



Trauma System Consultation
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American College of Surgeons
Committee on Trauma

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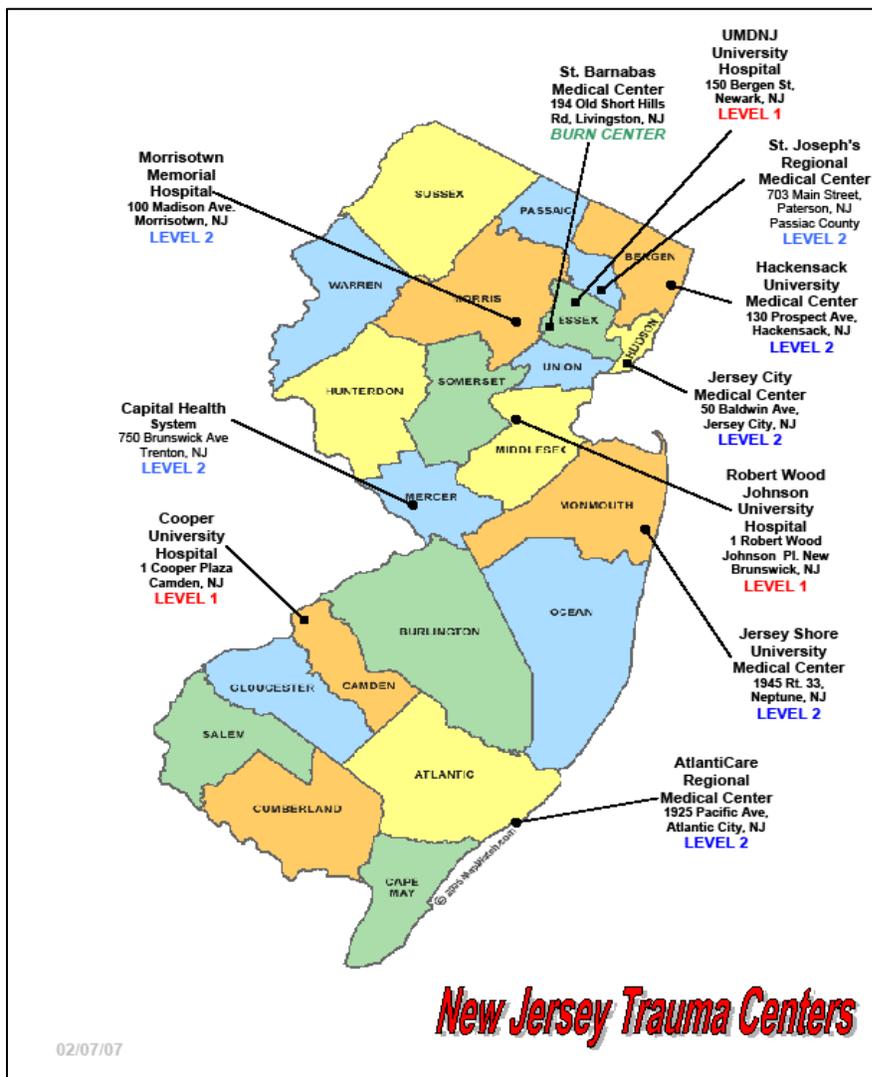
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Executive Summary

Injury is a major public health problem in New Jersey. It is the leading cause of death for New Jersey citizens between the age of 1 and 44 and the fourth leading cause of death for all age groups. Injury results in approximately 3,500 deaths annually and accounts for more than 60,000 emergency department visits in the State. Using 2005 data, the direct medical costs of injury are estimated to be more than \$2 billion. An analysis of injury data revealed that motor vehicle crashes, poisonings, and falls are the leading causes of unintentional injury and hospitalization. Homicide and/or suicide are among the top five leading causes of death for all age groups.



New Jersey has an exclusive trauma system, meaning that all hospitals in the state are not participating. The state is fortunate to have 10 American College of Surgeons (ACS) verified trauma centers in New Jersey, that are strategically located. Three are Level 1 centers and 7 are Level 2 centers. (Figure 1). All citizens were reported to be within 15 minutes by air, 25 minutes by ground, of a trauma center. The state is also fortunate to have E911 Statewide and 100% EMS

advanced life support (ALS) coverage. Rotorcraft coverage is statewide with both public sector and private sector response.

There is clear evidence that organized systems of trauma care save lives. Inclusive trauma systems are an integral part of the public health safety net and assure that persons who are injured while traveling to any portion of the state have access to optimal care that matches the severity of their injuries. In the absence of an organized system of trauma response, productive lives are needlessly lost. Through the evolution of an inclusive trauma system all citizens of the most populated State in the Union will be able to able to strive toward the State's motto of "Liberty and Prosperity".

The American College of Surgeons, Trauma System Evaluation and Planning Committee was asked by the New Jersey Department of Health and Senior Services to gather information regarding the New Jersey Trauma System from a pre-review questionnaire, key informant testimony and other sources. It was based on this input that the consultative team met, deliberated and put forth the recommendations contained in this report. The process is one of consultation rather than verification. The multidisciplinary team used a consensus-based process to arrive at independent recommendations. The "gold standard" for all ACS Trauma Systems Consultations is based on an inclusive trauma system, grounded in a public health framework, and with the best interests of the patient always foremost in the process.

Advantages and Assets of the Existing System

The current system, which has been built on the backs of the 10 Level I and Level II trauma centers, is not without notable strengths and accomplishments. The following list captures some of these important attributes.

- Very committed individuals who use their time and expertise every day to serve New Jersey citizens
- All ten of the existing trauma centers maintain ACS verification standards
- 100% of the State has enhanced 9-1-1
- 100% of the State has some access to Advanced Life Support prehospital coverage
- Statewide universal billing (UB-92) and emergency department data are available
- There is a stated commitment to sharing data – providing confidentiality is maintained
- Injury prevention activities are well established at the local level.
- The Certificate of Need process has resulted in a good distribution of trauma centers
- Many components of the trauma system are in place
- There is current legislative interest in strengthening the EMS system
- The Department of Health and Senior Services (DHSS) was supportive of the consultation process
- Personal Injury Protection and worker's compensation funding partially offsets the cost of caring for injured patients

- Funding for air medical services, EMS training, and Traumatic Brain and Spinal Cord Injury
- Multiple existing data sources with crash, fatality analysis reporting system (FARS), hospital discharge and emergency department data
- Excellent burn care assets
- Trauma centers reportedly submit data to the National Trauma Data Bank
- Advanced Life Support prehospital performance improvement is conducted at hospital base stations
- A large number of rehabilitation facilities exist, including assets for children
- Individual trauma centers collect trauma registry data
- Strong trauma center council

Challenges and Vulnerabilities

In spite of the hard work and dedication of many trauma professionals and government leaders noted above, the New Jersey Trauma System, as it exists today, remains fragmented. As such many injured patients in New Jersey do not receive the level of care that the system can optimally provide and that the patients and their families deserve. The current response to the injured patient is a function of where they are located in the State at the time of their injury and the ability of the system to respond on that given day to that given location. The following list captures some of the challenges of the current system.

- It is not an inclusive trauma system.
- Timely transport to a trauma center is not assured.
- No State or local mandate exists to assure the provision of consistent and timely EMS (prehospital) response.
- No common BLS EMS agency definition exists.
- Volunteer BLS EMS services lack accountability, reporting, and state licensure.
- There is no statewide EMS Medical Director or Trauma Director.
- No consensus has been achieved by the stakeholders regarding the form or function of a state trauma plan.
- No standards exist for scene trauma triage or trauma inter-facility transfers. Triage guidelines are permissive rather than prescriptive.
- Fiscal viability of many hospitals is in doubt.
- No Statewide trauma data collection of EMS, hospital, rehabilitation and Medical Examiner data can be used to evaluate system performance.
- No enforcement or monitoring of compliance with current statutes and regulations occurs.
- The lead agency is not designated in legislation.
- Limited collaboration exists between the Office of EMS, licensing, and other DHSS areas.
- OEMS staff reductions have impacted programs.

- The existing Trauma Center Council does not involve all key players in the trauma system.
- Stakeholders do not recognize that the trauma care system requires multidisciplinary participation.
- No collaborative effort has been initiated to educate the public about the trauma system.
- No incentives were identified to integrate the existing components of the trauma system.
- No systemwide trauma center financial data are available. Trauma centers do not know if they operate at a profit or loss.
- No match is present between Personal Insurance Protection payment and pay for performance.
- Injury outreach is fragmented across agencies.
- No guidance regarding injury prevention resources exists at the state level.
- Disparity in emergency medical dispatch was reported.
- Trauma transfer policies are not in existence, not enforced or monitored. No agreements for transfer with nontrauma acute care hospitals.
- Potential overuse of rotor wing air medical services is likely.
- Emergency preparedness is not well linked with OEMS and trauma.
- Performance improvement information is reported to be discoverable.
- No statewide trauma registry data are available.
- No plan for system performance improvement, no indicators identified, no personnel to coordinate PI.
- Challenges exist in aggregating and reporting trauma data.
- No collective voice to pressure the trauma registry vendor exists with the current contracts.
- No trauma system research is being conducted.
- No ongoing assessment of trauma center designation occurs after ACS verification.

Priority Recommendations Summary

Of the more than 100 recommendations and sub-recommendations contained in this report, the following 13 were considered by the consulting team to be the most important to the development and sustainment of the New Jersey Trauma System. They are listed by categories as they are presented in the report rather than stratified by presumed importance.

Statutory Authority

- Establish the statutory authority to plan, implement, operate and evaluate a statewide trauma system. Legislation should empower DHSS as the lead agency with the responsibility and authority, and provide the human and financial resources to accomplish this purpose.

System Leadership

- Appoint a fulltime EMS medical director with appropriate emergency medicine and trauma credentials.
- **Create a newly constituted State Trauma Advisory Committee (STAC) and appoint multidisciplinary members that include trauma and other acute care facilities, EMS, rehabilitation, injury prevention and other key stakeholders for system oversight with authority to provide specific input to the DHSS on trauma system issues.**

Coalition Building and Community Support

- Form a broad-based coalition (independent of the STAC) that is inclusive of trauma center professionals, EMS professionals, other health professionals, injury prevention leaders, health system payers, the state hospital association, community hospitals, public health officials, public safety representatives, the media, citizens, and policy makers to advocate for trauma system development.

Trauma System Plan

- Develop a trauma system plan that facilitates integration of system services and providers through a consensus, collaborative process involving community partners and stakeholders.

Financing

- The New Jersey legislature should provide adequate and dedicated (protected) support for the costs of the trauma system infrastructure.

Definitive Care

- Clearly define roles, responsibilities and accountabilities for all acute care hospitals in the system relating to trauma care.

Rehabilitation

- Add pertinent post acute care data elements to the trauma system registry data set which will allow pertinent questions regarding long-term functional, financial and other outcomes to be answered.

Prevention and Outreach

- Integrate injury prevention into the trauma system and ensure the participation of injury prevention stakeholders on the state trauma advisory committee.

Emergency Medical Services

- Ensure that the state EMS medical director, once hired, has responsibilities that include encouraging participation and conducting performance improvement, as well as providing adequate support to the local service EMS medical directors in their provision of medical oversight.
- Create a state mandate to assure consistent staffing and timely provision of EMS service.

System Coordination/Patient Flow

- Implement a prescriptive and enforceable prehospital trauma triage standard to ensure the right patient gets to the right hospital in the right amount of time.

Systemwide Evaluation and Quality Assurance

- Seek legal counsel to ascertain if there is currently protection for public health data registries and the peer review process. If not seek immediate enactment of appropriate legal protection for participation in the peer review process.

Trauma System Assessment

Injury Epidemiology

Purpose and Rationale

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

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

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

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

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

OPTIMAL ELEMENTS

- I. There is a thorough description of the epidemiology of injury in the system jurisdiction using population-based data and clinical databases. **(B-101)**
 - a. There is a thorough description of the epidemiology of injury mortality in the system jurisdiction using population-based data. **(I-101.1)**
 - b. There is a description of injuries within the trauma system jurisdiction, including the distribution by geographic area, high-risk populations (pediatric, elderly, distinct cultural/ethnic, rural, and others), incidence, prevalence, mechanism, manner, intent, mortality, contributing factors, determinants, morbidity, injury severity (including death), and patient distribution using any or all the following: vital statistics, ED data, EMS data, hospital discharge data, state police data (data from law enforcement agencies), medical examiner data, trauma registry, and other data sources. The description is updated at regular intervals. **(I-101.2)**
Note: Injury severity should be determined through the consistent and system-wide application of one of the existing injury scoring methods, for example, Injury Severity Score (ISS).
 - c. There is comparison of injury mortality using local, regional, statewide, and national data. **(I-101.3)**
 - d. Collaboration exists among EMS, public health officials, and trauma system leaders to complete injury risk assessments. **(I-101.4)**
 - e. The trauma system works with EMS and public health agencies to identify special at-risk populations. **(I-101.7)**
- II. Collected data are used to evaluate system performance and to develop public policy. **(B-205)**
 - a. Injury prevention programs use trauma management information system data to develop intervention strategies. **(I-205.4)**
- III. The trauma, public health, and emergency preparedness systems are closely linked. **(B-208)**

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

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

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

CURRENT STATUS

The state has valuable resources for injury epidemiology in the Office of Injury Surveillance and Prevention (OISP) within the DHSS's Center for Health Statistics. The OISP has an injury epidemiologist who is available to support injury data analysis using available databases. A large number of databases are available, such as the vital statistics, UB92 hospital discharge and emergency department databases, fatal accident reporting system, medical examiner reports, the violent death reporting system, and the central nervous system injury database. The state trauma registry will be maintained in the Center for Health Statistics when it is operational. Merging the central nervous system database and the state trauma registry should be considered in the future.

The impact of injury in the state is well described in the *Injury Prevention in New Jersey 2008* document. This document is tied to New Jersey's Healthy People 2010 goals and objectives. Injury is the fourth leading cause of mortality in the state, resulting in 3,500 deaths. An additional 60,000 individuals are injured and treated in hospitals or emergency departments. The 2005 cost of direct medical care for injured individuals in the state is estimated to be greater than \$2 billion. An analysis of injury data has revealed that motor vehicle crashes, poisonings, and falls are leading causes of unintentional injury and hospitalization. Homicide and/or suicide are among the top five leading causes of death for all age groups. Analysis has been conducted regarding injury mechanism and intent for different locations in the state, as well as different age groups and special populations. A companion report of injury epidemiology has been prepared to support the *Injury Prevention in New Jersey* document, and it is scheduled for publication later this year.

The OISP has violent injury deaths grant from the Centers for Disease Control and Prevention. A violent injury death surveillance system has been developed using grant funds.

Some injury data and reports are available on the state website, and information is also disseminated through an electronic listserv to injury prevention organizations and coordinators.

The injury epidemiologist reported that she is available to perform special injury data analyses for the state, for the trauma centers, and injury prevention organizations, but the amount of time for such consultation is not known.

A relationship between OISP and the Office of Emergency Medical Services (OEMS) exists as the state trauma registry is housed in the Center for Health Statistics. However, it is not clear that an effective relationship currently exists, as the state trauma registry is not operational and no reports can be generated. The OISP needs to be integrated into the coalition for trauma system development.

RECOMMENDATIONS

- Widely disseminate the *Injury Prevention in New Jersey* document and its companion document to the broad-based trauma system development coalition.
- Ensure that the injury data are integrated into the public information and education campaign to educate the public about the need for a trauma system.

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

The members of the trauma stakeholders participating in the review were, by and large, unfamiliar with HRSA's *Model Trauma System Planning and Evaluation* (MTSPE) document. Consequently, few were aware of the Benchmark, Indicator and Scoring (BIS) tool or process for trauma system self-assessment. No plans have been made to conduct a full trauma system assessment or a more focused assessment using 16 key indications from the BIS at this time.

When the participants were asked what body would be the most likely candidate to conduct this internal analysis, it was suggested that the Trauma Center Council, with expanded multidisciplinary representation would be the most logical to undergo the process.

RECOMMENDATIONS

- Convene an expanded, representative, multidisciplinary group of trauma system stakeholders, as outlined in the MTSPE document, to complete the BIS within a one year time frame. The new Statewide Trauma Advisory Council (STAC), recommended in Statutory Authority, should take a leadership role in the process.
- Contract with an outside, neutral facilitator to conduct the facilitation process.
- Establish system benchmarks based on the BIS process, and reassess progress on a periodic basis.

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

New Jersey has no comprehensive trauma legislation that establishes a lead agency for trauma system development and oversight. It was reported that no such legislation has ever been introduced. Some legislation and regulations do address specific elements within a trauma system, although these are neither comprehensive nor linked together in a systematic fashion.

Designated trauma centers in New Jersey grew out of the state's certificate of need process. In the absence of any data to the contrary, this history appears to be perceived as having served the state well in terms of balancing the number of Level I and Level II centers with the volume of and location of trauma patients. One problem with this approach is that it makes no provision for the role of non-designated hospitals in the routing of major trauma cases to a trauma center with the resources to meet the patient's needs.

Existing legislation and regulations address elements of EMS licensing and certification requirements, use of the American College of Surgeons (ACS) trauma center standards, and the establishment of a statewide trauma registry (still under development). Despite this foundation, significant system issues cannot be addressed.

- It was reported that the state has no protection for a trauma system quality improvement process.
- The state has no ability to enforce ongoing ACS-specified capabilities at the trauma centers.
- The state has neither a designated lead agency nor a process for establishing performance standards for the trauma system.

Following the legislatively mandated 2007 EMS System Review, it was reported that at least one legislator is motivated to sponsor an update of the State's existing EMS legislation. At the current time, participants reported that no serious thought had been given to linking this effort with a broader re-write that could include trauma system legislation.

In the absence of a legislatively-specified model, stakeholder groups have evolved to fill some voids. One example is the Trauma Center Council (TCC). The TCC has worked to provide non-binding input to the state's OEMS and to promote coordination among the State's designated trauma centers. While the existence of groups like the TCC has helped to improve the effectiveness of the designated trauma centers, it may have slowed the pace of trauma system development by obscuring the need for a more formal and enforceable system. Similarly the certificate of need process achieved a comfortable and reasonable distribution of trauma centers that was reported to be meeting the volume demands for trauma care in the state. The apparent success of these measures is understandable from a historical perspective.

If New Jersey is to develop a well organized and comprehensive trauma system, the stakeholders and state policy leaders must acknowledge the existing fragmentation and begin building an infrastructure to meet the state's present and future needs. One step towards establishing that infrastructure would be the formal creation in statute of a Statewide Trauma Advisory Council (STAC). This group should be organized and staffed by the lead agency and include representation from the broad spectrum of trauma system stakeholders to provide the forum for planning and coordination of all system components.

RECOMMENDATIONS

- **Establish the statutory authority to plan, implement, operate and evaluate a statewide trauma system. Legislation should empower DHSS as the lead agency with the responsibility and authority, and provide the human and financial resources to accomplish this purpose.**
 - Stakeholder groups including, but not limited to the TCC, the NJ Hospital Association, the Division of Highway Traffic Safety (HTS), the state chapters of ACEP, ACS, ENA, and others should participate in the effort to pass comprehensive trauma system legislation that defines a lead agency and establishes process for the development of policies that are enforceable to assure that the needs of trauma patients are optimally met.
 - The legislation should include the creation of a multidisciplinary Statewide Trauma Advisory Council (STAC) that will function as the forum for system-wide planning.
- Recognize DHSS as the lead agency for trauma system development in advance of passing enabling legislation.
 - The DHSS should convene stakeholder interest groups to define enforceable trauma system standards.

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

New Jersey has no state EMS medical director and no state trauma medical director. While the state contracts with a physician (0.2 full time equivalent [FTE]), the functions of this position generally include representing the state at out-of-state meetings rather than developing consensus amongst stakeholders and formulating EMS performance standards and guidelines.

A state EMS medical director is needed. A significant role for this individual is bringing together all stakeholders to reach consensus on the architecture of the trauma system and the roles and responsibilities of all individuals and organizations involved in trauma patient care. Trauma system medical direction could be provided by a state EMS medical director, by a trauma medical director, or by a subcommittee of the STAC.

Many of the current stakeholders appear to have developed their own advocacy groups and to pursue their own agendas with varying degrees of success. One group stated that they were developing language for revision of the state EMS statute at the request of an interested elected state representative. The language for the bill is to be submitted in September 2008.

The strongest interest group present regarding the trauma system appears to be the Trauma Center Council (TCC). This group was formed in 1990 and includes representatives from all 10 trauma centers. This group is distinct from the New Jersey chapter of the ACS Committee on Trauma. The TCC has been active in advocating for mandatory helmet laws, alcohol screening and gun control, as well as being instrumental in advocating for the ACS systems consultation visit. From the perspective of the site visit team, neither all trauma centers, nor other multidisciplinary partners are represented in an equitable manner on this group.

All participants expressed support for the development of a comprehensive state trauma system. Many acknowledged that the system is fragmented, without system standards or an inability to enforce compliance to standards, leading to an inability to operationalize a true trauma system. Data are collected but they are not systematically utilized to optimize trauma system function.

Energy should be redirected with the formulation of a STAC. Such a group should be officially sanctioned to provide input into trauma system design and function. The STAC should be representative of the many stakeholders involved in the trauma system process to promote consensus building for trauma system development and to promote information exchange between different groups. The STAC should have representation from prehospital providers, public service agencies, acute care hospitals and trauma centers, professional groups such as ACEP, ACS and ENA, pediatric specialists, rehabilitation and injury prevention. The STAC should review trauma system performance reports and act as an advocacy group for the dissemination of information pertaining to trauma system operations and injury prevention.

RECOMMENDATIONS

- **Appoint a fulltime EMS medical director with appropriate emergency medicine and trauma credentials.**
 - Trauma system medical direction may be provided by a trauma system medical director or a medical oversight subcommittee of the STAC.
- **Create a newly constituted State Trauma Advisory Committee (STAC) and appoint multidisciplinary members that include trauma and other acute care facilities, EMS, rehabilitation, injury prevention and other key stakeholders for system oversight with authority to provide specific input to the DHSS on trauma system issues.**

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

New Jersey has many individuals and groups passionately interested in issues regarding injury prevention and injury care, such as the injury prevention coordinators, burn program manager, trauma program directors, and trauma program managers. Broad coalitions have formed to address injury prevention. Most notable are the Safe Kids and the Highway Traffic Safety Program (HTS) coalitions. In each case coalition membership includes health professionals, trauma center representatives, law enforcement, fire service, injury prevention leaders, and others. The state Safe Kids Coalition has multiple local chapters and local coalitions. The TSP coalition is coordinated through the Division of Highway Traffic Safety.

At present no broad-based, statewide or regional multidisciplinary coalitions exist to promote or advocate for the development of the state trauma system. The Trauma Center Council is a coalition of trauma center representatives that address issues of trauma care for the state. However, membership is exclusive to trauma center directors, trauma program managers, trauma registrars, and trauma center injury prevention coordinators. The state chapter of the ACS Committee on Trauma is another group interested in trauma care issues, but its role in promoting the trauma system was not clear from discussions with participants. EMS provider participants did not report any involvement in coalitions related to trauma system development.

Health system payers, the state hospital association, community hospitals, the print and broadcast media, public health officials, citizens, a broader representation of health professionals (e.g., rehabilitation professionals, emergency physicians, emergency nurses, medical examiners, and EMS providers), and policy makers were not represented on any coalition focused on trauma system development.

Public information and education regarding injury prevention was reported to be widely available in the state. No public information and education efforts regarding a trauma system have occurred at a regional or state level. As a result, the state population is uninformed about the value of trauma care, the need for a trauma system, and is unprepared to advocate for the trauma system.

RECOMMENDATIONS

- **Form a broad-based coalition (independent of the STAC) that is inclusive of trauma center professionals, EMS professionals, other health professionals, injury prevention leaders, health system payers, the state hospital association, community hospitals, public health officials, public safety representatives, the media, citizens, and policy makers to advocate for trauma system development.**

- Educate the coalition members about trauma care, the current status of the trauma system and trauma care within the state, and the need for an inclusive trauma system.
- Develop a public information and education (PI&E) program and use the broad-based coalition to implement the public education program.
 - Collect and review models for educating the public about a trauma system. Examples include the American Trauma Society and South Carolina.

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

Currently the state has no lead agency with the authority, staffing and other resources needed to establish a trauma system. This void is a key barrier to further progress in organizing and improving trauma care for the state's citizens. The most likely organization to be charged with the lead agency role is the DHSS with administration by the Office of Emergency Medical Services (OEMS) within the Health Infrastructure Preparedness and Emergency Response Division (HIPER).

The OEMS and other programs within the DHSS are currently fulfilling some of the roles of a trauma system lead agency. Among these roles include the following:

- The authority to regulate licensed ambulance services.
- The provision of advanced life support in the prehospital setting.
- The verification and designation of 10 level I or level II trauma centers through a Certificate of Need process.
- A Trauma Program Manager in OEMS.

The Trauma Center Council was reported to have the opportunity for input to the Commissioner of DHSS and OEMS, however, this group appears to be a forum for the level I trauma centers rather than being inclusive of the spectrum of trauma system stakeholders.

Moving ahead with the organization of a state trauma system will be a significant undertaking. It is unrealistic to expect DHSS to accept this role until several provisions can be assured. These include:

- Legal authority to plan, develop, implement, manage and evaluate the trauma system. This authority should include the ability to regulate and enforce trauma care standards.
- The personnel resources necessary to accomplish the mission of the lead agency in developing the trauma system, including a physician EMS medical director.

- The financial resources needed to develop and then maintain the trauma system.
- The organization of a STAC to serve as the forum for stakeholder input and coordination on trauma system development, operation and evaluation.

The lack of a lead agency has resulted in several challenges for state trauma system development.

- Elements of a trauma care system are fragmented and not well coordinated.
- The expectations of trauma system performance exist as “guidelines” rather than “standards” or “requirements” that can be enforced.
- The state has no ability to monitor the performance of the trauma system using established performance expectations.
- No forum exists for trauma system stakeholders to meet, coordinate and collaborate on issues of system design, implementation and improvement.
- Trauma care in New Jersey is currently based in trauma centers rather than in an inclusive trauma system that has a defined role for all acute care hospitals.

Adequate personnel and resources are needed to address each of the challenges listed above. See Focus Question 3 for recommendations.

The OEMS recently supported an EMS System Review, as requested by the state legislature. While this review addressed elements of the *EMS Agenda for the Future*, it did not specifically describe the interfaces between the trauma system and EMS. As DHSS considers how it can achieve the role of lead agency for the state trauma system, the Commissioner should consider how elements of EMS, injury epidemiology, public health preparedness, hospital licensing, and injury prevention can best be blended to fulfill the lead agency role.

RECOMMENDATIONS

- Initiate a trauma system strategic planning process in which the Commissioner of DHSS meets with trauma system stakeholders to define the charge that DHSS will accept as the lead agency for trauma system development.
- Establish the legislative authority for DHSS to be the state’s lead agency for trauma system development, including the necessary human and financial resources to fulfill this role.
- Review and identify strategies to ensure that the trauma system elements of EMS, injury epidemiology, injury prevention, public health preparedness, and hospital licensing are optimally coordinated within the DHSS organization to fulfill the trauma lead agency role.

- Identify opportunities for improving the organization of the trauma system as plans are made to improve the EMS system, in response to the recent EMS System Review.
- Assure the participation of the New Jersey Hospital Association in the design of an inclusive trauma system that defines the expected role of every acute care hospital in the care of trauma patients.
 - Identify incentives or reduce disincentives for the participation of all acute care hospitals in the trauma system.

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 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 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

It was reported that a trauma system assessment, supported by HRSA trauma grant funding was performed in 2001. However, because of a reduction in personnel within the OEMS and redistribution of workload among remaining personnel, it was not possible to develop a comprehensive trauma system plan. Additionally, it has not been possible to conduct an ongoing assessment of trauma resources and asset allocation within the state.

The lack of a comprehensive trauma system plan developed through a collaborative process involving a broad representation of pertinent community partners and stakeholders means that deficiencies in system integration and challenges in the provision of optimal services are not effectively addressed.

It was reported that DHSS has 13.6 FTEs with planning responsibility for disaster preparedness. Potentially DHSS could reassign a planner to assist with development of a trauma system plan and integration of the trauma system into disaster preparedness planning for the state.

RECOMMENDATIONS

- **Develop a trauma system plan that facilitates integration of system services (including disaster preparedness) and providers through a consensus, collaborative process involving community partners and stakeholders.**
- Identify a role for all hospitals and stakeholders within the inclusive trauma system, defined within the trauma system plan.

System Integration

Purpose and Rationale

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

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

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

OPTIMAL ELEMENTS

I. The state lead agency has a comprehensive written trauma system plan based on national guidelines. The plan integrates the trauma system with EMS, public health, emergency preparedness, and incident management. The written trauma

system plan is developed in collaboration with community partners and stakeholders. **(B-203)**

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

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

CURRENT STATUS

Currently, the “de facto” state trauma system does not reflect a public health approach, nor does it exhibit a significant and meaningful degree of integration. Where integration does exist, it is mainly vertical (*within* a particular phase of care or provider group/stakeholder group, i.e. trauma centers, prehospital providers, rehab facilities, etc.) rather than horizontal (*across* the many providers and phases of care). Even the vertical integration is suboptimal in many instances (most notably the existence of unregulated prehospital agencies). This creates a series of functionally disparate silos and a perceived environment of discord rather than collaboration. This lack of integration promotes dysfunction. The stakeholders identified no perceived incentives for further integration; however, no perceived disincentives were identified to discourage greater integration.

The current system leaders, including the TCC, are limited by their failure to recognize the breadth of providers and services involved in a true and comprehensive trauma system. While many of the components and stakeholders of the trauma system are recognized as influential and are represented on groups such as the EMS Advisory Council and the TCC, many others (e.g., rehabilitation, mental health, social services, medical examiners, injury prevention, consumers, elected officials, and others) are not integrated. This promotes an environment of disenfranchisement and isolation.

Of particular concern is the lack of integration between the trauma system and the following: the EMS system, the emergency management/disaster preparedness community, acute pediatric care, emergency medicine, and public health and public safety. The weakness of these essential linkages was apparent from the absence of credible representation during the consultation visit by Emergency Management, Emergency Medical Services for Children (EMSC), Public Safety, the state chapters of ACEP and the American Association of Pediatrics (AAP) officials. It is not known if this absence was related to failure to be invited or failure to attend.

It is not clear how the state trauma system integrates with other neighboring state trauma systems and vice versa. For example, to what degree are services in those states considered resources to the New Jersey system; to what degree are

these out-of-state resources utilized; are those systems commensurate with the standards of care and outcome rendered by the New Jersey trauma system? Similarly, it is not known to what degree the state trauma system services are utilized by surrounding states, and with what impact on state resources?

RECOMMENDATIONS

- Identify all partners, stakeholders, and services to be represented on advisory committees and consulted on policy decisions during the trauma system planning process.

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

No established mechanism for funding a trauma system exists in New Jersey. However, funding is provided for various system elements necessary to a trauma system.

- An EMT training fund, administered by the Commissioner of DHSS, is based on a \$.50 surcharge from motor vehicle fines, and generates about \$2 million annually. This fund defrays the cost of EMT training programs in New Jersey.
- A helicopter fund, based on a \$3.00 per vehicle registration fee, covers the cost of the New Jersey EMS Helicopter Response Program (JemSTAR). Money collected pays for the cost of the State Police to own and operate the helicopters, as well as the clinical staffing of these units.
- Funding from motor vehicle registrations is dedicated to traumatic brain injury (TBI) and spinal cord injury (SCI) basic research programs. It was reported that funding cannot be used for research about the effectiveness of care interventions.

Limited funding for injury prevention initiatives is provided by the trauma centers and through the Office of Highway Traffic Safety. The OISP received CDC funding for a Violent Death Surveillance System.

The cost and reimbursement aspects of trauma care in hospitals and trauma centers are not well known or described except within the institutional setting. No agreement exists among the nontrauma acute care hospitals or trauma centers about standard approaches to the accounting for the costs of trauma care. Accordingly, it is not known whether trauma care is a profit or loss service for the institutions. The state mandated Personal Injury Protection (PIP) on motor vehicle insurance was reported at a cap of \$250,000. Given the relatively high proportion of trauma cases from motor vehicle injuries, this funding source is a major contributor to trauma care financing. Agreement on the hospital accounting methods is important to develop financial reports that can illustrate the impact of uncompensated care and whether institutions have financial

incentives or disincentives for their participation in the trauma system. Such information is also essential for trauma center funding advocacy.

The state's model of hospital-based non-transporting ALS suffered a major financial setback with the introduction of the Medicare Fee Schedule several years ago. Previously, hospitals with ALS programs were able to recover costs under Medicare Part A. When the fee schedule took effect, it limited billing for prehospital care to the transporting ambulance agency, resulting in a reduced net income stream for combined BLS and ALS care. Revenue-sharing arrangements between the BLS ambulance services and ALS programs have resulted that are likely providing less than the actual cost of service delivery. While the state's ALS model holds some clinical and operational benefits, it is not the only approach to providing high quality and economically efficient EMS services. The OEMS should consider a limited demonstration program(s) that permits and evaluates both the quality of care provided and the cost of service delivery through other models.

The ACEP gave New Jersey an "F" for its medical liability environment in its statewide report card on the status of emergency care. This grade reflects rising liability insurance costs for emergency physicians and the lack of caps on damage awards. It is likely that similar liability insurance costs exist for trauma surgeons. The magnitude of awards from litigation in the state and their impact on disincentives for these categories of physicians to practice in the state are unknown.

The 2007 EMS System Review indicated that the helicopter fund and operations revenue results in more than \$10 million annually. The charge rates for JemSTAR are currently linked to the charges for ground-based ALS and are modest compared to the rates reportedly charged by other private helicopters licensed in the state. The current JemSTAR charges are also below the Medicare allowable rates for air medical services. The 2007 EMS System Review included a recommendation about restructuring the JemSTAR charge rates to bring in additional revenue. Restructuring the charge rates would provide the opportunity to redirect at least \$2 million from the \$3.00 motor vehicle registration set aside and to apply those funds to trauma system development.

Without a solid revenue stream for support of the trauma system infrastructure, it is unreasonable to expect DHSS to absorb the costs of planning, management of a statewide trauma registry, verification of trauma center capabilities, medical oversight, trauma system evaluation, and similar costs. This concern regarding system funding is particularly critical in light of the continuing erosion in support for the OEMS over the past several years. If having a statewide trauma system is a priority, the system stakeholders will need to advocate for adequate financial support. The details of how much funding this will require and how it will be allocated should be determined in the trauma system planning process. The revenue source should be sustained over time and periodically reviewed to

assure that the level of funding is appropriate for the actual costs of system support.

RECOMMENDATIONS

- **Enact legislation to provide adequate and dedicated (protected) support for the costs of the trauma system infrastructure.**
- Collect and analyze financial data from acute care hospitals and trauma centers regarding trauma care-related revenues and expenses to identify incentives and disincentives for the provision of trauma care.
 - Encourage the New Jersey Hospital Association to coordinate with the financial officers of both the nontrauma acute care hospitals and the trauma centers to develop standardized accounting methods to report revenues and expenses related to provision of trauma care.
- Investigate opportunities to align reimbursement for trauma care from payers with the predetermined scope of care for each facility in the system as part of the trauma system planning initiative. This could take the form of preferential reimbursement for trauma care provided in trauma centers versus non-designated hospitals or similar changes.
- Carefully evaluate alternatives to the current model of non-transporting, hospital-based ALS units.
- Enact legislation to reduce the exposure of physicians and others providing EMS and trauma care through the reform of tort laws.

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

Injury prevention and outreach activities occur widely across the state. The trauma centers have many programs for injury prevention outreach. Level I trauma centers have a full time injury prevention coordinator, and level II trauma centers also have injury prevention coordinators, but generally at a lower FTE. Injury prevention coordinators working at trauma centers reported being actively engaged with Safe Kids coalitions and other local community groups to promote injury awareness and education interventions.

Trauma center injury prevention coordinators reported that they used their trauma center registry data to identify the focus for their injury prevention programs. The majority of injury prevention efforts involve education, but in some cases interventions utilizing enforcement, engineering, and environmental change strategies are used. Examples provided during discussions included the

primary seatbelt law, graduated licensing, repairing sidewalks, and establishing bicycle lanes.

Three model injury prevention programs were described:

- A pedestrian injury focus coordinated through the Office of Highway Traffic Safety that included the “Wheels Under Feet and Helmet on the Head” intervention strategy
- A fall prevention program developed through the Office of Policy and Planning of DHSS that includes many fall interventions with evidence of efficacy for different age groups
- A community-based sidewalk repair program that used GIS mapping to identify sidewalk locations associated fall injuries.

The state recently formed an injury advisory committee to develop the *Injury Prevention in New Jersey* guidelines, further described in the Injury Epidemiology section. Guidelines and recommendations for injury prevention initiatives are provided for the following injury mechanisms: motor vehicle crashes, unintentional poisoning, falls, fire and burns, sports, recreation and exercise, occupational-related injury, unintentional childhood injuries, and violence. While a representative of the level I trauma centers participated on the advisory committee, the majority of other trauma centers and meeting participants had no knowledge of this effort. It was reported that the document had been reviewed, but many significant injury prevention advocates had no opportunity for public comment. The document is in final form and under review in the Office of Communications. It is anticipated that the final document will soon be published and disseminated on the website and listserv.

No office in the DHSS has responsibility for injury prevention outreach coordination. As a result, injury prevention program efforts are fragmented within DHSS and other state agencies (Human Services and the Division of Highway Traffic Safety). Currently injury prevention advocates and coordinators across the state have no formal means to communicate and to share ideas, strategies for funding, and resources. As a result, injury prevention coordinators associated with the trauma centers have very limited knowledge of model injury prevention program resources. They additionally have no means to collaborate and address some of the most significant injury mechanisms identified in the *Injury Prevention in New Jersey* guidelines. The Division of Highway Traffic Safety representative indicated that she has the ability to expand her current coalition and to help coordinate this function. Funding and grants are reported to be limited for prevention interventions. The medical examiner reported that potential injury prevention funding could be available through the Department of Justice.

Evaluation of injury prevention programs is not routinely performed. No information was provided regarding the use or availability of academic resources for designing program evaluation and analyzing evaluation data. The availability

of injury data was cited as an impediment in selecting and evaluating injury prevention programs.

RECOMMENDATIONS

- **Integrate injury prevention into the trauma system and ensure the participation of injury prevention stakeholders on the state trauma advisory committee.**
 - Form an injury prevention subcommittee of the state trauma advisory committee (STAC) to serve as a mechanism for coordinated injury prevention outreach in the state.
- Identify an injury prevention organization, academic center, or state agency to serve as a repository and a clearinghouse for injury prevention strategies, programs, and resources to address the injury mechanisms targeted in the *Injury Prevention in New Jersey* guidelines.
- Expand the current electronic listserv operated by the Office of Injury Surveillance and Prevention (OISP) or develop a new listserv to promote communication among all injury prevention coordinators and advocates in the state.

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

With no organized or structured state trauma system, or the context in which such a system would be developed, is found in the existing state EMS system. The EMS system is comprised of varied local elements established and maintained by “Home Rule”. The EMS system in this regard has developed and evolved based upon the strengths, predilections, and preferences of local convention for the provision of Basic, Advanced, Air Medical, and Subspecialty out-of-hospital care.

Ongoing and consistent physician medical oversight for EMS at the state level is essentially non-existent, except for a consultant whose function was reported to be “representing the state at national conferences”. Medical decisions and input occur through the EMS Advisory Council that is a voluntary group with no authority. DHSS has defined in regulation the requirements for the education, licensure, and treatment protocols for EMS providers as well as acceptable practice for medical oversight, ambulance equipment, and staffing. Unfortunately, DHSS is both under-staffed and under-funded, severely limiting its ability to effectively and efficiently monitor and oversee EMS system. While data reporting requirements are in place, the reporting compliance is poor, and DHSS is unable to effectively analyze and process the data that are obtained. Currently DHSS is overwhelmed with administrative functions leaving it unable to perform vital system development and oversight functions. DHSS could consider delegating certain administrative functions to existing entities whose primary focus is to accredit EMS training programs (for example Committee on Accreditation of Education Programs for EMS Professionals [CoAEMSP]), to attest to the initial and ongoing competency of EMS professionals (for example National Registry of EMTs [NREMT], and National Academies of Emergency Dispatch [NAED]), and

to accredit the operations of EMS ground and air medical agencies (for example Commission on Accreditation of Ambulance Services [CAAS], and Commission on Accreditation of Medical Transport Services [CAMTS]).

Emergency medical services (EMS) are provided in the state via basic life support (BLS), advanced life support (ALS), specialty care transport units (SCTU) and air medical services. The OEMS reported that 21,726 EMT-Bs and 1,628 paramedics practice within the state. The EMS system operates as a two tiered response configuration composed of local BLS and hospital-based ALS providers. The dispatch of these assets occurs using protocols developed statewide that determine the response assignment (BLS only or simultaneous BLS/ALS). ALS dispatch is reserved for those complaints most consistent with the need for advanced care. ALS units typically do not transport, and use the BLS service ambulance to transport patients to destination hospitals. This results in the utilization of two vehicles and four EMS providers whenever an ALS patient requires transport. This model imposes significant financial and workforce constraints on the EMS system.

BLS agencies receive more than 800,000 calls per year. OEMS reported that approximately 292 OEMS-licensed, paid BLS agencies operate with a crew of two EMT-B's. A significant portion of the BLS system is volunteer-based, with 378 agencies having membership with the New Jersey State First Aid Council (NJSFAC). NJSFAC-affiliated BLS agencies staff ambulances with at least one EMT-B. Of concern was the OEMS report that an undetermined number of BLS agencies (estimated 150 agencies) are unaffiliated with either OEMS or NJSFAC, and they independently operate with personnel who have variable levels of medical training. Non-licensed BLS agencies are not required to have medical oversight (unless utilizing the epinephrine auto injector), and patient demographics or care reports are not uniformly documented, tracked, or evaluated for quality assurance. Anecdotal reports indicate that BLS agencies disregard or cancel ALS resources, perform treat and release functions, and determine destination hospitals based upon individual provider preference, instead of using state recommended triage and treatment protocols. Ineffective data collection from these entities and the inability of OEMS to analyze patient care reports that are obtained severely limits the ability to perform quality assurance.

The Advanced Life Support (ALS) system is comprised of 21 agencies whose geographical distribution was determined via the Certificate of Need process. ALS responds to over 400,000 calls annually, of which approximately 7% are trauma-related. ALS assets are hospital-based and are staffed with 2 ALS crew (medic-nurse, medic-medic). Base-hospital physicians provide medical oversight. All of the state's 566 municipalities are assigned an ALS agency. Anecdotal reports indicate that ALS agencies experience delays in patient transport awaiting the arrival of BLS assets to provide transport capability.

There are five NJ based air medical services licensed within the state. The state-supported JemSTAR system (operated by the New Jersey State Police) has two helicopters; one for the northern and one for the southern part of the state (NorthSTAR and SouthSTAR). Three private air medical vendors (MEDEVAC 5, MONOC Air One, and Atlantic Air One) provide added helicopter coverage in the south, central, and north regions of the state, respectively. These air assets provide scene response and interfacility transport capabilities.

At the discretion of the transferring physician, interfacility transports may be performed by either BLS agencies or SCTU. A total of 32 SCTU agencies are licensed by OEMS, and staffing consists of three to four personnel to include EMT-B, paramedics, registered nurses, and respiratory therapists.

The state is to be commended for accomplishing 100% 9-1-1 service and for aggressively moving to have enhanced 9-1-1 statewide. As the patient's entry point to the EMS system, emergency medical dispatchers (EMD) provide pre-arrival instructions. These EMDs require dedicated and knowledgeable medical oversight and accountability. Every public safety answering point (PSAP) has funding to train EMDs. Statewide EMD guidelines are approved by the Medical Communications committee of the EMS Advisory Council, and then reviewed within DHSS. Performance improvement for EMDs should be on par with that conducted for BLS and ALS services.

The absence of a comprehensive EMS patient record database contributes to an inability to obtain reliable and robust data from which system changes and improvements can be based. Many data regarding BLS call volume, response times, and treatments rendered are either not reported or are independently held by the NJSFAC. The state is thus unable to assess EMS care or to conduct performance improvement as it relates to the timeliness and quality of trauma care.

An aging EMS workforce, low pay, lack of pension and benefits packages, and substantial declines in volunteerism are expected to adversely affect the availability of EMS personnel in the future. Stakeholders reported their beliefs that EMS recruitment and retention would be improved if EMS could be "professionalized," along with attempts to bring salary and benefits in line with public safety entities (fire service, police).

RECOMMENDATIONS

- **Ensure that the state EMS medical director, once hired, has responsibilities that include encouraging participation and conducting performance improvement, as well as providing adequate support to the local service EMS medical directors in their provision of medical oversight.**

- **Create a state mandate to assure consistent staffing and timely provision of EMS service.**
 - Recognize that the provision of emergency medical care is vital to the public's health and welfare, and mandate that EMS be provided on par with the provision of police and fire services.
 - Require accountability, reporting, and standardization to all EMS agencies and personnel, including volunteer EMS services and personnel.
- Develop a career ladder to professionalize the practice of EMS and work to bring salary and benefits into parity with other public safety services to improve EMS workforce retention and satisfaction.
- Institute a valid, standardized pathway for licensure, accountability, and reporting for all EMS services (BLS and ALS ground services [including volunteer BLS services], air medical services, specialty care transport services).
- Institute a valid, standardized pathway for certification or accreditation of EMS provider educational programs, to include EMT-B and EMT-P programs.
- Institute a valid, standardized pathway for the initial and continuing licensure (certification) of all BLS and ALS providers,
- Allow ALS to routinely transport patients of specific defined acuity.
- Realign the medical oversight responsibility for emergency medical dispatch (EMD) to the state EMS medical director.
- Ensure that emergency medical dispatchers have nationally accredited training and certification.

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

Currently, the DHSS has the authority to designate, as well as de-designate trauma centers. Trauma centers are designated at Level I or Level II, consistent with the classifications outlined by the ACS Committee on Trauma's *Resources for the Optimal Care of the Injured Patient*. After a certificate of need process, the DHSS confers designation only after the applicant hospital has achieved verification by an ACS verification committee team. The verification period is four years. Redesignation requires successful reverification by the ACS. At least one trauma center has been denied redesignation upon failure to attain ACS verification.

DHSS relies totally upon the ACS for the assurance of compliance with requirements for trauma center optimal performance (such as appropriate performance improvement activities, competency and education of providers such as nurses, surgeons and emergency physicians, injury prevention, outreach, and research). Evidenced-based best care practices and standards for education and provider competency do not exist across the trauma system, with the exception, perhaps, being at the trauma centers.

Compliance with ACS requirements is not monitored by DHSS during the intervals between ACS verification visits. When an independent interval assessment does occur, the focus is primarily on structure, rather than process/function or outcome. The DHSS does not request, nor do trauma centers voluntarily submit, any reports containing performance information based on indicators and benchmarks or compliance data. The DHSS does investigate

complaints about trauma centers and their providers, as well as prehospital agencies and personnel.

No formal or consistent evaluation of trauma care practices and performance provided by nontrauma acute care hospitals is conducted by DHSS. Closer monitoring by DHSS of compliance with requirements for verification of trauma centers, as well as any requirements set forth for other acute care hospitals participating in the trauma system, is advisable.

The trauma centers reported that at least one attending trauma surgeon is on site at all times, and some receive stipends, however, this is not monitored by DHSS. The availability of specialty surgeons within trauma centers was not specifically investigated, but it did not appear to be an issue as assurance of this subspecialty availability was assessed during ACS verification. Some concern was expressed by the Level I trauma center directors about consistent availability of trauma surgeons and specialty surgeons in nontrauma acute care hospitals.

While there are 10 trauma centers in the state, neighboring states (Pennsylvania, New York, and Delaware) also receive and treat patients injured in New Jersey. A Level I trauma center is located in each of three EMS regions, and the seven Level II centers are well distributed as well. One American Burn Association (ABA) verified burn center is active in many trauma system activities.

The state reported six Children's Hospitals within the 10 trauma centers, however these were not identified as pediatric trauma centers. It is assumed that by virtue of ACS verification, adult trauma centers have a pediatric commitment. It is important to note that the ACS has revised its verification criteria, and the verification option of "adult trauma center with pediatric commitment" has been eliminated. Pediatric trauma centers are now separately verified by the ACS. Therefore, the trauma centers and the DHSS need to determine a method for assuring pediatric trauma care capabilities and pediatric commitment within the trauma centers.

The geographic distribution of trauma centers appears to be appropriate and the reported volumes are adequate, supporting the contention that no reconfiguration or change in number of trauma centers is needed. Definitive care at a trauma center was reported to be theoretically available within 25 minutes by ground transport for the entire state population. From an operational standpoint, however, prehospital triage and transportation issues may delay transport. Unfortunately, the efficacy and efficiency of the current trauma center network cannot be accurately evaluated without performance and outcome data, which is not readily available.

The state has three regions, geographically configured into north, central, and south. However, it is not clear how these regions relate to actual patient flow and transfer patterns, federal funding regions, emergency preparedness regions, etc.

No regional governance exists and no administrative regional oversight is provided by DHSS. The feasibility of maintaining this regional structure should be more formally evaluated.

The current trauma system is an exclusive system that does not include all acute care hospitals at some level of participation with defined roles and responsibilities for trauma care. The Level I trauma centers seem well integrated among themselves, as witnessed by the strong and functional TCC. However, these trauma centers are not well integrated with the rest of the system, or even other key stakeholders within the other trauma centers. Representatives from emergency medicine, rehabilitation, the medical examiner's office, and nontrauma acute care hospitals do not participate in TCC proceedings. Inclusion of these groups, among others, would facilitate communication on mutual concerns and foster true and comprehensive integration.

Some ambivalence or resistance was expressed by the New Jersey Hospital Association and nontrauma acute care hospitals regarding the formal inclusion of all acute care hospitals in the trauma system. Such inclusion of all acute care hospitals at some level of participation will entail setting expectations and standards appropriate for the hospital's capability and resources, and then holding the hospitals accountable. Some concerns revolve around patient volumes, reimbursement, and unfunded mandates, as well as reporting and regulation. Participants suggested that legislation and/or measures tying trauma system participation to hospital licensure requirements would need to be imposed to formally integrate nontrauma acute care hospitals into the trauma system.

RECOMMENDATIONS

- **Clearly define roles, responsibilities and accountabilities for all acute care hospitals in the system relating to trauma care.**
 - Consider developing nomenclature for the current nontrauma acute care hospitals (e.g. level III, IV; affiliate trauma hospitals; trauma receiving hospitals, etc.)
- Enact enabling legislation with specific emphasis on inclusive acute care hospital participation. (This might include provision of incentives as well as licensing mandates, sanctions, or other disincentives for non-participation).
- Ensure that membership on all pertinent trauma committees and initiatives includes multidisciplinary representation, including nontrauma acute care hospitals.
- Set standards for optimal care of pediatric trauma care at all trauma centers and acute care hospitals, prehospital triage/destination criteria, and pediatric specific performance improvement.

- Ensure that acute care hospital personnel are adequately trained and prepared to identify, stabilize and arrange for the appropriate transfer of patients beyond the predefined scope of their capabilities.

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

At the present time, the state has no mechanism to determine if the right patient is transported to the right facility at the right time. This applies to trauma patients triaged from the field, as well as secondary triage from nontrauma acute care hospitals to trauma centers.

Prehospital trauma triage guidelines were developed by the TCC, but these are guidelines rather than policy. It was reported that these guidelines are seldom adhered to. Participants reported that pressure is placed on the EMS transporting agencies aligned with nontrauma acute care hospitals to transport trauma patients directly to their facility. No systemwide trauma data or performance improvement initiatives have been used to examine these issues.

A project is examining the field triage destinations of trauma patients with a serious TBI. Preliminary results show that a significant number of patients with TBI are transported to nontrauma acute care hospitals. Additional data collection and data analysis will eventually result in recommendations and development of a corrective action plan. One trauma surgeon reported the results of his analysis of under-triage patterns within the state. Findings revealed that approximately 40% of trauma patients were transported to nontrauma acute care hospitals.

Acute care hospitals are required by regulation to have interfacility transfer agreements with trauma centers, but it was reported that these may not exist. Anecdotal reports from the participants identified cases in which the nontrauma acute care hospitals do not abide by the national standard of care to transfer trauma patients to trauma hospitals. The state has no ability to enforce the interfacility transfer agreement requirement.

Interfacility transfer agreements were reported to exist at Level II and Level I trauma centers because this is required for verification by the ACS. However, interfacility transfer from the Level II trauma centers to the Level I centers is reported to be a rare occurrence. Interfacility transfers of pediatric trauma patients do occur. No restrictions on transporting patients out of state to trauma centers in Pennsylvania and New York were reported.

No uniform process, guidelines, protocols or policies are in place to ensure the timely stabilization and transfer of trauma patients from nontrauma acute care hospitals to trauma centers. In the 1990s, the ACS's Optimal Resources document was the foundation for establishing a common interfacility transfer guideline, developed by the trauma center leadership. The state EMS Advisory

Council reviewed and approved this guideline, but no record of their endorsement or approval can be found in the minutes.

Trauma centers reported that they have transfer processes in place to receive interfacility transfers, but these processes vary between the trauma centers. One center has a trauma transfer hot-line. Physician-to-physician communication is required when trauma transfers are requested. No statewide central communication system exists to facilitate inter-facility transfers.

Numerous interfacility transfer issues were reported. Trauma centers reported some abuse of the transfer process, particularly due to the unavailability of specialty services at certain times or days of the week. Some nontrauma acute care hospitals do not complete an appropriate trauma work-up prior to the request for transfer. Once a trauma patient becomes an inpatient at the sending facility it is more difficult to arrange an interfacility transfer. Repeated educational efforts by the trauma centers have not improved adherence to the transfer process by the sending hospital. Participants provided anecdotal reports of cases when nontrauma acute care hospitals admitted trauma patients resulting in patient safety issues, delays in diagnoses, missed injuries and inappropriate management. Acute care hospitals often claim they must make numerous phone calls to get the patient transferred. Additionally trauma center directors have the perception that trauma patients with insurance are not transferred, but those without a payer source and undocumented residents are transferred.

Little attention is paid to the concept of repatriation (back triage) from a higher level of care to one of lesser intensity when appropriate. Repatriation is an issue, and it is itemized as a clause in transfer agreements. Some stakeholders surmised that this may be one reason why nontrauma acute care hospitals will not sign transfer agreements.

The mode of transport varies for interfacility transports. Most trauma centers rely on the acute care hospitals to make transport arrangements, and the mode of transport is determined by the sending facility. Some receiving trauma centers send their own ambulance and crew. A number of commercial agencies provide interfacility critical care transport. Many of these agencies were hospital-based initially and now are independent agencies. Most hospitals have a contract or arrangement with one of the interfacility transport agencies. If the patient is to be transported by air, the transferring agency contacts the helicopter dispatch center. Participants reported their perception that helicopters are overused or abused for interfacility transports. Some interfacility transports occur by BLS agencies.

Interfacility transport vehicles are licensed as specialty care transport units (SCTU) by OEMS. SCTUs are private agencies and hospital-based. Maintaining the credentials of the crew is a condition of licensure. A competency plan must be in place and the medical director signs off on competencies. Registered

nurses who staff the SCTUs have at least one year of critical care experience in addition to training in Advanced Cardiac Life Support (ACLS), Pediatric Advanced Life Support (PALS), and other clinical training. Many have EMT training to meet the requirement of two EMTs per vehicle. The state has 32 licensed critical care interfacility transfer vehicles and 42 licensed helicopters.

RECOMMENDATIONS

- **Implement a prescriptive and enforceable prehospital trauma triage standard to ensure that the right patient gets to the right hospital in the right amount of time.**
 - Develop, monitor and enforce triage/ destination criteria which prohibit EMS transport of acute patients to a satellite emergency department.
- Establish patient-oriented professional relationships between the trauma centers, nontrauma acute care hospitals, prehospital personnel, and interfacility transport agency providers to collaborate on system performance issues such as trauma triage, transfers, follow-up reporting, and educational opportunities.
- Monitor and enforce the requirement for acute care hospitals to have interfacility transfer agreements with the trauma centers.
- Create and seek STAC endorsement of interfacility transfer criteria or protocols for trauma patient stabilization by a nontrauma acute care hospital to be followed by transfer to a trauma center.
- Conduct a pilot study of over and under triage—both field and inter-facility, including an accurate determination of the rate and nature of noncompliance.
- Develop performance improvement indicators that measure over and under-triage of trauma patients from the field to the trauma center (based on a pilot study identified in prior recommendation).
- Develop performance indicators that measure interfacility stabilization and transport times, and review the indicator findings at a multidisciplinary systemwide performance improvement committee.

Rehabilitation

Purpose and Rationale

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

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

OPTIMAL ELEMENTS

- I. The lead agency ensures that adequate rehabilitation facilities have been integrated into the trauma system and that these resources are made available to all populations requiring them. **(B-308)**
 - a. The lead agency has incorporated, within the trauma system plan and the trauma center standards, requirements for rehabilitation services, including interfacility transfer of trauma patients to rehabilitation centers. **(I-308.1)**
 - b. Rehabilitation centers and outpatient rehabilitation services provide data on trauma patients to the central trauma system registry that include final

- disposition, functional outcome, and rehabilitation costs and also participate in performance improvement processes. **(I-308.2)**
- II. A resource assessment for the trauma system has been completed and is regularly updated. **(B-103)**
- a. The trauma system has completed a comprehensive system status inventory that identifies the availability and distribution of current capabilities and resources. **(I-103.1)**

CURRENT STATUS

The state reported adequate physical availability of rehabilitation facilities with bed capacity and services appropriate for trauma patients, however the functional availability and access to these services is unclear. Trauma center directors reported differing perspectives on the magnitude and reasons for access problems. Unfortunately, no objective data exist to document an access problem, quantify its magnitude, and discern causes.

One perceived access issue relates to the 90-day waiting period for Medicaid funding, however most rehabilitation facilities reported that Medicaid-eligible patients were accepted. Rehabilitation providers also expressed concerns regarding lack of discharge planning and care plans that commit the transferring hospital to accept the patient back after the rehabilitation plan has been completed, if the patient cannot be discharged home. Information regarding access to rehabilitation by trauma patients in Level II trauma centers and nontrauma acute care hospitals was not available. Access to rehabilitation for children was reported to not be an issue.

The rehabilitation phase of care is not integrated into the trauma system. No rehabilitation representative serves on either the TCC or EMS Advisory Council. No systemwide, consistent, standards or practices for rehabilitations exist relating to indications for early physical medicine and rehabilitation consultation, transfer agreements, or criteria to identify patients in need of particular rehabilitation resources (e.g., ventilator-dependence/weaning, severe versus moderate TBI, SCI, and pediatrics).

A systemwide resource assessment and inventory of rehabilitation resources (including out-of-state resources) has not been conducted. Two lists of rehabilitation hospitals and programs were provided to the consultation team, Comprehensive Rehabilitation Hospitals-2007 and Organizations with Commission on Accreditation of Rehabilitation Facilities (CARF) Accredited Programs. It is not clear which of the rehabilitation facilities on these lists receive and treat trauma patients, and not all Comprehensive Rehabilitation Hospitals appear to have CARF accreditation. Additionally, neither list appeared to include out-of-state facilities.

The CARF accredited facilities reportedly collect and submit functional outcome and other data contained in the UB-92 hospital discharge dataset. These data have not been utilized for any trauma system evaluation purposes. Functional outcome data have not been submitted to the trauma center's registry.

RECOMMENDATIONS

- **Add pertinent rehabilitation data elements to the trauma system registry dataset which will allow pertinent questions regarding long-term functional, financial and other outcomes to be answered.**
- Perform a resource/needs assessment of rehabilitation services for trauma patients, including out-of-state and Veterans' Administration resources.
- Categorize all rehabilitation facilities according to capabilities for treating patients with various conditions and acuity (e.g., ventilator-dependence/weaning, severe vs moderate TBI, SCI, and pediatrics).
- Develop, implement and monitor compliance with transfer agreements, policies, and criteria for transfer to rehabilitation from acute care which assure the patient needs are matched with the rehabilitation facility capabilities, regardless of ability to pay for services.
- Analyze trauma patient flow and discharge patterns to rehabilitation facilities, and to skilled nursing facilities and nursing homes, using trauma center registries.
- Identify financial or other incentives to ensure that all patients requiring in-patient rehabilitation have timely access to appropriate services.
- Assure representation of rehabilitation providers on all trauma system related advisory councils and policy setting groups.
- Include the rehabilitation phase of care in the systemwide performance improvement process by identifying and monitoring salient performance indicators and benchmarks.
- Assess the adequacy, efficiency, and processes of transfer to rehabilitation (both trauma center and nontrauma acute care hospital), particularly as they relate to finances, through the development of specific performance indicators.

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

With no state trauma system, evaluation of disaster preparedness is based upon individual and disparate state and local efforts subsidized by federally funded programs.

Various elements of the emergency management, EMS, and acute care facilities have attained nascent response capability and capacity based upon federal and

state initiatives, including CDC, HRSA, Urban Area Security Initiative (UASI), Veterans Administration, Urban Search and Rescue (USAR), Disaster Medical Assistance Teams (DMAT), and State Medical Reserve Corps. Unfortunately, the consultant team had no access to the state disaster plan, evidence of response planning (meeting minutes) or training (e.g., after action reports from drills, exercises, and tabletops). Therefore, an assessment of the disaster response readiness of state and local agencies was not possible.

Participants provided anecdotal reports describing some regional preparedness efforts. For example, nine medical coordination centers (MCC) have been established across the state to coordinate disaster resources and response on a regional basis. An 800 MHz radio system backs up hardwire telephones to facilitate communications between response agencies. Each acute care facility has a Hospital Emergency Radio Network (HERN) radio to facilitate intra-facility communications.

The state burn center (St. Barnabas Medical Center) in coordination with the Northeast Burn Regional Consortium (including 2000 burn beds in states from Maryland to Maine) polls the membership to determine the numbers of burn beds and personnel on a monthly basis. The EMS system has a similar process to determine ambulance availability and memoranda of agreement with EMS resources in adjacent states. Acute care hospitals and trauma centers should similarly report and monitor resources available to define surge capability. While it was reported that a web-based hospital bed monitoring mechanism exists, the consultant team did not learn how it is used.

RECOMMENDATIONS

- Create and strengthen the linkages and improve alignment between the evolving trauma system and disaster preparedness efforts, ensuring the inclusion of trauma centers, EMS, public health, acute care hospitals, and emergency management officials at local, regional and state levels.
- Provide consistent and comprehensive disaster training across the major disciplines (trauma, EMS, public health, hospital, etc).
 - Utilize the 15 national scenarios as the backdrop for regional exercises, drills, and tabletops to develop effective response capabilities and capacity.
- Ensure that trauma centers are linked with regional and local preparedness efforts that include the use of state and federal assets. (For example, USAR, DMAT, National Disaster Medical System, and Veterans' Affairs)
- Ensure that initial and recurrent Incident Command training is undertaken for trauma centers, acute care hospitals, and EMS.

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 current status of system evaluation processes and systemwide quality assurance / performance improvement (PI) as it pertains to trauma across the continuum of care appears to be non-existent. Historically, the lead agency has hosted three EMS system reviews or evaluations. The impact on the trauma system following these system evaluations is not evident. There is not a functional trauma management information system, and there are no efforts to link alternate data sources. Compounding this fact, the data that are available have not been used to perform any level of PI across the continuum of trauma care.

No trauma system multidisciplinary PI program or committee exists, and there have been either no efforts or ineffective efforts by the lead agency to establish such a committee. As a result no multidisciplinary, multi-agency trauma system PI is being conducted. The TCC, composed of personnel from the trauma center medical directors, trauma coordinators / program managers, and trauma registrars, have occasionally reviewed interesting cases as educational presentations. The TCC has limited membership and does not include representation from nontrauma acute care hospitals, rehabilitation facilities, prehospital agencies, or the medical examiners (ME). It was reported that the

lack of peer review protection in statute is a deterrent to a systemwide PI program.

No detailed historical information was provided regarding efforts to enact a law to protect peer review. However, the state does collect public health data, so it is possible that a statute exists to protect those data. No information was presented to indicate past collaborative efforts between the lead agency, trauma leadership and legal counsel to investigate this issue. Examples include the completion of a thorough investigation of state or local ordinances to protect the PI activity within accredited acute care facilities and an investigation into privacy protection for mandatory public health information.

The individual trauma centers have trauma PI programs as required for successful trauma center verification from the ACS. While some attempts to integrate prehospital components within their processes were described, many of these efforts have proven to be futile. Cases are referred to prehospital agencies, but minimal or no feedback for loop closure is received. It has been a challenge to implement and maintain meaningful PI with the volunteer squads. Some prehospital agencies are reluctant or refuse to participate with the trauma centers, citing Health Information Portability and Accountability Act (HIPAA) and patient privacy concerns.

The burn center is involved in system PI specific to burn patients. Follow-up reports are provided to the prehospital agencies. Positive feedback is provided, as well as identified opportunities for improvement. Corrective action is usually education, and this is welcomed by the EMS agencies.

Occasionally, the OEMS receives reports of concerns regarding trauma patient care. If a complaint is made about the hospital or a prehospital agency, a formal investigation is conducted, and the hospital or EMS agency must respond. If a trauma center files a complaint about a licensed EMS performance issue, the OEMS can move forward with an investigation. The investigation may be hampered due to the challenge of obtaining loop closure documentation / information from the EMS agency.

Historically, some of the trauma centers have experienced problems with obtaining medical examiner autopsy information and their participation in the PI processes. The Medical Examiner data cannot be released to the requesting trauma center until the prosecutorial aspects are resolved. While this is not unusual, it does present a barrier to obtaining timely autopsy information for some trauma patients. However, these cases represent a small percentage of the total trauma cases.

The state medical examiners unit within the Division of Criminal Justice is understaffed and under-funded. The unit staffing was at 8 positions and has been decreased to 5, and the MEs now cover more counties. A new state medical

examiner administration has been in place since mid-March 2008. The MEs were well represented during the trauma system evaluation meetings, and they identified numerous opportunities for improvement in trauma systems. They offered their willingness to participate in systemwide initiatives such as systemwide trauma information linkages, injury prevention, educational efforts, and participation in multidisciplinary trauma case reviews.

Little or no systemwide evaluation or PI has been performed. Prior to 2000, the system trauma registry was housed in the office of a trauma surgeon as there was concern about the data being discoverable. During this time, system reports were occasionally created and reviewed. The TCC did review UB-92 data to determine if a decrease in the number of motor vehicle crashes had occurred over time, but no information showing conclusions, recommendations or corrective actions was provided to the consultant team.

Because the state trauma registry is not operational, it is difficult to perform system PI. In the absence of a fully functional state trauma registry, other data sources exist. DHSS collects hospital discharge and ED data from all acute care facilities that include UB 92 diagnosis and procedure codes. One rehabilitation facility has been reporting outcomes data routinely, but some of the trauma center personnel were not aware of this. Barriers to using other datasets for PI include needing approval from many governmental entities. Volunteer BLS agencies affiliated with NJSFAC (this comprises approximately 35% of BLS agencies) are, voluntarily, reporting NEMSIS compliant (silver level) data to the OEMS. Silver compliance includes only national data elements and may not capture all of the items necessary for the OEMS to aggregate for the purposes of system performance improvement and reporting.

The trauma centers submit data to the National Trauma Data Bank (NTDB). Trauma center reports with comparison state trauma center data have been received but not reported to a system multidisciplinary group. No consensus was evident about the usefulness of these reports. It was reported that some trauma centers had significant difficulty submitting data to the state trauma registry and to NTDB due to registry software issues.

RECOMMENDATIONS

- **Seek legal counsel to ascertain if protection exists for public health data registries and the peer review process. If not seek immediate enactment of appropriate legal protection for participation in the peer review process.**
- Establish a multidisciplinary trauma system performance improvement and patient safety subcommittee of the State Trauma Advisory Council (STAC) that meets regularly to review data, cases, systemwide indicators, evaluate outcomes, and develop recommendations and corrective actions plans.

- Support the trauma system registry with staffing for coordination of the state system performance improvement process.
- Continuously improve the reliability of the State Trauma Registry to support trauma system performance improvement processes and programs.
- Encourage the participation of the state medical examiner's unit in the trauma system performance improvement process. This could include standard autopsy reporting procedures, participation in case reviews at the local and system level, and participation in corrective actions.
- Develop and implement a systemwide trauma performance improvement seminar to educate all trauma care providers across the continuum of care on the processes of performance improvement and the roles and responsibilities for each entity.
- Establish commonly defined indicators for acute care hospitals, trauma centers, and the trauma system for performance improvement across the continuum of trauma care.

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

New Jersey has a number of existing and emerging data sets that can be used for trauma system planning and evaluation. Among the existing data sets are UB-92 hospital and rehabilitation hospital discharges, emergency department visit data, fatal and non-fatal crash data, violent injury death surveillance, central nervous system injury surveillance, vital records, and individual trauma center registry data. Important among the emerging data sets are statewide EMS and trauma register data.

Historically, the 10 trauma centers submitted trauma registry data to DHSS. Prior to 2001, aggregation and reporting of the data were possible at the state level. However, the previous software vendor could not successfully convert the DOS-based program to a Windows platform and was, therefore, plagued with a number of year 2000 (Y2K) issues. The former software was abandoned and replaced with a product from another vendor. The DHSS purchased the new software and distributed it to all verified trauma centers. Individual trauma centers are responsible for ongoing maintenance fees. Of the ten trauma centers, 8 currently use the new software (Collector) and 2 continue to use the older software to meet their individual institutional needs. Unfortunately, due to persistent software failure, the DHSS has been unable to collect, aggregate and report individual trauma center data to describe systemwide performance. Systemwide performance improvement has stalled due to the lack of these data. The software vendor (Digital Innovations) suggests that the software failure issues will be resolved in the next version, scheduled for fall, 2008 release.

Since the maintenance fees for Collector are the responsibility of each trauma center, the leverage that any one user has on the software vendor is limited.

Trauma registrars, through the aegis of the TCC have recently agreed upon standardized definitions for their trauma registries. They have also identified a subset of 42 data elements that they would like all acute care hospitals to contribute to the state trauma registry. The trauma centers have, and continue to, contribute their data to the NTDB maintained by the ACS.

The DHSS has provided electronic patient care record software (emsCharts) to the advanced life units across the state, as well as to a portion of the BLS units. Plans are underway to provide the software to every licensed ALS and BLS unit in the state. Additionally, the NJSFAC has created a web-based patient care report (PCR) titled “NJSFACTs” (New Jersey State First Aid Council Tracking System) designed by PeopleForce to collect EMS incident data into a state-wide database. Both emsCharts and NJSFACTs are National EMS Information Systems (NEMIS) compliant at gold and silver levels, respectively. Linkage between these two systems is critical and, if a sufficient number of data elements for system performance improvement are not available within the NJSFACTs, then additional development may be necessary. Once aggregation of the prehospital data sets occurs, linkage to National Trauma Data Standard (NTDS) should be relatively successful as the Collector software is debugged.

The data reside in multiple agencies across state government. Many of the health care data sets reside in the DHSS Center for Health Statistics. Others reside in other units of DHSS, or other departments such as the Department of Transportation. There is some effort to bring several of the data sets under a single umbrella. Representatives of the DHSS Center for Health Statistics were eager to assist with linkages and analyses.

Some existing data sources have been used to answer questions of interest to the trauma system. For instance the distribution of patients with severe TBI by hospital distribution was recently determined from UB 92 data. However, existing data sets are not being used to their fullest extent for purposes of trauma system development. The multiple datasets that exist today do not represent a comprehensive management information system that can serve the future needs of trauma system stakeholders.

RECOMMENDATIONS

- Using a subcommittee of the State Trauma Advisory Council (STAC), develop a series of questions about the trauma system that could be answered by existing datasets (e.g. hospital discharge and emergency department data).
 - Work with existing data experts and epidemiologists to answer those questions.
- If statewide aggregation issues associated with Collector are not resolved by January 1, 2009, develop other methods for creating systemwide reports. For example, consider uploading essential elements to a database at the DHSS for analysis.
- As quickly as Collector issues have been resolved, ensure that all trauma centers and acute care facilities have a common software package.

- Provide resources for adequate technical support of the trauma registry.
- Continue to disseminate NEMESIS-compliant EMS software until 100% participation of the state's ALS and BLS services is achieved and all essential data elements necessary for system performance improvement are collected, aggregated and reported out.
- Establish a data release policy for trauma registry and related data.
- Consolidate data sources of interest into "data warehouses" supported by adequate numbers of appropriately trained staff to transform data into information that can be used for system performance improvement and refinement.
 - The state should explore if funding from the National Highway Traffic Safety Administration (NHTSA) to become a CODES (Crash Outcome Data Evaluation System) State could assist with these efforts.

Research

Purpose and Rationale

Overview of Research Activity

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

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

Trauma Registry–based Research

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

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

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

Population-based Trauma System Research

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

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

Participation in Research Projects and Primary Data Collection

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

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

Measures of Research Activity

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

OPTIMAL ELEMENTS

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

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

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

- a. The trauma system has developed mechanisms to engage the general medical community and other system participants in their research findings and performance improvement efforts. **(I-306.1)**
- b. The effect or impact of outreach programs (medical community training/support and prevention activities) is evaluated as part of a system performance improvement process. **(I-306.3)**

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

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

CURRENT STATUS

Several research activities were reported during the site visit.

- A research project studied the incidence of falls in the elderly that led to the development of a program to reduce falls among the hospitalized elderly. Program evaluation revealed a reduction of falls by 25% in participating hospitals.
- Data has been analyzed to identify dangerous intersections and crosswalks and appropriate intervention by repairing the sidewalk has been performed.
- Nonprescription fentanyl overdoses and deaths were tracked using data from the MEds, and maps were developed to identify local hotspots where intervention was needed.
- At the time of the site visit, data from all state acute care hospitals concerning the hospitalization rates for severe TBI was presented, with rates distributed in Level I trauma centers, Level II trauma centers and nontrauma acute care hospitals. An attempt to utilize the UB 92 data to identify hospitalization of trauma patients categorized by Injury Severity Score (ISS) has so far been unsuccessful because of a software malfunction.

The Level I trauma centers are required to perform research activities for ACS verification, and many personnel in these centers have national recognition for their research efforts. A number of multi-institutional research projects were performed, and participants cited studies involving pancreatic and urethral injuries during the site visit.

A research fund for spinal cord and head injury has been developed and is tied to moving traffic violations, but this funding is earmarked for basic research only.

Research within the trauma system should be encouraged, and it should be in the context of a comprehensive research agenda that is defined by the stakeholders. Some research questions can only be answered using the more detailed information that is held within the level I and level II trauma centers. However, all acute care hospitals should contribute some patient data that would permit evaluation and subsequent research regarding patient flow and injury outcome.

RECOMMENDATIONS

- Develop a research agenda for the trauma system.

Focus Questions

Focus Question #1

Does New Jersey need additional or fewer trauma centers?

CURRENT STATUS

The state has 10 trauma centers, and this does not take into consideration trauma centers in other surrounding states which receive and treat patients injured in New Jersey. The three Level I and seven Level II centers appear to be geographically well positioned throughout the state. One American Burn Association (ABA)/ACS verified Burn Center is near the center of the state. The state has no designated pediatric trauma centers.

While it appears that the geographic distribution and reported patient volumes could support the contention that the current trauma center network should not change, inadequate data are available to make a recommendation. Until appropriate information is available to verify patient volume, optimal trauma care performance, outcome, and efficient patient flow for systemwide operations, a recommendation for change to the current trauma center network is inappropriate. Reconsideration of the current Level I and II trauma center network construct for optimal care and efficiency should occur after that analysis.

Reconsideration of the trauma center network as it applies to pediatric trauma care is perhaps more urgent with the new ACS requirements for pediatric trauma center verification. The current trauma centers with Children's Hospitals need to make a determination about seeking pediatric trauma verification. No data were provided regarding pediatric trauma volume at the trauma centers with a commitment for children. An analysis of pediatric trauma patient volume at each of the trauma centers and the resources for a pediatric trauma program must be conducted to identify whether all or some of the currently verified trauma centers meet requirements for level I or level II pediatric verification. As the trauma centers are entering the reverification process with the new ACS verification guidelines, they have the option to choose whether or not to seek pediatric verification. Once it is identified how many of the trauma centers will seek pediatric verification, triage and transport guidelines will need to be modified to ensure that children arrive at the most appropriate trauma center for their severity of injury.

RECOMMENDATIONS

- Conduct an analysis of trauma patient flow and volume including injured children as well as all patients receiving care in neighboring states.
- Conduct a resource analysis of all trauma services and specialty care to identify gaps in the trauma care network.

- Ensure that children have access to a verified pediatric trauma center.

Focus Question #2

How can our trauma registry be improved to assure meaningful data are available?

CURRENT STATUS

This is a complex question that involves answers from a technical, political, financial and needed personnel perspective.

Technical: One or more technical issues must be resolved. First among these is that the current version of Collector™ does not meet the needs of the state for statewide aggregation and reporting. Secondly, at least in two trauma centers, the software does not meet the needs of the institution. These are serious issues that can/must be addressed by the vendor. It is unconscionable that versions of the software are being released without thorough testing and debugging, in fact using the trauma centers as beta test sites. Unfortunately, the fact that the maintenance contracts have been transferred to the individual facilities has diffused the state's ability to negotiate with the vendor based on the withholding of annual maintenance fees. Financial disincentives notwithstanding the vendor must fix the software in an effective and timely manner. Constant and nagging pressure must be brought to bear to accomplish this task, deadlines must not slip any further, and the replacement product must not introduce new "bugs" that further hamper the acquisition and analysis of meaningful institutional and system data.

Political: A number of political impediments to the development of a fully operational, statewide, trauma management information system were identified. For example, existing trauma centers cling to older software that "works". The consultation team does not suggest that patient care should be compromised by insufficient data, but each trauma center must be committed to making the universal software work. Common definitions must be adhered to and continuous quality improvement regarding the data entry process must be implemented as a routine system performance improvement check.

If the political will existed, there would be ways to "work around" the absence of the statewide collection process by exporting a specific sub-set of data to a freestanding database where aggregation and simple reporting could occur. This would, at the very least, identify discrepancies in the existing data entry processes at the trauma centers. Although it is difficult to sell a system that does not work, the 42 element subset for nontrauma acute care hospitals should be distributed to at least a sample of these facilities. Pilot testing should begin with the support and outreach of one or more of the verified trauma centers. Waiting

for a fully functional state system registry will only delay the trauma system's ability to begin to track the under-triage issue.

Financial: Clearly there are data costs, whether that be enticing the vendor to be more responsive to the trauma system's needs or the costs associated with the distribution of the software to nontrauma acute care hospitals. The financial burden associated with the information system should be a joint commitment of the state and the verified trauma centers.

Needed Personnel: One of the biggest challenges is the seeming absence of technical support to assist with fixing the bugs, applying pressure on the vendor, and assisting with the analysis of existing data. It was reported that personnel are present in sections of DHSS who may be helpful in this regard. A "users group" comprised trauma registrars, technical support personnel from their individual facilities, and the state technical support personnel should meet regularly to identify common issues and fixes.

A last comment is warranted. Waiting to initiate system PI for a "perfect" data set continues to place persons injured in the New Jersey at some unnecessary risk. New Jersey is a data-rich environment by many measures. More concerted efforts to do what you can with the data you have in hand are essential.

RECOMMENDATIONS

- Work collectively to encourage the vendor to provide an immediate fix for the trauma registry. Identify a specific strategy, e.g. each center calling on a rotating basis to keep the pressure on.
- Identify a limited number of data points that can be easily collected and transmitted to a central collection point to begin to answer a single question of interest. These data can be entered into a separate, freestanding database or spreadsheet.

Focus Question #3

What role should the DHSS as the lead agency be playing in the trauma system? What resources are needed to accomplish this goal?

CURRENT STATUS

As the lead agency for trauma system development, DHSS should provide leadership. This means taking action

- to plan,
- to bring stakeholders together,
- to develop standards,
- to convert data into information,

- to hold people and organizations accountable, and
- to make trauma system performance transparent to the public.

A New Jersey trauma system will ultimately be comprised of the people, hospitals, laws, information systems, and other elements which act together within that system. DHSS is not *the system* but should be playing the role of ensuring that resources are coordinated and functioning in a way that brings the right patient to the right hospital in the right amount of time.

It is unreasonable to expect the DHSS to succeed in filling the role of a lead agency for the trauma system without additional resources. At a minimum, DHSS needs a full time trauma system manager, a full time EMS medical director, a full time trauma registrar, a full time trauma system planner, access to information technology services and access to injury prevention epidemiologists. Options for obtaining this level of support include an internal reallocation of resources within DHSS or an infusion of additional funding (see Finance section).

RECOMMENDATIONS

- Ensure that the lead agency has authority to take the leadership role for development of the state trauma system.
- Ensure that adequate personnel are provided or available for trauma system development and management.

Focus Question #4

What do you see as New Jersey's greatest strength? What do you see as New Jersey's greatest weakness?

New Jersey has a number of strengths – probably the strongest is the breadth and commitment of the many stakeholders that already operate as components of the state’s health care delivery system. The knowledge, skill and accomplishments of many individuals from several disciplines were noted by the consultation team during the site visit. In many areas, the Pre-review Questionnaire did not do justice to these accomplishments. It was noted that many components of a truly outstanding trauma system exist.

The greatest weakness is also reflected in the myriad of stakeholders who have – in a silo mentality - pursued their own individual agendas. They have allowed the collaborative development of a consensus-driven approach to trauma system development to take second place. For example, many participants at the conference had knowledge and information that are essential for a fully functioning trauma system, but this was new information for many other participants present. The consultation visit team believes that this lack of information sharing is not deliberate, but caused by the lack of a suitable forum

for information exchange and consensus building. To the credit of the many participants present during the consultation visit, all seemed to understand the need to compromise in order to reach consensus regarding the most optimal path to pursue for the next stages of trauma system development.

From the consultation team's perspective, the essential component in this process is the consensus identification of a physician leader. This could be the newly appointed state EMS director or a New Jersey trauma director, one who can lead the discussion, help build the consensus, and assemble the many pieces of the puzzle. This would then allow the transition of a fragmented trauma network to an interlocking mutually dependent, fully functioning trauma system.

RECOMMENDATIONS

- Identify a physician or surgeon with the commitment, vision, and leadership skills to chair the State Trauma Advisory Council that will coordinate state trauma system development and management.
- Ensure the dissemination of information regarding trauma system development to all stakeholders to promote collaboration and consensus.

Focus Question 5:

What is the biggest hurdle in developing and sustaining a statewide trauma system?

The overarching principle of a trauma system is that of a patient-centered, patient-focused approach at each point along the continuum of care, but all of the state's population must have access. The focus must *become* and *remain* the development of a trauma system that ensures optimal care for every individual who suffers traumatic injury. This does not ignore or minimize the unique historical roots and pride in past trauma care accomplishments. It is acknowledged that the state possesses dedicated, knowledgeable professionals who have been intensely involved in the development and maintenance of individual components that contribute to trauma care.

If the current paradigm of isolationism (people working on pet projects) and protectionism ("my program" is the only way) is not modified, the state is destined to remain quagmire of duplicative efforts, lost economies of scale, inefficiency, and mediocrity.

The focus must become one of a patient-centered, patient-focused construct that will require all stakeholders (state officials, EMS agencies, trauma centers, volunteers, etc.) to be active participants, able and willing to explore new paradigms of care. This will require a change to the status quo with state leadership of the newly evolving trauma system. All stakeholders need to join a

unified and selfless effort to develop and maintain a truly inclusive and comprehensive trauma system.

RECOMMENDATIONS

- Pass legislation mandating trauma center participation by all acute care facilities and all EMS agencies.
- Establish financial resources necessary to achieve the legislated mandates.

Focus Question #6:

What does NJ need to do to enhance our trauma system and improve the delivery of care?

There are many opportunities across the continuum of trauma care to improve the delivery of patient centered care through the implementation of an optimal trauma system. The state currently has no trauma system. This trauma system assessment provided an opportunity to educate and motivate all key stakeholders to demand and commit to the implementation of a trauma system. Key stakeholders must participate in all aspects of the development and implementation of the strategic plan.

Each of the recommendations from the trauma system assessment should be woven into a trauma system strategic plan. Benchmarks, indicators, and standards (BIS) from the MTSPE document should to be included in the strategic plan to help establish goals for development and provide a measurement process for evaluation of accomplishment.

For this process to be successful, all stakeholders must understand that silos must not exist. All stakeholders must come to the table with the openness and willingness to maintain focus on optimal care of the trauma patient across the continuum of care. This is essential for the system to ensure that safe patient-centered care is a consistent theme throughout the planning phases of trauma system development.

Creating a shared vision, optimistic attitude, collegiality, and collaboration amongst all stakeholders must be foundational working rules for the development and implementation of the trauma system strategic plan. Now is the time to dissolve the silo's, bring together stakeholders, develop a trauma system strategic plan, assign teams to accomplish the goals and objectives, and move into the implementation phase. This is the time to make this happen.

RECOMMENDATIONS

- Identify key stakeholders to participate in the strategic planning process who will communicate with their colleagues and represent their ideas.
- Ensure the opportunity for public comment as the trauma system strategic plan evolves.

Focus Question #7

Are there any existing trauma systems that NJ could use as a model for trauma system development?

The history and evolution of the system for provision of EMS and trauma care, as well as the state's compact geography makes New Jersey quite unique. It therefore is more appropriate for New Jersey to look at separate components of trauma systems that have been developed by others to identify creative strategies for New Jersey's trauma system development.

A good starting point would be to review the reports of trauma system consultations performed by the ACS. Many of these reports are available on state websites.

Clark County, Nevada Trauma System Consultation Report
<http://www.southernnevadahealthdistrict.org/trauma/download/ACSfinal.pdf>

State of North Carolina Trauma System Consultation Report
<http://www.dhhs.state.nc.us/dhsr/EMS/pdf/cotdec04.pdf>

State of Hawaii Trauma System Consultation Report
<http://hawaii.gov/health/about/legrpts2006/acsreport2.pdf>

State of Connecticut Trauma System Consultation Report
http://www.ct.gov/dph/lib/dph/ems/pdf/acs_trauma_system_report.pdf

State of Arizona Trauma System Consultation Report
http://www.azdhs.gov/bems/trauma-pdf/Arizona%20TSC%20Report_Final.pdf

State of Minnesota Trauma System Consultation Report
<http://www.health.state.mn.us/traumasystem/minnesotafinaltscreport.pdf>

State of North Dakota
<http://www.ndhealth.gov/trauma/traumanews/default.asp?ID=340>

A review of these trauma system consultation reports will provide information about the status of the trauma system, the challenges and opportunities, and the recommendations for trauma system development at the time of the visit. The information gained could help to identify states to approach for more extensive discussions about aspects of trauma system development.

Illinois is another state to consider approaching. This state has some of the same geographic, demographic, and resource utilization issues that New Jersey has. The state is completing a trauma system strategic planning process, following an ACS trauma system consultation. It is expected that this strategic plan will be completed in the fall of 2008.

New Jersey should also take advantage of opportunities for learning about the trauma system development in other states through membership in the Trauma Manager Council of the National Association of State EMS Officials. The network of trauma managers provides support and information to each other to promote trauma system development. Consider sending the state trauma coordinator to the annual and semi-annual meetings of the Trauma Manager Council for the education and professional networking opportunities. If travel is not possible, enable the state trauma manager to participate in the Trauma Manager Council conference calls. Investigate the potential for mentorship with an experienced state trauma manager for New Jersey's new trauma manager.

RECOMMENDATIONS

- Review available reports on trauma system consultations to identify creative strategies for trauma system development.
- Develop relationships with state trauma managers to identify other strategies for aspects of trauma system development and support.

Appendix A: Site Visit Team Biographical Sketches

ALASDAIR K. T. CONN, MD, FACS- TEAM LEADER

Alasdair Conn is Chief of Emergency Services at the Massachusetts General Hospital in Boston. After receiving his medical degree in Edinburgh, Scotland and his surgical training in Toronto, Canada, Dr. Conn became a staff surgeon at the Maryland Institute of Emergency Medical Services Systems (MIEMSS) in Baltimore. In addition, he was the EMS Director for the state of Maryland and the Medical Director of the Maryland State Police aviation program. In 1985, he transitioned to Boston where he initially worked at Boston Medical Center as a trauma and general surgeon, as well as Medical Director of a newly initiated consortium hospital based helicopter program (Boston MedFlight). In 1988, Dr. Conn moved to his present position and has been taking trauma call at the MGH since that time. He is still actively involved in prehospital issues; he continues to work with Boston MedFlight; and has worked with the Commonwealth of Massachusetts as Trauma Director, helping to draft the initial trauma legislation that was signed into law in the year 2000. He is an active participant in the drafting of regulations for the Massachusetts Trauma System. Dr. Conn has also served as Chairman of the American College of Surgeons Massachusetts Committee on Trauma and Chief of Region I (New England) ACS Committee on Trauma.

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.

THOMAS J. ESPOSITO, MD, MPH, FACS

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 Diplomate 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.

HEIDI HOTZ, RN

Heidi Hotz is the Trauma Program Manager at Cedars-Sinai Medical Center, a DHS designated and ACS verified Level I Trauma Center. She is also the Past President of the Society of Trauma Nurses (STN) and Immediate Past President of the Trauma Managers Association of California (TMAC). She has over 25 years of trauma clinical and program management experience inclusive of trauma data, trauma performance improvement - peer review, trauma program - systems development and implementation, injury prevention, consultant for trauma centers and systems, and all trauma related issues across the continuum of care. She has extensive experience in trauma education inclusive of lectures on many aspects of trauma care, trauma educational curriculum development, and conference and event planning. She was the Chair of the Advanced Trauma Care for Nurses® (ATCN) Committee in Arizona for 6 years. She was the first appointed Chair of the STN's ATCN National-International Committee, and is currently ATCN Faculty. She is an author and Faculty Member for the STN's Trauma Outcomes Performance Improvement Course (TOPIC). She was a member of the STN Board of Directors for over 8 years in the positions of Director at Large, Treasurer, President Elect, and President. She is also a Board Member and Executive Committee Member with the American Trauma Society. Heidi Hotz has been actively involved in many local, regional, national and international trauma projects, programs, and initiatives and has held many trauma leadership positions. Her involvement includes trauma hospital and trauma system site surveys; project-program development for screening and brief

interventions for alcohol in trauma patients; expert panelist for trauma educational events, invited participant in national trauma leadership forums; spokesperson for media events; work group participant for the Model Plan for Trauma Systems; provided testimony at formal hearings in support of trauma systems funding; member of the Health Resources and Services Administration (HRSA Trauma Stakeholders Committee).

W. DANIEL MANZ, BS

W. Daniel Manz is the Director of Emergency Medical Services for the Vermont Department of Health. He has been in emergency medical services (EMS) for more than 30 years and worked as an emergency medical technician (EMT), volunteer squad leader, hospital communications technician, EMS regional coordinator, EMS trainer and State EMS Director. Much of his work has been in rural areas including Maine and Saudi Arabia. Mr. Manz has been active in the National Association of State EMS Officials, serving as their President for 2 years, liaison to the American College of Surgeons, and representing the association for several national projects including the EMS Agenda for the Future, the HCFA Negotiated Rule Making process, and the recently released National EMS Scope of Practice Model. He is currently chairperson of the National Association of State EMS Officials task force on implementation of the EMS Education Agenda for the Future. He is also working with the CDC on an India-US Joint Working Group for Implementation of a Road Traffic Injury Prevention and Control Project. Mr. Manz remains active as a volunteer EMT-Intermediate with the local ambulance service in his community. Mr. Manz served on the Institute of Medicine's ED Subcommittee for the Future of Emergency Care within the U.S. Health Care System project.

KATHY J. RINNERT, MD, MPH

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

Dr. Rinnert currently serves as Associate Professor in Emergency Medicine at the University of Texas Southwestern Medical Center at Dallas (UTSWMC). In addition, she is the Associate Medical Director for the UTSW/BioTel EMS system, encompassing sixteen municipalities and their fire-based EMS and Public Safety agencies. In this capacity she oversees the out-of-hospital practice of over 1700 paramedics operating in urban, suburban, and rural environments.

Dr. Rinnert directs the Center for Government Emergency Medical Security Services (GEMSS) at the UTSWMC, which provides academic and clinical tactical support to government agencies. At the Center she directs both the EMS and GEMSS fellowship programs, which provide post-doctoral training in these subspecialty areas of emergency medicine.

Dr. Rinnert has special interest and expertise in trauma, injury prevention and control, air medical transport, tactical EMS, urban search and rescue, and domestic preparedness for weapons of mass effect (WME) and counterterrorism. She serves as the physician representative on the Panel of Commissioners (POC) for the Commission on Accreditation of Ambulance Services (CAAS), the national body for accreditation of EMS agencies in the United States and Canada. In addition, Dr Rinnert is an active site reviewer for the Committee on Accreditation of Educational Programs for the EMS Professions (CoAEMSP) and trauma systems consultant to the American College of Surgeons Committee on Trauma (ACS-COT). Dr. Rinnert was recently elected to the Board of Directors of the National Association of EMS Physicians, the premier organization for physician practice in EMS.

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 doctorate in Health and Human Behavior from Walden University.

Appendix B: List of Participants



New Jersey Trauma System Consultation
 August 4th-7th, 2008
 Participant List

| Name | Title | Organization |
|--|-------------------------------------|--|
| May Jennifer Amolat-Apiado | Assistant Medical Examiner | Northern Regional Medical Examiner Office |
| Arlene Avila, RN, BSN | Trauma Registry Nurse | RWJ-University Hospital |
| Molly Berkowitz, RN, BSN | Injury Prevention Coordinator | Jersey Shore University Medical Center |
| Eileen Byrne, RN | Community Burn Educator | St. Barnabas Medical Center - Burn Center |
| Frank Castello, MD | Medical Director | Children's Specialized Hospital |
| Dennis Castro BSN, RN, EMT-B | Trauma Program Manager | St. Joseph's Regional Medical Center |
| Kathe Conlon, RN | Burn Disaster Education Coordinator | St. Barnabas Medical Center - Burn Center |
| Louis DiFazio, MD | Director of Trauma Services | Morristown Memorial Hospital |
| Nancy Distelcamp | Injury Prevention Coordinator | Capital Health System - Fuld |
| Connie Domingo | Medical Director | Weisman's Children's Rehabilitation Hospital |
| Theresa Edelstein | Vice President | Continuing Care Services NJ Hospital Association |
| Ryn Fernandez, RN, MSN, APRN-BC, CCRN, CEN | Trauma Program Manager | Jersey Shore University Medical Center |
| Pam Fischer | Director | Division of Highway Traffic Safety |
| Marissa Fisher, RN, BSN | Injury Prevention Coordinator | Jersey City Medical Center |
| Barbara Geiger-Parker | President & CEO | Brain Injury Association of NJ |
| Carol-Ann Giardelli | Director | NJ Safe Kids |
| John Gontarski | Program Manager | NJ Department of Health & Senior Services |

| Name | Title | Organization |
|--|------------------------------|---|
| Deanna Gray-Miceli, Ph.D., GNP-BC, FAANP | Fall Prevention Consultant | NJ Department of Health & Senior Services |
| John Grembowicz, Sr. | Assistant Director, EMS | UMDNJ-University Hospital |
| Karen Halupke, RN, M.Ed. | Director, OEMS | NJ Department of Health & Senior Services |
| Jeffrey Hammond, MD | Director of Trauma Services | RWJ-University Hospital |
| Delores Henderson | QA Analyst | UMDNJ-University Hospital |
| Tom Hendrickson, RN | Trauma Manager | NJ Department of Health & Senior Services |
| Joseph Hummel, DO | Chairperson | JemSTAR Advisory Council |
| Bretta Jacquemin | Center for Health Statistics | NJ Department of Health & Senior Services |
| Sandra Johansen, RN | Burn Registrar | St. Barnabas Medical Center - Burn Center |
| Nancy Kelly-Goodstein, MICP, CPM, MAS | Program Manager | NJ Department of Health & Senior Services, OEMS, Education & Special Services - |
| Steven Kirschblum, MD | Director | Spinal Cord Injury Service Kessler Institute for Rehabilitation |
| Robert Lavery, MS, MICP | Trauma Registrar | UMDNJ-University Hospital |

| Name | Title | Organization |
|--------------------------------|---|--|
| John Liqua, MICP | Public Health Rep, OEMS | NJ Department of Health and Senior Services |
| Diane Litterer, MPH, CPS | Executive Director | NJ Prevention Network |
| David Livingston, MD | Director of Trauma Services | UMDNJ-University Hospital |
| John LoCurto, MD | Director of Trauma/Surgical Critical Care | Hackensack University Medical Center |
| Kathleen Lutz, MSN, CPNP | Nurse Consultant | NJ Department of Health and Senior Services, OEMS |
| Hani Mansour, MD | Director of Burn Services | St. Barnabas Medical Center - Burn Center |
| Steven Marcus, MD, DABMT | Executive Director | NJ Poison Information & Education System |
| Michele Maresca, RN | Trauma Outcomes Coordinator | Hackensack University Medical Center |
| H. Mickey McCabe, EMT-B | President | Medical Transportation Assoc. of NJ |
| Bruno Molino, MD | Director of Trauma Services | Jersey City Medical Center |
| Marian Moore, RN-BC, BSN, CCRN | Trauma Program Manager | Capital Health System-Fuld |
| Timothy Murphy, RN | Trauma Program Manager | RWJ-University Hospital |
| Pat Nierstedt, RN | Trauma Program Manager | Hackensack University Medical Center |
| Joanne Pawar, RN | Trauma Registrar | Morristown Memorial Hospital |
| Lyla Perez, MD | Assistant Medical Examiner | Northern Regional Medical Examiner Office |
| Sharon Pineda, RN | Interim Trauma Program Manager | St. Joseph's Regional Medical Center |
| James Pruden, MD, FACEP | Chairman | St. Joseph's Hospital & Medical Center, Emergency Medicine |
| Craig Reiner | Director | Office of Emergency Telecommunications |
| Donald Roberts, MICP | Program Specialist | NJ Department of Health and Senior Services, OEMS, Enforcement |
| Tracy Rogers | Trauma Registrar | Jersey Shore University Medical Center |

| Name | Title | Organization |
|--------------------------------|--------------------------------------|--|
| Steven Ross, MD | Director of Trauma Services | Cooper University Hospital |
| Roger Sarao, CHFP, MPA | VP, Economic & Financial Information | NJ Hospital Association |
| Louis Sasso, MBA, NREMT-P | Emergency Medical Services | RWJ-University Hospital |
| Diana Starace | Injury Prevention Coordinator | RWJ-University Hospital |
| Thomas Starr, MICP | EMS Task Force Coordinator | NJ Department of Health & Senior Services |
| Lesha Suber | Injury Prevention Coordinator | UMDNJ-University Hospital |
| Joseph Tricarico, Jr., DMD, JD | Assistant Commissioner | NJ Department of Health & Senior Services |
| Sue Van Orden, EMT | President | NJ State First Aid Council |
| Patricia Walling, RN | Trauma Program Manager | UMDNJ-University Hospital |
| Jennifer Waxler, DO | Chair | NJ EMS Council |
| Paula Weiler, EMT | Northern Area Vice President | NJ State First Aid Council |
| Wil Yap, RN | Trauma Program Manager | Jersey City Medical Center |
| M. Thomas Zanna, MD | Acting Director | Office of Policy & Planning NJ Department of Health & Senior Services |

Appendix C: Acronyms Used in the New Jersey Trauma System Consultation Report

AAP – American Academy of Pediatrics
ACEP – American College of Emergency Physicians
ALS – Advanced Cardiac Life Support ACS – American College of Surgeons
ALS – advanced life support

BIS – benchmarks, indicators, and scoring
BLS – basic life support

CAAS – Commission on Accreditation of Ambulance Services
CAMTS – Commission on Accreditation of Medical Transport Services
CARF – Commission on Accreditation of Rehabilitation Facilities
CoAEMSP – Committee on Accreditation of Education Programs for EMS Professionals
CODES – Crash Outcome Data Evaluation System
CDC – Centers for Disease Control and Prevention

DHSS – Department of Health and Senior Services
DMAT – Disaster Medical Assistance Teams

ED – emergency department
EMS – Emergency Medical Services
EMSC – Emergency Medical Services for Children
EMT-B – emergency medical technician basic
EMT-P – emergency medical technician paramedic
ENA – Emergency Nurses Association

FTE – full time equivalent

HIPAA – Health Information Portability and Accountability Act
HIPER – Health Infrastructure Preparedness and Emergency Response Division
HRSA – Health Resources and Services Administration

ISS – Injury Severity Score

MCC – medical coordination centers
ME – medical examiner
MTSPE – Model Trauma System Planning and Evaluation

NAED – National Academies of Emergency Dispatch
NEMIS – National EMS Information Systems
NHTSA – National Highway Traffic Safety Administration
NJSFAC – New Jersey State First Aid Council
NJSFACTs – New Jersey State First Aid Council Tracking System
NREMT – National Registry for Emergency Medical Technicians
NTDB – National Trauma Data Bank
NTDS – National Trauma Data Standard

OEMS – Office of Emergency Medical Services
OISP – Office of Injury Surveillance and Prevention

PALS – Pediatric Advanced Life Support
PCR – patient care report
PI – performance improvement
PI&E – public information and education
PSAP – public safety answering point

SCI – spinal cord injury
SCTU – specialty care transport units
STAC – statewide trauma advisory council

TBI – traumatic brain injury
TCC – trauma center council
TSP – traffic safety program in the Office of Highway Traffic Safety

UASI – Urban Area Security Initiative
USAR – Urban Search and Rescue