and results in a long-term burden for patient, family, and society, as well as lost productivity. Ventilator-dependent patients are not accepted at SNFs. West Virginia Medicaid will pay for rehabilitation patients admitted to SNFs in adjacent states, although at a reduced rate. Because of financial impediments, repatriation across state lines in either direction may be delayed or denied if patients require major rehabilitation. Transfer agreements to rehabilitation for qualified patients are generally in effect for the level I and II centers, but they do not exist systemwide.

The directors of the several rehabilitation hospitals and various concerned constituencies have approached the legislature repeatedly to help solve this inequity, but their efforts have not been successful. The trauma system has not participated in these coalitions.

Rehabilitation medicine does not have a seat on the STAC. The state office has not conducted a needs assessment, particularly for pediatric beds. Functional outcomes at the time of hospital discharge are included in trauma registry data, but these data have not been shared with the STAC or the legislators.

In a model inclusive trauma system, rehabilitation medicine is essential to achieve the goal of integrating the injured patient back into society. This is best accomplished when the system is kept informed about the available resources, finances, and patient outcomes—and that implies inclusion of rehabilitation experts in the regular deliberations with the members of the STAC.

RECOMMENDATIONS

- **Conduct an assessment of rehabilitation needs and resources for the injured patient (both insured and uninsured).**
- Make outcomes (Functional Independence Measure [FIM] Scores) and financial data available to stakeholders and legislators to illustrate the magnitude and impact of uninsured patients with severe injuries
- Establish relationships with rehabilitation directors to facilitate patient outcome data sharing.
- Partner with stakeholders to achieve access to rehabilitation care for patients in need.

Disaster Preparedness

Purpose and Rationale

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

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

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

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

Exercises must be jointly conducted with other agencies to ensure that all aspects of the response plan have the trauma system integrated.

OPTIMAL ELEMENTS

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

- a. There is a resource assessment of the trauma system's ability to expand its capacity to respond to MCIs in an all-hazards approach. **(I-104.1)**
- b. There has been a consultation by external experts to assist in identifying current status and needs of the trauma system to be able to respond to MCIs. **(I-104.2)**
- c. The trauma system has completed a gap analysis based on the resource assessment for trauma emergency preparedness. **(I-104.3)**

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

- a. The EMS, the trauma system, and the all-hazards medical response system have operational trauma and all-hazards response plans and have established an ongoing cooperative working relationship to ensure trauma system readiness for all-hazards events. **(I-305.1)**
- b. All-hazards events routinely include situations involving natural (for example, earthquake), unintentional (for example, school bus crash), and intentional (for example, terrorist explosion) trauma-producing events that test the expanded response capabilities and surge capacity of the trauma system. **(I-305-2)**
- c. The trauma system, through the lead agency, has access to additional equipment, materials, and personnel for large-scale traumatic events. **(I-305.3)**

CURRENT STATUS

The Division of Threat Preparedness (DTP) within the BPH has primary responsibility for overseeing the health response to disasters occurring within the state borders. DTP, with assistance from the OEMS serves as the medical branch of emergency operations (Emergency Support Function [ESF] 8) in the event of a large scale event. The DTP also maintains the ESAR-VHP.

The DTP's emergency health plan is included as an appendix to the emergency operations plan of the Division of Homeland Security and Emergency Preparedness (DHSEP). In that appendix the OEMS, not DTP, is charged with numerous operational functions. Given the absence of DTP in the plan, the TSC team was unable to determine if it had access to the most recent draft of the health preparedness plan. However, a strategic plan (2004-2006) for the DTP was included, and it is well constructed with appropriate strategic plan components, including mission and vision, goals, objectives, and strategies. An update on the progress towards meeting the goals was not provided to the TSC team. The relationship between the DTP and OEMS was not clearly articulated, although it was reported by participants to be amicable and collaborative.

The engagement of the trauma program or its broad stakeholders in the emergency health planning process was reported to be limited. Several trauma stakeholders expressed frustration with the lack of inclusion to assist with planning, inclusive exercises, and resources. Surge capacity was noted to be limited. A representative of the WV ACEP stated that the organization planned to conduct a telephone survey of all state facilities within a one hour window, to determine, at that moment in time, the status, overflow, diversion, and bed capacity available in each facility. The TSC team was not informed about how that information will be used or disseminated.

As part of the MCC effort, the SMARTT system is on-line to track facility status on a daily basis. Data about specialty physician coverage, service line interruptions and bed status are reported daily by all facilities. The state is to be commended for the transfer of this technology from North Carolina and for its implementation in WV.

Overall, the emergency operations plan of the DHSEP appears adequate, although the health response sub-plan may need revision to more clearly reflect the role of the DTP and OEMS. The deputy director of DHSEP acknowledged that most large scale responses have, to date, largely resulted in trauma-related issues, with flooding being a primary concern to the state in terms of risk. Unfortunately, many trauma stakeholders feel disenfranchised from the plan or the preparedness efforts. When asked if trauma representatives could be included, the director provided a hopeful response.

RECOMMENDATIONS

- **Pursue inclusion of the trauma system in the activities of hospital disaster preparedness (e.g. burn care, Emergency Systems for Advance Registration of Volunteer Health Professionals [ESAR-VHP], surge capacity).**
- Ensure that the medical response as noted in the Division of Homeland Security and Emergency Preparedness's emergency operations plan is up to date and clearly defines the roles, responsibilities, and relationship of the

Division of Threat Preparedness (DTP) and the Office of Emergency Medical Services.

- Ensure that the DTP works with trauma facilities to develop mechanisms to increase surge capacity.
 - Address, specifically, burn care capacity and surge needs.
- Create realistic scenarios and drills that exercise the entire spectrum of the trauma system.
 - Provide meaningful after action reports and resources to correct noted deficiencies.

Systemwide Evaluation and Quality Assurance

Purpose and Rationale

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

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

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

OPTIMAL ELEMENTS

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

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

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

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

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

CURRENT STATUS

The trauma system has the fundamental structure in place within legislative rule to have a very successful PI program. This includes strong regulation for data protection for the PI process.

The state and regional MRCs have been formalized within legislative rule for all trauma system PI activities. The state MRC meets quarterly and addresses local issues submitted to the state via a web-based forum. Minutes provided from the state MRC meetings reflect response and loop closure for all submitted issues. The regional MRCs are not currently functioning due to lack of participation, interest, and time, most notably, by physicians. As a result, any unresolved local issues that would be expected to go to the regional MRCs are submitted to the state MRC for resolution. Other PI activities from designated and nondesignated facilities are strictly addressed at the local level and through the designation process.

The STAC, by legislative rule, also has the responsibility of reviewing all trauma-related matters; however this role has not been fulfilled. Members of the STAC stated that even though they discuss some of systemwide issues, they have no

authority and do not participate in the any of the decision-making processes regarding the issues.

All trauma designated hospitals are required to submit data to the trauma registry, and a select number of non-designated hospitals participate voluntarily. The thorough data set within the registry can provide sufficient data for systemwide evaluation. Routine reports are not run by the trauma program for systemwide evaluation.

The trauma system has no regional or state plan to measure compliance with standards of care, to document system effectiveness, or to identify PI opportunities. No trauma system PI efforts are directed toward EMS agencies, dispatch centers, or rehabilitation facilities. These are all handled at the local level. A list of filters was provided in the PRQ, but patient outcome measures are not routinely evaluated. No benchmarks have been developed to monitor progress or deficiencies within the trauma system. The trauma program could benefit from consultation to assist with the development of a PI plan that is inclusive systemwide.

The process for initiating an autopsy for purposes of PI has been problematic, and no participant could really explain the benefits this would have on systemwide evaluation. The local trauma centers send requests for an autopsy to the county coroner. Funding is limited, resulting in denial of most requests. A legal ruling has prohibited the release of autopsy reports to care providers; however, they can be released to the state trauma program, a potential solution for obtaining autopsy data.

RECOMMENDATIONS

- **Develop a trauma system performance improvement (PI) plan to include ongoing evaluation of structure, process, and outcomes within the trauma system.**
 - Monitor, on an ongoing basis, system outcomes to include, but not limited to: injury mortality/morbidity, over/under triage, transfer times, length of stay, and cost of trauma care from prehospital through rehabilitation.
 - Consider obtaining a consultant to assist with the plan's development, or obtain model PI plans from other states.
- Ensure that the State Trauma Advisory Committee assumes the primary role for systemwide performance improvement.
- Establish system benchmarks for monitoring trauma system process and outcomes.

- Investigate the National Trauma Data Bank benchmarks for applicability.
- Provide quarterly or annual reports to trauma stakeholders using selected filters (such as those provided within the Pre-Review Questionnaire).

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 systemwide 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 trauma system has a long legacy of capturing data in a registry to document the care of the injured patient. The registry system has transitioned from a Microsoft Disk Operating System (DOS), to a home grown version, and now to a product provided by Digital Innovations™. The Collector software product was reported as stable and useful in performing its functions.

Data are captured by two different methods. Larger facilities (levels I, II and III) input data to their local server. From there, data are batched and transmitted to the state trauma program office. Smaller facilities (level IV) enter their data through a Citrix server at the DHHR.

Additionally, two different software versions exist, the 123 and the 45 versions. The 45 version is a minimum data set derived from the broader 123 elements. Core data fields are included in both software versions, allowing for aggregation, analysis, and reporting across the two versions.

The WV Collector is not 100% compliant with the National Trauma Data Standard (NTDS). Variations reportedly exist in how intensive care unit, ventilator, and hospital days are calculated. Additional, minor, differences were noted, such as some items not collected in WV. Oxygen saturations and ethnicity are identified as fields in the NTDS but not captured in Collector. Digital Innovations™ has provided optional drop down “fixes” for these missing field challenges to bring the WV Collector into synchrony with the NTDS. The WV Collector also has fields to capture some items not in the NTDS, including prehospital procedures and procedures from the referring hospital. The WV trauma staff most familiar with the WV Collector served on the NTDS development task force. It is estimated that the WV Collector is at least 95% compliant with the NTDS. All level I, II and III trauma centers submit data to the NTDB with validation testing noted as good.

Trauma program personnel appear very adept at running reports from Collector, and they were responsive to several requests by the TSC team. No standard reports are currently generated on a regularly scheduled basis, e.g. quarterly. Trauma program personnel indicated that no one has asked for any specific reports, nor are they certain which reports would be most useful to whom. Individual trauma registrars, program managers, and medical directors were asked about aggregate reporting, and they indicated that reports allowing for intrastate benchmarking would be helpful.

Some data linkage occurs at the local facility level with registrars manually entering data from prehospital and dispatch records. At this time, linkage (either deterministic or probabilistic) at the broader system level does not occur. It is unknown whether West Virginia has had a Crash Outcomes Data Evaluation System (CODES) grant from NHTSA. The CODES grants focus on data linkage and would serve as an excellent resource to assist the trauma and EMS programs with TEMIS data linkage. The TSC team provided information that a former CODES project director (Dr. Zhu) from New York, now holds a faculty appointment at WVU ICRC in Morgantown.

Beginning in January 2009, a web-based prehospital electronic medical record-keeping system (WV PreMIS) was launched. EMS agencies have been coming on-line at an accelerated pace as the deadline for compliance approached. The WV PreMIS was adapted from the North Carolina PreMIS product which was further based on the definitions and transaction protocols of the National EMS Information System (NEMSIS). The OEMS data specialist assigned to oversee the WV PreMIS is also adept at report generation. Given the newness of the system, data errors are expected to occur, although it was reported that a high number of entered records have five or fewer errors, set as an original benchmark for data quality.

The initial emphasis of the WV PreMIS of assuring submission compliance by all licensed EMS agencies will be followed by an emphasis on improvements in data quality. WV PreMIS data are being submitted to the NEMSIS. It was noted that a software bridge is available for purchase that would allow for data linkage between WV PreMIS and WV Collector; however, funds for this are not currently available.

During the discussions with participants, other available data sets were evident. Among these are hospital discharge data and mortality data. Recent comparisons between mortality data stratified by International Classification of Diseases (ICD) 10 for injury-related codes derived from death certificates and Collector data demonstrated a substantial discordance between the two data sources.

RECOMMENDATIONS

- Create routine and special reports, for example:

- Glasgow Coma Scale of less than 8 with intubation
 - Cause of injury code and outcome
 - Level I trauma team activations
 - Transfers taking greater than 2 hours
 - EMS scene times
 - Alcohol present/level
 - Motor vehicle crash with/without restraints
- Seek a consultation from the National EMS Information System Technical Assistance Center to assist in data linkage and EMS performance improvement processes.
 - Contact the WVU ICRC to determine interest in providing consultation on issues of data linkage and analysis.
 - Consider purchasing the bridging software that would allow for linkage of WV PreMIS and Collector, (following the data validation stage), if methods for linkage have not been established by other means.

Research

Purpose and Rationale

Overview of Research Activity

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

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

Trauma Registry–based Research

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

vehicles can be identified and the scope of the problem defined in terms of who, where, and how riders are injured, and then, through presentations and publications, the public can be informed of a new threat.

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

Population-based Trauma System Research

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

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

Participation in Research Projects and Primary Data Collection

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

systems can participate as co investigators 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

Currently, the WV Trauma System does not have a research work group or committee to develop priorities for trauma system research and to facilitate the accomplishment of research. The level I trauma facilities are conducting research; however, it is not, with one exception, systemwide. The trauma system has not catalogued the trauma-related research conducted by its trauma centers. The trauma system has not developed a comprehensive list of state and neighboring state agencies or academic institutions that are conducting injury research, and with whom the system could partner.

Although the trauma registry has over 130,000 records, no reports have been written regarding system performance. Also, no specific research questions or hypotheses have been addressed using these data. The trauma system did have the foresight to develop a data request and review process for researchers who would like to access trauma registry data. Participants from the system acknowledged the research value of their trauma registry data, and the desire to facilitate its use.

With regard to trauma system research that involves primary data collection, one study was recently completed, a study investigating the impact of the Rural Trauma Team Development Course (RTTDC) on time intervals to interfacility transport. This study is an excellent example of how trauma systems can do research involving original data collection that can have an impact on the entire trauma system, and also at the national level. Participants were very enthusiastic about this study, and are hopeful it can be a catalyst for future research involving primary data collection with statewide and national generalizability.

In the past, the trauma system collaborated with the WVU ICRC on injury-related projects, but there is no current active collaboration. Re-establishing such a collaboration will be helpful for developing important research questions and for planning and implementing the studies to answer those questions.

Many of the participants voiced concerns about interaction with their local institutional review board (IRB). Some thought the IRB was an impediment for their plans to conduct trauma system research. The trauma system should identify regulatory roadblocks to conducting research within the system, and strategies to overcome those roadblocks. Participants also expressed the need for funding to support research. Currently, the trauma system has not identified sources for injury research funding within the system.

RECOMMENDATIONS

- Establish a trauma system research group or committee. Two important objectives for this committee should be to:

- Identify regulatory roadblocks for conducting trauma system research and strategies to overcome them.
- Formulate a research agenda and/or a series of trauma research questions or hypotheses that include all trauma system components.
- Identify sources for funding trauma system research.
- Partner or seek assistance with research entities within the state to assist trauma system stakeholders in conducting research.
- Establish a strong collaboration with the West Virginia University Injury Control Research Center.
- Inventory, catalogue, and distribute, through the bi-annual trauma system report, all trauma-related research completed by entities within state borders, including the statewide trauma system.

Focus Questions

FOCUS QUESTION 1: Does the TSC Committee believe that the trauma patient suffering from a spinal cord or traumatic brain injury has adequate resources for rehabilitation?

Documentation provided to the TSC team indicates abundant inpatient rehabilitation beds (318), but the number of pediatric rehabilitation beds was not reported. Participants reported that insured, non-ventilator-dependent adults in need of SCI or TBI rehabilitation could be promptly placed in a qualified facility. However, no reported studies can confirm or refute this statement.

West Virginia Medicaid is required by law to underwrite rehabilitation services for children, adolescents, and young adults (up to age 21 years). Such care may be rendered in an inpatient rehabilitation bed, or in a SNF. Similarly, Medicare reimburses care for patients over the age of 65 years. For these populations, the only potential barrier is bed availability.

Uninsured adults between the ages of 21-65 years do not have access to comprehensive rehabilitation services for SCI or TBI unless they can self-pay, with the exception of a few charity beds at Charleston Area Medical Center. Since these are the decades of an individual's greatest productivity, and the time during which their families are most dependent on their support and income, it is paradoxical that the system cannot accommodate them. The costs to society are tremendous. It behooves the trauma system to collaborate with the rehabilitation community to determine the magnitude of those costs and to confront the legislature with the data and education.

Is there adequate involvement from rehabilitation experts in the trauma system?

The PRQ states that the trauma system has no authority over rehabilitation. Rehabilitation experts do not have membership on the STAC. It is not known whether they participate in STAR, but the TSC team believes it is unlikely.

It is important for the trauma system to have the following information:

- the number, distribution, and availability of adult and pediatric rehabilitation beds
- areas of the state experiencing rehabilitation access challenges, even for patients with insurance
- the availability of beds in surrounding states, and rules governing both access and repatriation
- the number of physiatrists/rehabilitation medicine physicians and their qualifications
- the number of physical, occupational, and speech therapists; and

- the number of facilities that are CARF certified.

Currently, this information is not available to trauma experts. The MCC could provide some assistance if rehabilitation facilities are incorporated into the data base.

Finally, by collaborating with rehabilitation experts, communication with the legislature could become more effective regarding the severity of rehabilitation access problems for the adult uninsured population and its impact on society.

RECOMMENDATIONS

- Integrate rehabilitation medicine into the trauma system.
 - Add rehabilitation representation to the State Trauma Advisory Committee.
 - Obtain and share critical data (e.g. rehabilitation beds, patient outcomes, and cost of care or no care).
- Partner with the Bureau of Public Health and the WVU Injury Control Research Center to estimate societal costs associated with the denial of inpatient rehabilitation access to uninsured adults.
- Support the legislative initiatives of the rehabilitation community.

FOCUS QUESTION 2: Does the Trauma System Consultation Committee feel the state performance improvement program has adequate PI initiatives or methods of loop closure? How important is a post-mortem exam in performance improvement?

The general consensus of the TSC team is that an organized, focused, and coordinated systemwide and system-specific PI initiative does not exist. Variable PI occurs at the hospital level, and perhaps to a lesser degree at the agency level. Little is known regarding PI or outcomes related to trauma system performance in the EMS or preceding phases of care, and in the post acute care or rehabilitation phase of care.

A PI program for the trauma and EMS systems can be initiated by asking pertinent questions about system performance, determining where the answers can be found, and what to do with the information. Some examples follow:

- Do EMS patients with Glasgow Coma Score (GCS) of 8 or less who are intubated by prehospital providers have better functional outcomes than those who are not?
- Do patients who are intubated in the emergency department with GCS of 8 or less do any better or worse than those intubated by prehospital providers with regard to functional outcome?

The intent with these two questions would be to determine the benefit, if any, to prehospital intubation of the brain injured patient that might result in the requirement by system leadership (MPCC currently) for all prehospital providers to be trained in the skill of intubation.

Data needed to answer the questions include the prehospital GCS, venue of intubation, and a FIM or GCS outcome score at discharge from acute care or rehabilitation. This assumes all confounding variables relating to post emergency department care are equal and controlled (e.g., intracranial pressure monitoring and craniotomy). Loop closure might involve a policy change regarding prehospital intubation if results proved favorable.

Some simple questions that might lend themselves to local benchmarking from year to year or benchmarking against system or national benchmarks might include the following:

- 1) What is the rate of unsuccessful intubation attempts and/or unrecognized prehospital esophageal intubations?
- 2) What is the median systemwide transport time? What is the effect on patient outcome?

- 3) What is the median time to affect a transfer from an initial facility to a receiving hospital? Does the transfer time affect outcomes in certain patient populations?
- 4) What is the average emergency department length of stay (dwell time)?
- 5) What is the rate of deep vein thrombosis and/or pulmonary embolism?
- 6) What is the rate of ventilator-associated pneumonia?
- 7) What is the additional non-medical hospital length of stay while waiting for a rehabilitation or SNF bed?
- 8) What is the rate of unplanned return to the intensive care unit? Why?
- 9) What is the rate of unplanned re-admission to the hospital? Why?
- 10) What is the preventable death rate? Is there a trend in opportunities for improvement in the phase of care where these deaths occurred?

Question 1: Loop closure might involve a remedial training program for agencies or individual providers that have an unacceptable rate (e.g. one standard deviation from the systemwide average for all ALS agencies). An alternative intervention might be the assurance of capnography use and availability throughout the system. A pre and post intervention comparison should be performed to assess the efficacy of the intervention selected.

Question 2: The intent is to assess systemwide transport times and to compare those times with other rural systems or the NTDB or NEMSIS benchmarks. If a difference in outcome (e.g., mortality, functional outcome in TBI, infectious outcome in an open fracture) can be demonstrated, then an intervention is indicated, such as reconfiguration of ambulance placement, change in destination criteria, or change in criteria for aeromedical transport. If no demonstrable difference is found, then an argument can be made that no intervention is necessary unless the system has a desire to be at or better than benchmark values.

Question 3: This is a corollary to Question 2 and the same concepts and principles apply regarding benchmarking any impact on outcomes. The state has already completed some very nice work regarding the impact of the Rural Trauma Team Development Course (RTTDC) and on time to make a transfer decision. However, these studies required the collection of specific data that is sometimes difficult to collect. If the state wishes to continue tracking the time to transfer performance indicator, then it would be logical to add this element to the registry data set for level II, III, and IV trauma centers. Note that in all variables

involving time, the median should be used in addition to or instead of mean. A few significant outliers (either long or short) can potentially skew the mean.

Question 4: The intent is to assess the efficiency of patient throughput. This could potentially be stratified by priority 1 or 2 activations. An intervention can be identified to increase efficiency. If no appreciable effect on outcome measures (clinical, financial or others) is noted, then no arguable reason to intervene may be found. This is essentially analogous to Question 7 where an aggressive case management system may be entertained to reduce additional length of stay. Alternatively “best performances” may be identified and targeted for emulation and promulgation of their practices by other trauma centers.

Questions 5 and 6: The intent is to benchmark individual trauma centers or systemwide, perhaps by injury type, and to identify best performers for emulation and promulgation of their practices. Loop closure would be represented by improvement in the complication rates among such standard performers after implementation of best practices models.

Questions 8 and 9: The intent is to identify trends in opportunities for improvement with regard to discharge criteria, such as adequate pain control, pulmonary function, and efficacy of rapid response teams. National data on these indicators are sparse but do exist.

Question 10: Perhaps the PI activity that is most revealing is the mortality review seeking to identify preventable deaths. Be aware that the taxonomy of “preventable” events is being reconsidered by the ACS-COT due to the contentious and onerous nature of the term “preventable”. The essential element for this PI process is to ensure the consistency in review methods, judgment criteria, inter-rater and inter-review panel reliability. Trending of opportunities for improvement, regardless of preventability, stratified by nature and phase of care in which mortality occurred provides starkly revealing information about how the system actually functions and provides suggested appropriate interventions to address opportunities for improvement in the various phases of care. Opportunities for improvement may be further subcategorized as provider-related, system-related, error in judgment, error in technique, delays in diagnosis or treatment, etc. Also, a multidisciplinary review panel which receives training in the review and judgment process is optimal.

Finally, with regard to the use and necessity of autopsy reports in conducting system PI activities, particularly mortality reviews, the autopsy is considered the “gold standard” and foundation of any mortality review. Practical experience and some published and unpublished data suggest this may not be the case. Due to the wide variability in quality and completeness of the postmortem examination or in cases of multiple trauma, a specific cause of death may not be determined. Sometimes the high quality and completeness of the post mortem exam may

provide information on too many findings (e.g., the report might detail a subdural hematoma with bilateral hemothoraces and large hemothorax with C₁ spinal cord contusion), and it is not possible to identify the cause of death. In reality, in trauma systems' PI programs, the more important issues are the processes of care rather than the specific cause of death. For patients that survive through the emergency department phase of care, most of the information potentially gleaned from an autopsy report is already available from diagnostic radiology or operative findings. In one soon to be published study analyzing systemwide deaths in a mixed urban rural system, a multidisciplinary review panel determined preventability, opportunities for improvement, and cause of death before and after review of autopsy reports. The autopsy report reviews had no significant effect on the panel's determination of preventability.

The TSC team members addressing this question felt that the cost-benefit ratio does not appear to favor the expenditure of time, effort and funding required to gain access to the autopsy reports.

The key to an optimal trauma system PI plan for examining various outcomes of structure, process, and outcome includes the following: its broad scope, consistency, combination of standard as well as ad hoc reports or evaluations, asking pertinent questions that use more than the trauma registry data, and the use of the answers to monitor and improve the entire trauma system.

RECOMMENDATIONS

- Develop a statewide trauma system performance improvement plan within the next 12 months.
 - Identify the resources needed for data analysis of both the trauma registry and population-based data (e.g. hospital discharge data) for performance improvement activities.
 - Identify the key aspects of the trauma system process of care that stakeholders wish to monitor during the first year.
 - Identify topics for review on a routine (e.g., quarterly) basis and on an ad hoc basis.
- Seek assistance from such programs as the National EMS Information System Technical Assistance Center or the National Emergency Medical Services for Children Data Analysis Resource Center to develop data analysis support for performance improvement activities.
- Ensure that information about system performance review is provided to the State Trauma Advisory Committee so that policy or procedure change needed for loop closure can be discussed and recommendations can be made to the EMS and Trauma Advisory Committee.

Focus Question 3: Critical Care Transport: There are a multitude of issues surrounding lack of critical care transport in the state. Can the TSC Committee make any recommendations in improving the availability of CCT in rural areas?

In November of 2005, OEMS published critical care transport (CCT) program requirements. This comprehensive document addresses issues and other specific treatment protocols or guidelines, such as descriptions of CCT personnel and CCT quality assurance chart audits. On August 3, 2009, OEMS published a memorandum to all West Virginia Hospitals regarding a newly developed statewide inter-facility transport program including CCT. On Nov 1, 2009, the OEMS published the state's CCT Guidelines. These guidelines include trauma care. The guidelines were developed by the former OEMS medical director with input from the MPCC, CCT Medical Directors, and the CCT Taskforce. None of these documents were provided in the PRQ. No participant members of the MPCC referred to these documents or to the existence of CCT Medical Directors or the CCT Taskforce.

Currently, 20 vehicles are licensed for CCT in the state, 9 of which are ambulances. No data were provided regarding the number of personnel licensed to function in CCT.

In reading the above documents it is readily apparent that OEMS and its former medical director have an enlightened and comprehensive viewpoint on the importance of CCT. However, one striking limitation is that trauma surgeons had no opportunity to provide input to the CCT program.

In the PRQ and during discussions with review participants, no specific issue or set of issues regarding CCT were brought forward for discussion. Thus, it is hard to answer question 3 without some clarification as to what are perceived as CCT issues within the state trauma system.

Regardless of the issues identified, the following information will be needed to address those issues:

- What are the current number, nature, and distribution of CCT resources throughout the state?
- What are the frequency, nature, and distribution of CCT in the state?
 - This information should include information about the sending and receiving facility.
- What are the transport time intervals for CCT?

This is an issue that could become a focus of the trauma system PI program. If information were reported on the need for CCT, number of individuals

transported by CCT who truly needed the level of care, and the unmet need, it would be possible to identify the primary issues and to begin to identify strategies to address those issues.

RECOMMENDATIONS

- Offer trauma surgeons the opportunity to review guidelines for CCT and offer suggestions for revision, if needed.
- Perform a needs assessment and gap analysis of CCT needs and resources.
- Make critical care transport a priority focus area for trauma systemwide performance improvement.

FOCUS QUESTION 4: When the legislation was written for the development of the state trauma system appropriate funding was not identified. It appears that the state constitution would need to be changed in order to provide funding for the trauma system. What recommendations would the TSC Committee have for obtaining funds to support trauma centers participating in the state trauma system?

West Virginia has been fortunate to have received limited state appropriation through General Funds to provide infrastructure support for the trauma system, as illustrated in the PRQ. The state has recognized the need for financial support of the public health system, and the state ranks 6th in funding for public health programs (see the attachment in Appendix C). Since the state has been providing limited support of the current infrastructure and regulatory aspects of the system, prior year lead agency budgets can be used to determine the administrative funding needs of the trauma system.

The state has not developed a strategy to assess and identify the costs of all aspects of implementing an inclusive trauma system. The budget provided in the PRQ pertains to the administrative aspects of the state infrastructure and its resources. It provides an incomplete picture of fiscal and human resources across the state. A budget of estimated costs should be prepared for the next stage of trauma system development and for monitoring activities within the state lead agency.

Ongoing, stable funding is necessary to expand and maintain the trauma system infrastructure. To support the lead agency, states use a variety of funding sources, including: general fund revenues; fines or fees on motor vehicle moving violations (12 states); fines or fees on other criminal penalties (4 states); motor vehicle registration/license plates fees or drivers license renewal surcharges (8 states); cigarette excise taxes (5 states); gambling taxes (1 state); surcharge on 911 calls (1 state); and other sources (2 states).^{*} In many cases, these funds are used to provide incentives for hospitals to participate in the trauma system, such as with the provision of readiness costs or covering the fee associated with verification. Other potential funding mechanisms for program infrastructure are as follows:

- Some EMS and trauma care equipment needs are funded by state capital improvement funds.
- Federal, state, and private funding partnerships (e.g. Benedum Foundation).
- Federal grants. The absence of a specific grant program for trauma system development, such as those previously funded through the Title XII Trauma and EMS Program, makes it more difficult to find sources of financial support from the federal level. However, states have helped build trauma system infrastructure with the following federal grants: Assistant Secretary for Preparedness and Response (ASPR), Department of

Homeland Security, DOT NHTSA 402 and 408 funds, HRSA Rural Hospital Flexibility grant, Centers for Disease Control Block Grants, Maternal and Child Health Block Grants, and Emergency Medical Services for Children grants.

The state has not yet considered clinical component costs. When considering trauma system finances, it would be useful to have a full accounting of the funds spent each year to provide trauma care statewide for all levels of injury. No budget or report summarizes the total cost of injury care at the state, region, locale, institutional, agency, and practitioner level. Having the staffing resources available and the ability to obtain access to current hospital and EMS financial information is essential to accomplish this task.

Some states encourage hospitals to collect charge and payment data, as well as payment source in their trauma registries. Hospitals then submit this information in aggregate form to the state at designated reporting times. This information can help track percentages and costs of uncompensated care. It can help document the costs of injury hospitalizations (not including physician charges and other costs) by different payer sources (e.g., Workers' Compensation, Medicare, Medicaid, and private insurance). The burden of uncompensated care for West Virginia trauma centers is not documented in an aggregate form. A gross estimate of the uncompensated care burden for injured patients is 25-35% of the total uncompensated care, based on surveys in other states. Trauma centers may find that collecting this financial information is valuable when advocating for resources within their own facility. For example, some hospital administrators may discover that trauma does not cause as high a proportion of uncompensated care as other disorders.

Another aspect of financial support is the readiness cost to maintain trauma center designation, e.g., on-call pay, adequate personnel 24/7 in the emergency department, and the infrastructure in the facility. Provision of readiness funds helps facilities to reach and maintain a level of verification, facilitate interfacility transfer to a higher level of care, or integrate rehabilitation into the trauma emergency care system. Some of these functions could be accomplished with limited additional funds, such as establishing guidelines for interfacility transfer and involving rehabilitation experts into the trauma system planning process.

One way to identify projected readiness costs is to ask hospitals what funding (with details by category of cost) would be needed to consistently meet their trauma center level (using ACS verification guidelines for level I, II, and III, IV and non-verified participating hospitals). Once this information is collected, an average readiness cost per level of trauma care could be developed. Factored into this readiness cost could be the cost of ACS or state verification visits. Arkansas is one state that has recently completed a similar process.

Trauma center leaders often become myopically focused on reimbursement for uncompensated care. While this focus is important, funds must be invested in the trauma system infrastructure, management, and oversight to best protect the health and welfare of the state's citizens. Any funds provided to support trauma centers from disproportionate share or additional uncompensated care should be linked to trauma center performance.

Obtaining funding to support trauma center costs will be very challenging if all options used by other states are not available to West Virginia. Further investigation of all options outlined in the list of funding mechanisms that have been successful by other states is an important first step. It will be essential to collect and develop compelling information about funds needed by trauma centers prior to approaching state legislators for a funding mechanism or for a potential state constitution change. Trauma stakeholders will then need to form a broad coalition that includes an educated public to approach the legislature as to why additional funding is needed.

The trauma stakeholders and legislature will be very interested in tracking both programmatic progress and fiscal expenditures associated with appropriated funds. An annual report should be prepared for the legislature that outlines the progress made with the currently appropriated General Funds. Such reports may increase the confidence of state legislators that the program will be even more successful with additional funding. Eventually, a cost-benefit analysis of the system (cost per life saved) should be attainable. It is important to share this financial information with the public and the legislature.

* Source: American College of Surgeons, "Summary of Trauma Systems and Funding Mechanisms by State."

RECOMMENDATIONS:

- Encourage trauma centers to collect financial data on patient cost, charges, and payer, and to submit these data in aggregate form to the lead agency at least annually.
 - Determine the burden of uncompensated care for injured patients in the state.
- Survey hospitals to determine readiness costs needed to support continuous preparedness to function at the trauma center verification or participation level.
- Consult with other states regarding trauma program infrastructure budgets and additional sources of funding above the state appropriation. The Trauma Managers Council of the National Association of State EMS Officials could facilitate contacts with state trauma managers.

- Determine a methodology for providing financial assistance for designated trauma centers to assist with the cost of readiness.
- Develop a strategy to seek all available revenue resources to support and sustain the trauma system.

FOCUS QUESTION 5: Except for the bi-annual STAC meeting, there is limited dialogue between the state trauma center medical directors and the state trauma system leaders. Can the TSC Committee comment on whether there is adequate input from the medical directors in the development of the state trauma system.

As recognized by this question, the actual interaction between trauma system leadership (trauma medical directors, trauma center program managers, and other members of the STAC) and the state trauma program managers is very limited. Because of the infrequency of meetings, the trauma center medical directors do not feel engaged in the planning and implementation of the trauma system, and they are frustrated by their inability to promote trauma system development.

The fact that the trauma center medical directors and others are not identified in this question as the trauma system leaders provides insight into how their role is viewed by the state trauma program managers.

The trauma system leaders (STAC members) have demonstrated leadership and experience in the development of the trauma system for their local catchment areas. Their expertise and experience is essential for statewide trauma system development. An evening meeting twice a year is not sufficient to enable them to provide recommendations for trauma system development. Administrative rule outlines the range of responsibilities that the trauma system leadership (STAC) has. Examples of activities that the trauma system leadership, especially members of the STAC, should have a significant role include the following:

- Development of the statewide trauma system strategic plan and implementation plan
- Performance of a trauma system needs assessment and gap analysis
- Recommendations for needed modifications of the trauma center designation criteria and process
- Monitoring trauma system performance, leading to recommendations that could improve patient care and trauma system performance
- Review of new policies and procedures for the EMS system that could impact the statewide trauma system
- Recommendations for future trauma system rule revisions
- Education of elected officials and the public about the trauma system

This list of activities illustrates that a meeting twice a year is inadequate. Trauma system leadership (STAC members) should begin meeting monthly to develop the trauma system strategic plan and implementation plan. Other groups of stakeholders supporting the STAC could meet less frequently. The STAC meeting schedule could potentially change to every 2 months or even quarterly for ongoing system development and to fulfill the activities listed above after the

strategic plan is finalized. It is possible that some meetings could be conducted through web-based conferencing to reduce travel times for the trauma system leaders.

The trauma program managers should be responsive to the recommendations of the trauma leadership and support the implementation of statewide trauma system modifications if possible. Such acknowledgement of the trauma system leadership's recommendations will hopefully result in true engagement by the leadership. The trauma system leadership should also be assigned specific responsibilities and be held accountable for them. This would provide assurance to the trauma program managers and to the system leaders that an effective partnership can exist to support statewide trauma system development.

RECOMMENDATIONS

- Increase the frequency of STAC meetings to conduct the business of trauma system development.
- Ensure that the trauma system leadership is fully engaged in trauma system development
- Support the recommendations of the STAC when possible, acknowledging their expertise and experience with the trauma system.

Acronyms

ABA – American Burn Association
ACEP – American College of Emergency Physicians
ACS – American College of Surgeons
ALS – advanced life support
ASPR – Assistant Secretary for Preparedness and Response
ATS – American Trauma Society
ATV – all terrain vehicles

BIS – Benchmarks, Indicators, and Scoring
BLS – basic life support
BPH – Bureau of Public Health

CCT – critical care transport
CFRT – Child Fatality Review Team
CHEMTAC – Centralized Hospital and Emergency Medical Triage and Coordination Center
CME – continuing medical education
CODES – Crash Outcomes Data Evaluation System
COT – Committee on Trauma

DHHR – Department of Health and Human Resources
DOS – disk operating system (Microsoft)
DOT – Department of Transportation
DHSEP – Division of Homeland Security and Emergency Preparedness
DTP – Division of Threat Preparedness

EMS – Emergency Medical Services
EMSAC – Emergency Medical Services Advisory Committee
EMTs – emergency medical technicians
ESAR-VHP – Emergency System for the Advance Registration of Volunteer Health Professionals
ESF – emergency support functions

FIM – functional independence measure
FTE – full time equivalent

GCS – Glasgow coma score

HRSA – Health Resources and Services Administration

ICRC – Injury Control Research Center
IRB – institutional review board
ISS – injury severity score

MADD – Mothers Against Drunk Driving
MCC – Medical Command Center
MOC – maintenance of competency
MOU – memorandum of understanding
MPCC – Medical Policy and Care Committee
MRC – Medical Review Committee

NHTSA – National Highway Traffic Safety Administration
NEMSIS – National EMS Information System
NTDB – National Trauma Data Bank
NTDS – National Trauma Data Standard

OEMS – Office of Emergency Medical Services

PI – performance improvement
PI & E – public information and education
PRQ – Pre Review Questionnaire

RTTDC – Rural Trauma Team Development Course

SADD – Students Against Destructive Decisions
SCI – spinal cord injury
SMARTT – State Medical Asset Resource Tracking Tool
SNF – skilled nursing facility
STAR – State Trauma Audit Review
STECS – State Trauma and Emergency Care System
STEMI – ST Elevation Myocardial Infarction

TBI – traumatic brain injury
TEMIS – Trauma and Emergency Medical Information System
TSC – trauma system consultation
TSN – technical support network

WV – West Virginia
WVU – West Virginia University

Appendix A: Methodology

Methodology

The State of West Virginia Department of Health and Human Services (DHHS) requested this trauma system consultation, which was conducted under the auspices of the American College of Surgeons (ACS), Trauma System Consultation program (TSC). The multi-disciplinary Site Visit Team (SVT) consisted of: two trauma/general surgeons, one emergency physician, a state EMS/trauma director, a trauma program manager, a rural trauma and prehospital specialist, and a public health and injury specialist. Biographical sketches for team members are included as Appendix B of this report.

The primary objective of this ACS trauma system consultation is to guide and help promote a sustainable effort in the graduated development of an inclusive and integrated system of trauma care for the State of West 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 SVT reviewed the ACS Pre-Review Questionnaire (PRQ) submitted by DHHS. The SVT also reviewed a number of related supporting documents provided by the DHHS and information available on state government websites.

The SVT convened in Roanoke, West Virginia on December 13th-16th, 2009, to review the state of West Virginia trauma system. The meetings during the four-day visit consisted of plenary sessions during which the SVT engaged in interactive dialogue with a broad range of representative trauma system participants. There was also an opportunity for informal discussion with the participants and time devoted to questions and answers. During the survey, the SVT also met in sequestered sessions for more detailed reviews and discussion, and for the purpose of developing a team consensus on the various issues, preparing a report of their findings, and developing recommendations for future development of the trauma system in West Virginia. This report was developed independently of any other trauma system consultations or assessments.

Appendix B: Review Team Biographical Sketches

THOMAS J. ESPOSITO, MD, MPH, FACS- TEAM LEADER

Thomas J. Esposito, M.D., M.P.H. is a Professor of Surgery at Loyola University, Stritch School of Medicine in Maywood, Illinois. He is the Director of the Division of Trauma, Surgical Critical Care and Burns in the Department of Surgery at Loyola University Medical Center. Additionally, he serves as the Director of Injury Analysis and Prevention Programs at the Loyola University Burn & Shock Trauma Institute. He is an attending surgeon at Loyola University Medical Center.

Dr. Esposito received his medical degree from Georgetown University School of Medicine in Washington, D.C. and a master's degree in Public Health from the University of Washington School of Public Health and Community Medicine in Seattle, Washington. He did his surgical training at St. Elizabeth's Hospital in Boston, Massachusetts. Following his residency, Dr. Esposito completed fellowships in Critical Care and Traumatology at the Maryland Institute for Emergency Medical Services Systems, and in Injury Prevention at Harborview Injury Prevention and Research Center in Seattle.

A Diplomat of the American Board of Surgery, Dr. Esposito has a Certificate of Added Qualifications in Surgical Critical Care. He is a Fellow of the American College of Surgeons and Vice-Chair of the Chicago Committee on Trauma of the ACS. He is also a member of the national ACS/COT.

Dr. Esposito's professional organization memberships include, the American Trauma Society, the American Association for the Surgery of Trauma, the Eastern Association for the Surgery of Trauma, the National Association of EMS Physicians, the Chicago Metropolitan Trauma Society, Society of University Surgeons, the Society for Academic Surgery, Society of Critical Care Medicine, the American Public Health Association, and the Illinois Public Health Association, among others.

He has been appointed to the Prevention Committee of the AAST and EAST as well as to both organizations' committees on the Future of Trauma Surgery. He serves as the Chair of the AAST Injury Assessment and Outcome committee as well as the EAST Task Force on Research Related Issues and is a member of the Illinois EMSC Advisory Council. He is a consultant to the US Department of Transportation, and a number of states on trauma care system issues. He has served as a trauma center and trauma system site reviewer for the ACS, NHTSA, and the states of Mississippi, Maryland, and Pennsylvania. He was a recipient of the NHTSA Public Service Award in 1993 and the Florida Committee on Trauma, David Kreis Visiting Trauma Professor Award in 2005. He serves on the Board of Directors for the Critical Illness and Trauma Foundation in Bozeman, Montana, the Eastern Association for the Surgery of Trauma, and the SAFEAMERICA Foundation. He also serves as Medical Director of the Rural Emergency Medical Services and Trauma Technical Assistance Center and is the AAST liaison to the Brain Trauma Foundation.

In addition to clinical and teaching duties, Dr. Esposito is active in many trauma related studies and projects. He is the recipient of over \$500,000 in federal and private grants to conduct these activities. He has a particular interest in trauma prevention strategies, trauma systems and their development and evaluation. He also has expertise in the area of trauma data systems and outcomes research. He has numerous trauma related publications and presentations to this credit.

JANE W. BALL, RN, DRPH

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

Dr. Ball has authored numerous articles and publications as well as several health care textbooks, including Mosby's Guide to Physical Examination (6 editions), Child Health Nursing (first edition), Pediatric Nursing: Caring for Children (4 editions), Maternal and Child Nursing (2 editions), and Pediatric Emergencies: A Manual for Prehospital Care Providers (2 editions). One of these texts, Pediatric Nursing: Caring for Children, received the 1999 and 2001 Robert Wood Johnson Foundation Last Acts Coalition Outstanding Specialty Book Award. 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 recently completed her term 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. She currently serves as the organization's Immediate Past President.

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.

AMY EBERLE, RN, BSN, EMT

Amy Eberle has worked as the State Trauma Coordinator with the Division of Emergency Medical Services, North Dakota Department of Health for four years. She has also worked at the St. Alexius Medical Center in Bismarck, North Dakota on the Neuro/Surgical floor for the past 8 years.

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

Amy has been a strong advocate for an all inclusive trauma system within ND. She has been involved in many legislative activities in regards to enhancing the ND trauma system and as a result has been very successful in getting legislature to pass a bill that requires all hospitals in ND to be trauma designated at some level.

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

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

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

Dr. Maio is the Director of the Office of Human Research Compliance Review (OHRCR) for the University of Michigan, is as Professor of Emergency Medicine, and has appointment in the School of Public Health (SPH) as Professor of Environmental Health Sciences. Prior to being appointed Director he was the Assistant Dean for Research Regulatory Affairs at the Medical School and also was the founder and Director of the University of Michigan's Injury Research Center, based in the Department of Emergency Medicine.

Dr. Maio has practiced emergency medicine in both the rural and non-rural setting, was an assistant medical director for two EMS systems in Michigan, and, served on the board of the Huron Valley Ambulance Association based in Ann Arbor, Michigan. Dr. Maio has also served on numerous state and federal

committees and panels and has served as the chair for the National Association of EMS Physicians' (NAEMSP) Research Committee.

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

DREXDAL PRATT

Chief Drexdal Pratt heads the Office of Emergency Medical Services in the Division of Health Service Regulation of the North Carolina Department of Health and Human Services. His agency manages 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.

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.

Currently, Chief Pratt serves as a Commissioner on the Governor's State Emergency Response Commission and serves as Chairman of the Commission's Homeland Security Medical Committee. In addition, Mr. Pratt serves as Chairman of the NC Hospital Preparedness Committee.

CHARLES F. RINKER II, MD, FACS

Charles F. Rinker II, MD, FACS, has been in the private practice of general surgery in Bozeman, MT since 1976. He established and for 15 years directed the trauma service at Bozeman Deaconess Hospital, an ACS verified Level III trauma center.

Trauma care, both local and regional, has been his special interest throughout his career, beginning in 1981 as co-director of the first ATLS course offered in the

northern Rockies. He served as vice-chair, and then chair, of the Montana Committee on Trauma, during which time he was involved in establishment of the state trauma system. Since then he has taught more than 100 ATLS courses, served on the national ATLS subcommittee, participated in two revisions of the ATLS manual, and participated in promulgation of the program at five international sites.

In the 1990s Dr. Rinker served as Vice-Chair of the national ACS Committee on Trauma, and as Chair of the Regional Committees on Trauma. While serving on the COT, he was for eight years a member of the Verification Review Committee, and has been a senior reviewer for the VRC since 1993. He has led hospital consultation and verification site visits in 20 states, including West Virginia. He was an original member of the Ad Hoc Subcommittee on Trauma Systems, and served on the review team for the state of Wyoming. He has also participated in several NHTSA-sponsored state EMS system reviews.

Dr. Rinker has authored a textbook chapter and several articles on rural trauma care.

Currently he is in charge of the National Surgical Quality Improvement Program (NSQIP) at Bozeman Deaconess Hospital, and Director of Surgical Quality and Patient Safety.

NELS D. SANDDAL, MS, REMT-B

Mr. Sanddal is currently the president of the Critical Illness and Trauma Foundation (CIT), in Bozeman, Montana. CIT is a non-profit organization dedicated to improving the outcomes of people who are injured in rural America through programs of prevention, training, and research. He recently completed a detachment as the Director of the Rural EMS and Trauma Technical Assistance Center which was funded by the Department of Health and Human Services, Health Resources and Services Administration. Mr. Sanddal worked as the training coordinator for the EMS and Injury Prevention Section of the Montana Department of Public Health and Human Services in the late 1970's. He has served as the Chairperson of the National Council of State EMS Training Coordinators and as the lead staff member for that organization, as well as the National Association of EMT.

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

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

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

Appendix C: State Public Health Budgets

State Public Health Budgets			
State	FY 2007-2008	FY 07-08 Per Capita	Per Capita Ranking
Hawaii ²	\$221,008,697	\$172.21	1
Vermont ³	\$90,222,763	\$145.23	2
District of Columbia	\$67,703,000	\$115.08	3
California ⁸	\$3,070,883,069	\$84.01	4
Idaho	\$117,390,200	\$78.29	5
West Virginia	\$139,404,494	\$76.93	6
New York	\$1,328,537,400	\$68.84	7
Oklahoma ^{1,8}	\$240,042,246	\$66.36	8
Massachusetts ⁴	\$425,187,621	\$65.92	9
Wyoming	\$33,561,119	\$64.19	10
New Mexico	\$123,277,100	\$62.58	11
Alabama	\$270,565,257	\$58.46	12
Delaware ²	\$45,431,100	\$52.54	13
Tennessee	\$313,513,800	\$50.92	14
Rhode Island	\$53,487,559	\$50.56	15
Colorado	\$241,227,816	\$49.62	16
Louisiana	\$206,987,822	\$48.21	17
Alaska ²	\$31,433,600	\$45.99	18
Kentucky	\$179,848,193	\$42.40	19
Virginia ⁴	\$320,724,724	\$41.59	20
Washington ⁴	\$268,638,500	\$41.53	21
South Carolina	\$180,538,528	\$40.96	22
Maryland ²	\$214,244,000	\$38.13	23
Nebraska ⁴	\$65,069,351	\$36.67	24
New Jersey	\$303,664,000	\$34.96	25
MEDIAN \$33.71			
Utah ⁸	\$89,182,200	\$33.71	26
Florida ²	\$545,458,887	\$29.89	27
South Dakota	\$22,683,983	\$28.49	28
Arkansas	\$77,373,002	\$27.29	29
Maine ²	\$35,326,645	\$26.82	30
Montana	\$24,280,665	\$25.35	31
Illinois	\$301,629,600	\$23.47	32
Connecticut ²	\$2,104,494	\$23.44	33
New Hampshire	\$30,300,891	\$23.03	34
Michigan ⁴	\$213,486,300	\$21.20	35
Pennsylvania ²	\$249,951,000	\$20.10	36
Iowa	\$58,274,612	\$19.50	37
Kansas	\$52,373,831	\$18.87	38
Georgia ^{6,8}	\$174,971,859	\$18.33	39
Arizona	\$113,795,500	\$17.95	40
North Dakota ⁷	\$10,824,747	\$16.92	41
North Carolina ²	\$147,749,787	\$16.31	42
Minnesota ²	\$84,582,000	\$16.27	43
Texas ⁸	\$381,626,020	\$15.96	44
Indiana	\$97,735,693	\$15.40	45
Ohio ⁴	\$172,616,353	\$15.05	46
Oregon	\$54,315,766	\$14.49	47
Mississippi ^{2,8}	\$36,903,314	\$12.64	48
Wisconsin ⁴	\$58,849,240	\$10.51	49
Missouri ^{5,8}	\$51,802,017	\$8.81	50
Nevada	\$8,686,841	\$3.37	51

Notes:

- 1 May contain some social service programs, but not Medicaid or CHIP.
- 2 General funds only.
- 3 Includes federal funds.
- 4 Budget data taken from appropriations legislation.
- 5 Missouri's percent change based on FY 2006-07 and FY 2007-08 actual expenditures.
- 6 Georgia's budget data for FY 2006-07 taken from appropriations legislation.
- 7 North Dakota's budget data for the 2007-2009 biennium taken from appropriations legislation.
- 8 Excludes one-time funding for Anti-Virals.

Appendix D: Consultation Participant List

Participant**Title**

Chris Curtis, MPH	Acting Commissioner, Bureau for Public Health
Ron Forren	Interim Administrator, STEMS
David Kappel MD, FACS	State Deputy Trauma Medical Director
William Rose MD, FACEP	Interim State EMS Medical Director
Frank (Chuck) Lucente MD, FACS	WV ACS-COT Chair, Level I Trauma Medical Director, STAC President
Bruce McClymonds, President	West Virginia University Hospitals
Mike Williams, Vice President	Charleston Area Medical Center, STAC Member
Allison Wilson MD, FACS	Level I Trauma Medical Director, STAC Member
Chuck Whiteman MD, FACEP	ACEP Representative, STAC Member
David Denning MD, FACS	Level II Trauma Medical Director, STAC Member
Rebecca Wolfer MD, FACS	Level II Trauma Medical Director, STAC Member
Bonnie Beaver MD, FACS	Pediatric Trauma Surgeon, Level II Trauma Center
Robert Biundo, MD	Rehabilitation with Health South
David Ghaphery MD, FACS	Trauma Medical Director, Level II Trauma Center, STAC Member
W. B. Clayton MD, FACEP	Emergency Physician, Regional Medical Director
Jonathan Newman MD, FACEP	Emergency Physician, Regional Medical Director
James Carrier MD	Trauma Medical Director Level III Trauma Center, STAC Member
Jeff Pliney, MD	Trauma Medical Director, Level IV Trauma Center
Connie Campbell RN	Trauma Program Manager, Level I Trauma Center, STAC Member
Rhonda Brown RN	Trauma Program Coordinator, Level II Trauma Center
Kelly Jo Evans RN	Trauma Program Manager, Level I Trauma Center
Lori Schorr RN	Trauma Program Manager, Level II Trauma Center
Staci Trudo, RN	Trauma Program Manager, Level II Trauma Center
Bruce Trent RN	Trauma Program Director Level II Trauma Center, STAC Member
Howard Shackelford MD, FACS	Trauma Medical Director Level II Trauma Center, STAC Member

Beth Blosser RN, MSN
Kyna Moore
Ramona Rodeiquz

Peggy Williams Rn

Christina Dellinger

Jimmy Gianato, Director

Jim Doria, Epidemiologist
Gordon Merry, Director
Jim Donathan, Program Director
Robert Dozier
Clinton Burley, Manager
Joe Richards
Ginger Dearth, Director Marketing
Jerry Rhodes, Deputy Director
Paul Seaman RN, REMTP
Cindy Crammer, Acting Director
Collaboration
Mark Holmes

Lisa Shamblin, RN

Sylvia Madzunovic, RN

Chuck Thayer, Associate Director

Lorri White RHIA
Jerry Kyle
Deron Wilkes
Sherry Rockwell RN, MSN
Lisa Wiles
Penny Byrnside RN, MS
Sharon Pearson
Assistant

Level IV Trauma Program Manager
Rural Non Designated Hospital
Level I Trauma Program Manager,
STAC Member
Trauma Program Director, Level IV
Trauma Center
WV ENA President, STAC Member,
Program Manager Level III Trauma
Center
Home Land Security, Emergency,
Management, 911 Representative
BPH, Vital Statistics
EMS Management
Regional EMS/TSN
Data (STEMS)
HealthNet Aero medical Representative
EMS/TSN
Health South Rehabilitation
Threat Preparedness
EMS Agency
WV, DOT, Injury Prevention and
WV Governor's Highway Program,
Injury
Prevention and Collaboration
Trauma Registrar, Level I Trauma
Center
Trauma Registrar Level IV Trauma
Center
Community Health System and Health
Promotion, Injury Prevention
State Trauma Registrar
Director, Division of EMS (STEMS)
Disaster Coordinator/EMS-C (STEMS)
State Designation Coordinator (STEMS)
State Designation Assistant (STEMS)
Director, Division of Trauma (STEMS)
STEMS Lead Secretary/Trauma