Trauma System Consultation

State of Louisiana

Baton Rouge, Louisiana

June 28th-July 1st, 2009

American College of Surgeons

Committee on Trauma

A multidisciplinary working group prepared this document based on the consultation visit that took place on June 28th-July 1st, 2009 in Baton Rouge, Louisiana and included the following members:

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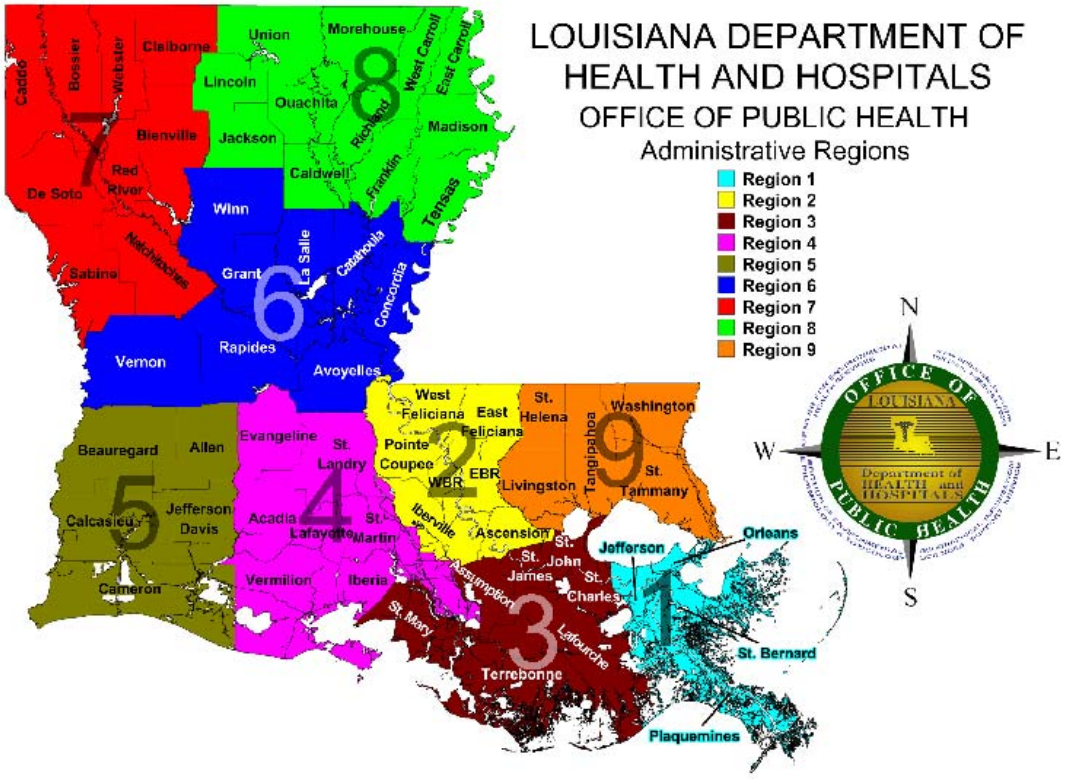
Executive Summary

Louisiana, known as the Pelican State, Bayou State, and Sugar State, is a state with approximately 51,843 square miles, making it 31st in geographic size. The state population is estimated to be 4,500,000, making it 22nd in size by population. Approximately 25% of the population lives in rural areas of the state.

Louisiana's state motto is "Union, justice, and confidence." The state bird is the brown pelican. The magnolia is the state flower.

The Louisiana public health care system is organized by 9 regions. The state has 118 acute care facilities providing emergency care, of which 27 are critical access hospitals. The state has one level I ACS verified trauma center, and one acute care facility pending ACS verification.



Significant characteristics of the state, injury, and the health care system as they relate to the trauma system include the following:

- The mechanism of injury is primarily blunt trauma outside of the major urban centers.
- The state has had recent experience with major disasters, and extensive consultation has led to revision of the disaster preparedness system.
- Louisiana is characterized by local governmental control with little central authority.
- The emergency medical services (EMS) system has little systemwide integration.
- EMS agencies have limited ability to transport patients over long distances.
- Two functional exclusive trauma systems surround existing trauma centers, and these have not yet been integrated into the Louisiana Emergency Response Network (LERN).
- Essentially no trauma hospital standards are enforced outside of the areas covered by these exclusive trauma systems.
- A significant proportion of the population is at a considerable distance from a trauma center.
- The state has significant issues with specialty coverage in some areas.

LERN was established by statute in 2004 and funded since 2006. Affiliated with the Department of Health and Hospitals, it was established as an independent board with wide powers. LERN is tasked with responsibility for trauma system development, but it has no clear delineation of authority for operational issues. LERN has received significant appropriations for the LERN infrastructure.

LERN has been strongly focused on developing a communications network, with the two call centers and triage program. Hospitals voluntarily report resources available for trauma care, but the status of resources available is subject to change daily or hourly. The triage system is kept informed using a web-based application.

Limited progress has been made with trauma system development. The two trauma centers function outside of the current LERN communication system. No strong incentives exist for hospitals to achieve a higher level of trauma care capability or to seek trauma center verification. Significant issues exist with funding for patient care. An additional challenge is that two hospital groups may have competing interests: the historical network of “charity” hospitals with public funding and private hospitals.

Advantages and Assets

- Professionals and acute care facilities have a long history of strong commitment to trauma care.
- The trauma system has benefited from a high level of legislative interest and involvement.
- LERN has a newly established systemwide authority with an inclusive trauma system focus.
- Significant funding has been appropriated for the LERN infrastructure and the LERN communications network
- The LERN call centers are effectively matching severely injured patients to facilities with appropriate resources for their care.
- Hospitals and EMS providers are apparently willing to participate in the LERN.

Challenges and Vulnerabilities

- LERN has newly established systemwide authority with an inclusive trauma system focus.
- The LERN Board lacks a vision and structured planning for the overall trauma system.
- Louisiana has a historical legacy of local control and rural/urban distrust.
- Only two trauma centers have attained American College of Surgeons verification.
- The state has no uniform program for certification of hospitals as trauma centers or participating trauma hospitals at an appropriate level for their resources. Additionally, no program exists for ensuring compliance with certified levels of care.
- LERN lacks incentives for facilities and providers to participate.
- LERN has addressed no overall system integration beyond getting the severely injured patient to the emergency department.

Themes

- Louisiana needs a detailed guiding vision and a comprehensive plan.
- Significant structural and operational changes are needed.
- LERN has the attention of the legislature and substantial funding.
- LERN should build the trauma system from the successful LERN call center program.

- LERN would benefit from finding ways to maximally use the existing regional infrastructure.

Priority Recommendations

Statutory Authority and Administrative Rules

- Establish, in statute, the operational infrastructure of LERN as the lead agency for trauma system development within the Department of Health and Hospitals to ensure that the standards and rules promulgated by the LERN Board are consistently enforced statewide.
- Propose legislation to provide the Department of Health and Hospitals, LERN, and system participants with peer review protection of all data collected and analyzed for performance improvement and research.

System Leadership

- Develop a clear and focused written vision for the structure of an inclusive Louisiana trauma system and use it as the basis for an updated trauma plan.
    - Establish priorities for the sequential realization of the plan.

Coalition Building and Building and Community Support

- Develop an active communication strategy to inform stakeholders, policy makers, and the public about the need for and evolution of the trauma system, perhaps including a listserv, newsletter, or website.

Trauma System Plan

- Rewrite the LERN (system) plan to encompass a broader scope of system components with additional detail.
    - Use the HRSA Model Trauma System planning and evaluation document as a guide.

System Integration

- Develop an active communication strategy to inform stakeholders, policy makers, and the public about the need for and evolution of the trauma system, perhaps including a listserv, newsletter, or website.
- Assess the current trauma system stakeholders and identify needs for additional participants or increased participation by existing member groups.
    - Consider adding a position(s) on the LERN Board or LERN work groups for an intensive care physician, cardiologist, neurologist, family practitioner, emergency nurse, social work representative, and citizen-at-large.
    - Encourage participation in the planning and operation of the trauma system by representatives from EMS and trauma systems of surrounding states

Financing

- Determine a methodology for providing financial assistance for hospitals certified by the state as trauma centers to assist with the cost of readiness and uncompensated care.

Emergency Medical Services

- Establish minimum statewide prehospital care treatment protocols in collaboration between LERN and Bureau of EMS.
    - Include a plan for how these protocols will be operationalized by the LCCs and Regional Commissions.
- Complete a prehospital care resources assessment that includes air medical transport resources.
    - Determine if sufficient and well-coordinated transportation resources exist to ensure that EMS providers arrive at the scene promptly and expeditiously transport the patient to the correct hospital by the correct transportation mode.
    - Close gaps as they are identified.

Definitive Care Facilities

- Establish rules for trauma center certification that ensure level-appropriate resources are consistently available at all times.
    - All hospitals should be a participating trauma hospital certified at an appropriate and sustainable level.
    - ACS standards for trauma center verification at levels I, II, and III are a reasonable starting point.

    - One or two lower certification levels should be established to allow facilities without significant surgical or inpatient resources to be categorized as trauma participating hospitals and to serve as points for stabilization and transfer.
- Eliminate the ability of participant hospitals to vacillate with regard to a certified level of service.
- Develop and certify at least one or two additional level I or level II trauma centers that are geographically located to improve trauma center access.

Trauma System Assessment

Injury Epidemiology

Purpose and Rationale

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

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

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

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

An ongoing part of injury epidemiology is public health surveillance. In the case of injury surveillance, the trauma system provides routine and systematic data

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

OPTIMAL ELEMENTS

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

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

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

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

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

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

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

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

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

a. The trauma system and the public health system have established linkages, including programs with an emphasis on population based public

health surveillance and evaluation for acute and chronic traumatic injury and injury prevention. **(I-208.1)**

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

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

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

CURRENT STATUS

Louisiana is able to conduct injury surveillance, analysis, and reporting through the Injury Research and Prevention Program (IRPP) in the Department of Health and Hospitals (DHH). The IRPP has established partnerships with many state agencies such as Maternal Child Health, Highway Safety, and the Bureau of Primary and Rural Health. The Louisiana Emergency Response Network (LERN) is also a partner; however, data support provided by the IRPP has been limited to date. Epidemiologists are available within the DHH.

Many data sources are available for injury surveillance including vital records, hospital discharge data from some hospitals, Child Death Review, traumatic brain injury (TBI), Fatal Analysis Reporting System (FARS), poison control, traffic safety, crime data, and domestic violence fatalities. Some trauma data are available from the two trauma centers. LERN currently has data from the 64 elements collected through the call center. EMS data are not standardized or consistently submitted and (ED) data are not available. Louisiana has two Schools of Public Health that could potentially be supportive of injury surveillance efforts.

The IRPP has developed numerous injury reports and summaries, including suicide and homicide fact sheets, *Injury Fatalities 2005*, and leading causes of injury mortality and nonfatal injury hospital discharges. The comprehensive description of injury is incomplete without linkages to clinical and population-based databases.

Currently, LERN is involved in the early stages of assessing the state's burden of injury. LERN's infrastructure has not existed long enough to tap into resources needed to establish a thorough description of injury. LERN is using an Access

database for data collection by the call center until a statewide trauma registry infrastructure is implemented in 2010.

LERN has performed minimal trending analyses for blunt and penetrating trauma and mechanism of injury relative to specific age groups using data from its call centers. LERN has not yet completed a risk assessment or gap analysis.

The IRPP representative suggested that the Sudden Unexplained Infant Death Investigation panel could, potentially, serve as a resource and model for LERN's future injury analysis.

RECOMMENDATIONS

- Collaborate with other public health officials to assess and report on the status of injury in Louisiana.
- Conduct an extensive analysis of injury including age, morbidity and mortality, mechanism, and trends over time for the state and for each of the nine regions as soon as sufficient data are readily available.
    - Analyze injuries of special populations, e.g., pediatrics, geriatrics and ethnic/cultural groups.
    - Thoroughly define the injury problem for the state and the nine regions.
- Encourage or mandate the submission of hospital discharge data (UB-04) by all hospitals resulting in a population-based dataset.
- Partner with the Injury Research and Prevention Program (IRPP) staff to conduct an assessment to identify populations at high risk for injury.
    - Utilize the results of the risk assessment to target injury prevention efforts.
- Provide injury information to the public through a public access database.
- Develop reports and fact sheets on an annual basis to inform state residents about the injury problem, trends, the relationship to trauma care, and 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

When the participants were asked about their knowledge of the HRSA *Model Trauma System Planning and Evaluation* (MTSPE) document, only a few participants responded affirmatively. Even fewer noted any familiarity with the Benchmark, Indicators, and Scoring (BIS) tool contained within the MTSPE. Participants stated that during the development of the *LERN Build Out Plan 2008-2012*, the authors considered the BIS indicators in the optimal element section descriptions of the American College of Surgeons' (ACS) document,

Regional Trauma Systems: Optimal Elements, Integration and Assessment. While this familiarity and application is noteworthy, it does not use the BIS tool in the manner in which it was intended.

Discussion with the participants confirmed the information in the pre-review questionnaire (PRQ), which notes that the LERN Board has not determined if, or when, a facilitated BIS process might occur. As the participants become more acquainted with that tool, it should become more apparent that completion of the BIS assessment will create a broader understanding of the various attributes and functions of the system. Additionally, the BIS process will allow the leadership to target areas for development and allocation of resources. It can also serve as a benchmarking and accountability tool that can be used as a measure to report progress in system development.

When asked who might be assigned the task of completing a BIS assessment, the LERN leadership was unsure about engaging a broad-based coalition in the entire process. Having a broad-based coalition of stakeholders participate in the BIS assessment process is important to establish a fundamental understanding and dialogue about the entire spectrum of the trauma system and its operation. The participants did note that the LERN Board would serve as the core group for the BIS assessment process and additional individuals representing other interests would be invited. This is an appropriate starting point, but the participating stakeholders should include grass roots and active system practitioners, in addition to representatives from organizations and various disciplines.

RECOMMENDATIONS

- Identify a multidisciplinary group of appropriate stakeholders (< 40) who provide a broad perspective on the “trauma system”.
- Convene a meeting of the stakeholder group, led by knowledgeable facilitators, and complete the BIS assessment process.
- Review the results of the BIS scoring process and identify priority target areas for activities and resources.
- Repeat the BIS scoring process on a biannual 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

The September 11, 2001 terrorist attacks on the United States motivated trauma stakeholders in Louisiana to mobilize an effort to develop a statewide trauma system. Over time, these individuals developed a coalition of up to 40 stakeholder groups such as Mothers Against Drunk Driving (MADD), trial attorneys, and many others interested in the development of a trauma care system.

A Governor's Task Force on Trauma was formed in 2002 by executive order with the mission to develop a board to govern the development of a statewide trauma system. In 2004, the LERN was established through legislation (La. R.S. 40:2841-2846). The legislation authorized the development of a governance board to plan, promulgate administrative rules, and implement requirements necessary to establish and maintain a statewide trauma system.

In addition, the purpose of the legislation is to "safeguard the public health, safety and welfare of the people of this state against unnecessary trauma and time-sensitive related deaths and incidents of morbidity due to trauma." The legislation authorized LERN to include public and private prehospital, acute care, post acute care, and rehabilitation programs located throughout the state of Louisiana in its planning efforts. The legislation identified LERN as the state's lead agency within the Department of Health and Hospitals (DHH) for the operation of the comprehensive statewide trauma system. LERN is defined in the legislation as "the statewide system of regional trauma-patient care that is an organized, seamless, coordinated effort among each component of care including pre-hospital, acute care, post-acute care, rehabilitation, and injury prevention in a defined geographic area which provides access to local health systems for time-sensitive patient care treatment and is integrated with local public health systems and the Governor's Office of Homeland Security and Emergency Preparedness," La. R.S. 40:2842(3). The legislation further provides that LERN, "through its board, shall direct the efforts to decrease trauma-related deaths and incidents of morbidity and mortality due to trauma in Louisiana," La. R.S. 40:2843(A). The mandatory duties of the LERN Board, as set forth in the legislation include: providing for the development, implementation and support of the statewide system, La. R.S. 40:2845(A)(1) and providing for the implementation of the

network, La. R.S. 40:2845(A)(2). Finally, the Board is empowered by the legislation to "adopt and revise such rules and regulations as may be necessary to enable it to carry into effect the provisions" of the legislation, La. R.S. 40:2846(A).

In 2007, the Limitation of Liability statute was enacted (LA. R.S. 9:2798.5) that provides liability immunity for persons duly licensed or certified who specifically act in accordance with the protocols adopted and promulgated by LERN for the transport of trauma and time-sensitive ill patients.

A significant strength is that LERN has the authority to provide leadership for the development and regulatory oversight of the state's trauma system. The statutory authority provides an opportunity to identify and collaborate with the numerous stakeholders for trauma and emergency medical services (EMS), including the Louisiana Hospital Association, State Medical Society, prehospital provider organizations, health professional organizations, and numerous governmental and non-governmental entities.

Currently, the hospital participation in the statewide trauma system is voluntary, and no financial incentives are provided to encourage participation. To establish an inclusive systems approach to improve the trauma care statewide, it is essential that all hospitals participate in the statewide trauma system.

Regulation of EMS is fragmented between multiple state agencies within the DHH. EMS personnel certification is under the authority of the Louisiana Bureau of EMS (BEMS). Vehicle equipment standards are the responsibility of the Louisiana Health Standards Section, and EMS protocol requirements are the responsibility of the local parish medical society.

Although LERN has the authority in La. R.S. 40:2845, A, (4) (b) to require mandatory data submission by all parties participating in the trauma system, no specific statute provides protection for peer review that enables use of the data in a statewide trauma system performance improvement program.

In spite of a clear legislative manifesto to create and oversee the development of a trauma system, the operational and reporting functions of LERN within the Department of Health and Hospitals was unclear. Additionally, the relationship between LERN and other governmental units could not be adequately described.

RECOMMENDATIONS

- **Establish, in statute, the operational infrastructure of LERN as the lead agency for trauma system development within the Department of Health and Hospitals to ensure that the standards and rules promulgated by the LERN Board are consistently enforced statewide.**

- **Propose legislation to provide the Department of Health and Hospitals, LERN, and system participants with peer review protection of all data collected and analyzed for performance improvement and research.**
- Propose legislation to consolidate all regulatory functions of the EMS system under one state agency within the Department of Health and Hospitals.
- Promulgate rules to require participation of all hospitals in the statewide inclusive trauma system.
- Promulgate rules to require all hospitals to submit data elements as defined by LERN to the state trauma registry.

System Leadership

Purpose and Rationale

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

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

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

OPTIMAL ELEMENTS

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

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

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

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

CURRENT STATUS

The LERN was established in 2004, with the charge to "direct the efforts to decrease trauma-related deaths and the incidence of morbidity and mortality due to trauma in Louisiana." The LERN Board, a multi-disciplinary group appointed by the Governor, was charged with the development of the trauma system. The LERN Board is a fairly large group of about 24 members who serve terms of 1 to 3 years on a voluntary basis.

Significant infrastructure for LERN, including the development and implementation of 2 call centers was added with the appropriation of substantial ongoing funding in 2006. Annual appropriations have ranged from approximately $3.6 million to $5.5 million.

While the authority of the LERN Board is identified in legislative language, the exact relationship of LERN to the DHH and to the BEMS was not clear to the site visit team. Additionally, the lines of authority with respect to development and enforcement of rules and regulations is unclear. Thus, it is difficult for the reviewers to clearly identify, operationally, the lead agency with the over-arching responsibility for trauma system implementation and operation, in spite of legislative authority and intent.

Over the past 20 years, many dedicated individuals have provided leadership and have been involved in the efforts to develop Louisiana's trauma system. This leadership and commitment remain embodied within the current LERN Board and its working groups, as well as within an active group of regional trauma commissions. During its first few years, the LERN Board has successfully focused on the following:

- developing and implementing the two LERN call centers,
- building a voluntary network of acute care facilities, and
- encouraging EMS providers to use the LERN call centers to triage injured patients to appropriate hospitals in the regions where the call centers are operational.

The call centers are believed to be working well to improve prehospital triage in the regions where they are operational.

Because of policy choices and resource limitations, the LERN Board has not yet begun to address development of other major components of an inclusive regional trauma system. Active steps to develop and promulgate consistent rules and policy have also been hindered by a long history of local (parish level) political control and an intrinsic distrust of centralized state governmental.

Technically, the Louisiana trauma system has a lead agency with the authority to direct trauma system development and operation, however, no clear unified vision for what the overall Louisiana trauma system should look like has been developed. Without this unified vision, the energy and commitment of the many stakeholders has been insufficient to make significant progress in the development of the trauma system beyond the LERN regional call centers.

RECOMMENDATIONS

- **Develop a clear and focused written vision for the structure of an inclusive Louisiana trauma system and use it as the basis for an updated trauma plan.**
    - **Establish priorities for the sequential realization of the plan.**
- Establish the LERN Board, using its working groups in the role of advisory bodies, with responsibility to set broad system policy, develop central rules, and to approve region-specific rules brought forward from the regional commissions.
- Ensure that the LERN Board has the responsibility and authority to periodically review systemwide data to ensure proper system function and to ensure that the needs of the state are being met.
- Move the operational LERN infrastructure into the Department of Health and Hospitals to facilitate its operation as a regulatory lead agency, enabling clear lines of authority for daily operations, rule making and enforcement, and confidentiality protection for quality assurance data.
- Utilize the regional commissions to develop and promulgate the trauma systems approach, with appropriate local policies and procedures subject to LERN Board approval.

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

Louisiana was able to mobilize many stakeholders to support the legislation that authorized the LERN Board and development of a trauma system. Support was

further mobilized to pass the legislation for liability protection of emergency care providers that adhered to LERN triage guidelines. Current coalition member organizations include the Louisiana Hospital Association, the Louisiana Rural Ambulance Association, the Louisiana Association of Nationally Registered Emergency Medical Technicians, the Louisiana Stroke Task Force, and numerous state agencies, including the Emergency Medical Services for Children (EMSC) grant program. While many current stakeholders are listed, it is not apparent that all members of the legislative coalition have held together. For example, the trial attorneys were a key group supporting legislation, but they are not reflected in the current list of stakeholders.

The LERN Board has an official pediatric representative and official representation from the state Senate and House of Representatives. Not all organizations or key system participants are represented on the Board, including emergency nurses, a trauma center coordinator or manager, and a data trauma registrar. Nurses are members of the LERN Board only through their appointment as hospital administrators.

The LERN Board has invited some non-board members to participate on work groups. However, there is little opportunity for direct care providers to participate in development of the trauma system. Support may wane if more opportunities for broader participation are not offered. Additionally, EMS appears to be perceived as a transport system rather than being fully engaged participants in the trauma system. Relationships must be developed and sustained to maintain on-going support for trauma system development, support for new legislation, future appropriations, and increased voluntary participation.

The LERN Board has not developed a mechanism to communicate with the public or with direct care providers to keep them informed about the development of the trauma system. Presentations and reports to elected officials have been developed. No public education has yet been developed about the need for the trauma system.

RECOMMENDATIONS

- **Develop an active communication strategy to inform stakeholders, policy makers, and the public about the need for and evolution of the trauma system, perhaps including a listserv, newsletter, or website.**
- Recognize that many more stakeholders exist for the state trauma system than currently engaged, e.g., direct care providers (emergency nurses, EMS providers), the prevention community, disaster community, health insurance representatives, and the public (survivors and advocates).
- Identify roles for additional trauma system stakeholders in the development of system components. For example, trauma center registrars and EMS data managers need to be engaged in the work group focused on the new state trauma registry.

- Develop public relations and education programs to enhance public awareness of the value, current status, and planned development of the Louisiana trauma system, to ensure that the value of ongoing investment of public funds is clearly understood.

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 certification 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

LERN has the legislative authority to establish a strong infrastructure for overall planning and design of a comprehensive statewide trauma system. The state is to be commended for clearly identifying the process of appointing members to the LERN Board and for the establishment of nine regional commissions.

The lead agency for trauma system development has not been clearly identified and the current build out plan 2008 – 2012 is not a comprehensive inclusive trauma plan based on the national HRSA model. The LERN currently lacks sufficient funding to fully support inclusive trauma system development, maintenance, and sustainability to include addressing the issue of uncompensated care.

LERN has a fulltime medical director who is to be commended for his efforts of implementing and maintaining a statewide destination protocol used by the state's central call centers that determine patient triage destinations. However, the medical director's responsibilities relating to the medical oversight of a comprehensive trauma system are unclear.

LERN currently does not have two important persons necessary for a functional trauma system - a state trauma system manager and a state trauma registrar. While LERN does have an Executive Director, the job description does not reflect many of the responsibilities of a state trauma system manager. The state trauma registrar is scheduled to be employed as a part-time contractual position in 2010. The responsibilities for this position have not been defined and no job description is currently in place.

Currently, LERN is in the process of hiring staff to manage the infrastructure it has established. Most of the efforts of the existing staff are focused on providing the opportunity to collaborate and encourage the support of the trauma stakeholders in building a statewide inclusive trauma system. Having qualified staff at all levels with clearly defined roles is necessary for implementation of the build-out plan the LERN Board has adopted.

The role of LERN in the trauma system development is clear in state statutes; however, its role in integrating trauma care into all the hospitals and EMS system should be better defined. One strategy for this to be accomplished is through the review and revision of the build-out plan based on the stakeholder feedback. All hospitals and EMS agencies need to participate, and regional transfer agreements need to be developed to further improve this effort. No statewide air medical protocols are in place, and coordination of the air medical assets is limited.

The LERN has recently purchased a new trauma registry and EMS software program from Image Trend and purchased licenses for all participants in the program. Transition to the new system may be challenging since no requirement exists in rule for data submission by EMS agencies or hospitals. Until the new system is fully operational and participants are required to submit data, benchmarking and quality improvement efforts by the Trauma System are limited. Non-verified hospitals will need a person identified to collect and submit data to the state trauma registry before it can provide its maximum benefit.

Through LERN, the trauma system has a designated physician to provide medical oversight of the system. It is unclear how the LERN Medical Director interacts with the state EMS Medical Director and the two regional medical directors other than monitoring the call centers' destination protocol processes. The state EMS Medical Director is a member of LERN's Board. In spite of these formal relationships it was not clear to the site visit team who/how is overseeing the clinical aspects of care within prehospital and hospital agencies.

RECOMMENDATIONS

- Develop a job description and identify a state system trauma manager.
- Develop a job description and hire the state trauma registrar.
    - Increase the FTE allocation from 0.5 to 1.0
- Clearly define the roles and responsibilities of all the LERN employees.
- Identify a strategy to rapidly complete the hiring of trauma system personnel for the LERN that includes trauma system performance improvement, support for regional trauma education, and the development of an inclusive system that includes all facilities and specialty populations, pediatric trauma and burn.
- Review and revise the *Build-out Plan 2008-2012* to be consistent with the federal Health Resources and Services Administration model, the *Model Trauma System Planning and Evaluation* document.

Trauma System Plan

Purpose and Rationale

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

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

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

OPTIMAL ELEMENT

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

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

CURRENT STATUS

Louisiana has a published trauma system plan, referred to as the LERN System Plan that was developed by the LERN Board. Rather than building the plan on a completed inventory of trauma systemwide resources within each component and all phases of care, it appears to focus on a perceived lack of access to initial hospital trauma services in the ED phase of care.

A “Gap Analysis” has been done as a “Survey of Best Practices,” but whether these relate to all trauma system components and all phases of care is unclear. The degree to which the identified best practices were analyzed and used in developing the plan is also unclear. The “Gap Analysis” would seem to serve the purpose of a “needs assessment,” but no evidence was provided to support that.

The LERN Board is functionally the leadership entity by virtue of the enabling legislation. The trauma system was conceived as a “network,” and it functions as a voluntary public and private partnership to formulate and implement the plan. As currently proposed and presented, the plan contains few tangible incentives, and no requirements, funded or otherwise, for participation in LERN activities.

While the LERN Board seems to reflect representation from a generally broad stakeholder contingent, it is not apparent that all board members have a full understanding of the network or the Network Plan. However, the plan appears to be promoted among the LERN Board’s rank and file.

The plan is commendable and visionary in a number of aspects. It acknowledges the eventual need to address “time critical” conditions other than trauma, such as ST Elevation Mydocardial Infarction (STEMI) and stroke. It takes into account and attempts to overcome the realities of variable resources and variable commitment to trauma care across the state. The plan defines the LERN trauma patient to be managed and monitored. Most commendable is the effort to introduce the concept of central direction and allocation of resources, matching patient needs to existing available resources in a “real-time” fashion.

The plan is not comprehensive and does not clearly describe an inclusive trauma system design. It contains prehospital, hospital, communications, and data/performance improvement components, as well as a section devoted to LERN function and operations.

Currently, the published plan is limited in scope and focuses exclusively on management of prehospital patient triage and destination criteria primarily at the ED level of care. Creation of the LERN Call Centers (LCC) and a LERN Operations Center (LOC) are the cornerstone of this effort. The data collection initiative is focused on pre-hospital and ED process indicators, and for the most part they only include events up to disposition from the first ED.

The accompanying *Build-Out Plan 2008-2012* is essentially an implementation plan. This is much broader in scope and appears to address initiatives and goals for a complete set of trauma administrative and clinical components. However, the building blocks appear to be nebulous and vague, priorities within and between components are not identified, and the timelines for completion of tasks are ambitious and may not be feasible.

The LERN plan is based on a governance structure composed of a Board and 9 Regional Commissions which are supported by an Executive Director (RN, MBA), a Program Manager, an Administrative Assistant, a Medical Director, 2 regional Medical Directors, a QI/PI Systems Director/Administrative Director (RN), three tri-regional coordinators (RNs), and a Program Monitor. The LERN Medical Director has an Emergency Medicine background. He is enthusiastic, energetic, clearly dedicated, and maintains a clinical practice in addition to substantial administrative duties. The Medical Director, along with the LERN Board and Regional Commissions, has been responsible for the implementation of prehospital destination guidelines and the establishment of LCC's and the LOC. This process has essentially been one of cajoling EMS agencies and hospital EDs to participate. No objective data exist to support the premise that participation in LERN has a tangible benefit to the EMS agencies, hospitals and their EDs, or to patients.

The plan does provide for certain sanctions associated with non-compliance; however, the ability to enforce these sanctions and the implications for network operations and patient care and outcome are unclear. LERN has little ability to monitor the degree and nature of noncompliance with the current terms of hospital and EMS agency participation.

Cited impediments to implementation of the plan include: funding, inexperience of the leadership, failure to engender a team mentality among the stakeholders, and lack of identity or "branding" of LERN within DHH, or among the medical community and the public. Other significant confounding factors may be the need for clear leadership of the process, a clear vision for the implementation process,

as well as overcoming reticence to enact mandates and standards and the lack of political will.

RECOMMENDATIONS

- **Rewrite of the LERN (system) plan to encompass broader scope of system components with additional detail.**
    - Use the HRSA Model Trauma System planning and evaluation document as a guide.
- Use the authority vested in the LERN Board to selectively, strategically, and sensitively impose minimum mandates and standards.
- Prioritize financial and other resources to initiate additional aspects of the trauma system beyond the communication and hospital destination system design and operation.

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

LERN has inconsistent and, in some cases, non-exist integration of trauma system resources, disciplines, data, phases of care, and components both in the current operations and the LERN System Plan. The plan itself does not recognize or address the need for, and a strategy to achieve, these essential linkages. This lack of integration exists within and between the public health domains of primary, secondary, and tertiary prevention as well.

As LERN is a direct result of lessons learned from a natural disaster, it is no surprise that emergency preparedness integration is acknowledged as essential, and it is evident in the plan. This may also explain the prioritization of efforts to identify available initial trauma care resources and route patients with identified resource needs to hospitals that are able to meet them in a timely fashion. However, even participation by all providers in this important process is fragmented.

The LERN leadership organizational structure and perceived intent does seem to reflect the need for integration, as reflected by language in the vision statement and plan referring to other “time-sensitive” conditions. It is also reflected by the apparent intent to embrace all clinical providers as part of the LERN Network. The LERN Board and Regional Commissions are relatively complete, and representation on these boards reflects continuity of care and other nonclinical components of a trauma system. Despite the apparent intent for integration, the culture of traditional trauma stakeholders, and their practice and operations, continues to reflect a “silo” approach rather than one of horizontal integration. Most potential trauma system participants appear to be skeptical of, unfamiliar with, or unconvinced of the benefits associated with a team approach.

Conversely, some of the barriers to comprehensive integration may be the result of the LERN leadership’s failure to recognize the importance of including certain nontraditional stakeholders in the LERN and its planning process. Examples of nontraditional stakeholders include mental health, social services, child protective services, public safety, the research community, and representation from EMS and trauma systems in surrounding states. An issue may also exist with the clarity of mission, vision, and strategies to accomplish these linkages in a manner supporting a spirit of participation.

RECOMMENDATIONS

- **Develop an active communication strategy to inform stakeholders, policy makers, and the public about the need for and evolution of the trauma system, perhaps including a listserv, newsletter, or website.**

- **Assess the current trauma system stakeholders and identify needs for additional participants or increased participation by existing member groups.**
    - **Consider adding a position(s) on the LERN Board or LERN work groups for an intensive care physician, cardiologist, neurologist, family practitioner, emergency nurse, social work representative, and citizen-at-large.**
    - **Encourage participation in the planning and operation of the trauma system by representatives from EMS and trauma systems of surrounding states.**
- Develop a public information and education program specifically intended to recruit new and pertinent stakeholders.
- Fill the designated rehabilitation position on the LERN Board.
- Revise the LERN plan to include intended roles of mental health, social services, child protective services, etc.
- Provide more visibility for law enforcement, fire, and public safety individually rather than under the umbrella of the Homeland Security at the LERN Board level.

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

Louisiana is fortunate to have state appropriation funding to support the infrastructure of the state's trauma system planning and development. Although facing some reduction from prior funding levels, LERN anticipates that it will receive 3.6 million dollars of state funding for the fiscal year beginning July 1, 2009.

Given the number of stakeholders serving on the LERN Board and the nine regional commissions, the LERN has many opportunities to obtain funding from a number of sources in addition to the state allocation. The LERN needs to aggressively seek and take optimal advantage of available resources that can be used to support the trauma system. Examples include multiple federal funding sources

- Hospital Preparedness Grant funds through the Health and Human Services Assistant Secretary for Preparedness and Response (ASPR) program,
- Centers for Disease Control (CDC) Surge Capacity Building Grant,
- Homeland Security Grant,
- Rural Health Flex Grant Program,
- Department of Transportation 402 and 408 funding, and
- HRSA EMSC Grant.

In addition, the LERN needs to be aggressive in seeking any available private foundation funding to support its goals and objectives.

The legislative authority to establish LERN also provides authority to develop and implement a comprehensive statewide trauma system. The LERN could develop a strategy for distributing funds from such grants to many of the stakeholders implementing the vision of reducing morbidity and mortality statewide. Unfortunately, many of the federal funding sources provide only short term assistance, but they would be beneficial until more sustainable state resources are available.

The new trauma registry should include a mechanism to collect financial data regarding trauma patients, and it is essential that all the hospitals participate in the trauma registry to enhance the ability to obtain actual costs of uncompensated care and to support the system in financial planning.

RECOMMENDATIONS

- **Determine a methodology for providing financial assistance for hospitals certified by the state as trauma centers to assist with the cost of readiness and uncompensated care.**
- Develop a strategy to seek all available revenue resources to support and sustain the trauma system.

Trauma System Assurance

Prevention and Outreach

Purpose and Rationale

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

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

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

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

OPTIMAL ELEMENTS

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

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

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

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

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

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

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

CURRENT STATUS

Injury prevention and outreach is a significant focus for Louisiana. The DHH State Health Officer is an advocate for prevention. The state's Injury Research and Prevention Program (IRPP) has epidemiology and program coordination support. The state currently has a CDC Injury Core Surveillance grant. An Injury Community Planning Group was formed and members participate on several committees.

Louisiana has developed an Injury Prevention Plan that is due to be released in the summer of 2009. In partnership with the Injury Community Planning Group specific injury prevention priorities have been identified in the plan, and include the following mechanisms of injury: motor vehicle (teen and distracted driving), falls in elderly and children, poisoning, TBI, and sexual violence. Many public education materials have been developed for these priority prevention topics. The state has engaged in many statewide injury prevention activities.

The LERN statute provides the authority to establish a "network and plan for implementation of regional injury prevention programs." To date, LERN has not initiated any activities in injury prevention. An educator will be hired as a mechanism for LERN to address injury prevention, but this individual will have many responsibilities and may have limited time to integrate injury prevention into LERN activities.

As LERN does begin to integrate injury prevention into the overall trauma system, efforts should be made to avoid duplication of effort and to collaborate with the state IRPP.

RECOMMENDATIONS

- Establish a relationship with the state Injury Research and Prevention Program and attend the injury prevention advisory committee meeting.
- Support the Injury Research and Prevention Program in building a comprehensive infrastructure for injury prevention and in addressing the injury prevention priorities outlined in the new Louisiana Injury Prevention Plan.
- Initiate discussions with the Injury Research and Prevention Program regarding how LERN can collaborate with state program goals and meet LERN statutory requirements regarding prevention.

Emergency Medical Services

Purpose and Rationale

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

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

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

discussion of in-field (primary) triage criteria is provided in the section titled: System Coordination and Patient Flow (p 20) (White Book).

Human Resources

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

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

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

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

Integration of EMS Within the Trauma System

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

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

OPTIMAL ELEMENTS

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

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

b. There is a clearly defined, cooperative, and ongoing relationship between the trauma specialty physician leaders (for example, trauma medical

director within each trauma center) and the EMS system medical director. **(I-302.2)**

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

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

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

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

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

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

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

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

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

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

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

CURRENT STATUS

The BEMS is based in the Louisiana DHH. One of the BEMS' main responsibilities is to certify and re-certify Emergency Medical Technicians (EMTs). This responsibility also extends to taking disciplinary action, including revoking an EMT's certification to practice in the state. The state certifies three levels of EMTs: EMT Basic, EMT Intermediate, and Advanced EMT. The state certification process includes a passing grade on the National Registry for Emergency Medical Technicians (NREMT) exam, and a practical exam provided by one of 11 physician examiners.

The LERN has no specific plan for working with the BEMS to ensure that certified EMTs have appropriate knowledge and skill levels for the provision of trauma care, including pediatric trauma. LERN also has no specific plans to facilitate adult and pediatric trauma education for EMTs in co-operation with the BEMS and/or other organizations.

By statute, the BEMS has the authority to promulgate rules and guidelines for prehospital care. This can be done only after a protocol has been approved by the State Medical Society Committee on EMS. Currently, no state protocols exist related to trauma care, including destination/transport protocols.

Each EMS provider agency, regardless of level of service, must have a medical director. The medical director is responsible for developing treatment protocols that must be reviewed and approved by the local parish medical society before they can be used. The LERN addresses this decentralized approach to protocol development and implementation through its regional commissions. The regional commission approach may be inefficient compared to a "top down" approach that would have treatment protocols approved by the State Medical Society with subsequent promulgation of rules or guidelines by the BEMS. Participants expressed the opinion that a "top down" approach would not be well received by EMS agencies throughout the state. Such viewpoints may be a major reason why

statewide EMS treatment and destination protocols for trauma, or any other medical problem, do not exist.

LERN asks EMS agencies to voluntarily sign an MOU for following LCC directions regarding the destination and transport of injured patients meeting criteria and for the submission of data. However, unlike the operating procedures for participating hospitals, no specific steps are described about actions that will be taken if an activity standard is breached by a prehospital agency. The LERN documentation acknowledges the importance of performance improvement (PI), and provides some general guidelines that will be used. However, no specific plan regarding prehospital performance improvement loop closure processes has been described or developed.

The DHH Health Standards Section licenses ambulances. Municipalities and other local governing authorities may regulate privately operated ambulance agencies and the services they provide. No description was provided as to how LERN plans to work with the DHH Health Standards Section to ensure that ambulances are appropriately equipped to care for adult and pediatric trauma patients.

The structure of EMS response is variable across the state. In general, initial patient assessment and care is provided by non-paramedic level providers with transport provided by paramedics. All parishes have access to paramedic services. Participants stated that in general patients are taken to the nearest "appropriate hospital." EMS agencies in parishes that border other states frequently have agreements with bordering states regarding the transport and care of emergency patients. If directed by medical control, EMS providers may bypass the closest hospital and transport the patient to another hospital, including hospitals located outside the parish.

Resources for trauma care are very heterogeneous throughout the state, and are particularly sparse in rural areas. Furthermore, the resources for trauma care at a given hospital may vary on a daily basis. The result is a major challenge for efficient trauma patient transport, particularly for rural EMS agencies. Participants reported that EMS providers have been in situations in which they may transport a patient to a hospital that will not accept the patient because the hospital does not have the resources at that time to appropriately care for the patient. This would increase the time it takes for a trauma patient to receive definitive care. This also increases the amount of time an ambulance is unavailable to respond to a new call.

The two LERN call centers (LCCs), operationally directing patients for the entire state are an innovative way to address the challenge of timely transport to the most appropriate hospital. The LCCs have up-to-date information on the trauma care resources for all participating LERN hospitals in the region. Prehospital

care providers can contact the LCC when they have an injured patient meeting triage criteria, and immediately be directed to the closest appropriate hospital.

LERN has developed a clear destination protocol. Discussions with LERN leadership, indicates that LERN also hopes to develop and implement prehospital treatment protocols that are approved by local parish medical societies. However, the method or timeline for developing these protocols were not explicitly stated.

Louisiana has 6 air ambulance services that provide care for trauma victims in the state, and one is based in Jackson, Mississippi. State protocols or guidelines for when to activate air medical transport in the prehospital setting do not exist. In some parishes, first responders may be authorized to request air medical transport without contacting on-line medical control. Once under the care of the air medical team, the hospital destination is determined by that service's guidelines, protocols, or medical direction. LERN provided no specific plans for addressing the appropriate and efficient air medical transport of prehospital trauma patients.

Except for some very limited information regarding air medical services, no data regarding the quantity, characteristics, and distribution of prehospital care resources were provided by LERN, the BEMS, or the DHH Health Standards Section. Such information is essential to determine if transportation resources are sufficient and coordinated to ensure that EMS providers arrive at the scene promptly and expeditiously transport the patient to the correct hospital by the correct transportation mode. Participants stated that they were unaware of any recent EMS resource assessment that had been conducted.

RECOMMENDATIONS

- **Establish minimum statewide prehospital care treatment protocols in collaboration between LERN and Bureau of EMS.**
    - **Include a plan for how these protocols will be operationalized by the LCCs and Regional Commissions.**
- **Complete a prehospital care resources assessment that includes air medical transport resources.**
    - **Determine if sufficient and well-coordinated transportation resources exist to ensure that EMS providers arrive at the scene promptly and expeditiously transport the patient to the correct hospital by the correct transportation mode.**
    - **Close gaps as they are identified.**
- Develop and implement a plan that describes how LERN will work with the Department of Health and Hospitals on issues of prehospital certification,

education, protocol development, and ambulance licensing standards to promote the optimal care of adult and pediatric trauma patients.

- Develop and implement a plan for PI activities that will be conducted at the prehospital agency and individual provider level. This should include the development and enforcement of compliance policies.

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 certified 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 certified 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 certification.

Certification 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 certified 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 certified trauma facility. The number of trauma centers by level of certification 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 certified 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 Certified Trauma Facilities Within the Trauma System

Certified 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 certified 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 noncertified transferring centers), including region specific primary (field) and secondary (early transfer) triage protocols. The highest level trauma facilities should provide leadership of the regional trauma committees through their trauma program medical leadership. These medical leaders, through their activities on these committees, can assist the lead agency and help ensure that deficiencies in the quality of care within the system, relative to national standards, are recognized and corrected. Educational outreach by these higher levels centers should be used when appropriate to help achieve this goal.

OPTIMAL ELEMENTS

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

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

II. To maintain its state, regional, or local certification, 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 certified 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

According to the LERN, Louisiana has 118 acute care facilities that provide emergency services. Of these, 27 are critical access hospitals. The DHH certifies trauma centers based upon their level of and ability to maintain ACS verification. At the time of the trauma system consultation (TSC) visit, the state had one ACS-verified level 1 trauma center and 1 center currently pending focused review for re-verification as a level 1 center. These centers are located in cities and separated by approximately 240 nautical air miles or 350 highway miles. The state has no other ACS-verified trauma centers, and thus no other state certified trauma centers.

Currently, no unified statewide trauma system for the hospital-based phase of care exists. Two defacto exclusive trauma systems function in the areas surrounding the state's two trauma centers - one centered around New Orleans (primarily DHH/LERN region 1, and parts of regions 2, 3, and 9) and one centered around Shreveport (primarily region 7). Within these two areas, injured patients bypass local hospitals and are taken to the trauma center, based upon established EMS practice rather than explicit policy. Hospital-based PI, EMS education, and outreach are conducted under the ACS verification requirements. Participants, both hospital and EMS representatives, expressed their belief that these trauma systems currently function fairly well, however no data to substantiate this was provided to site visitors. It is estimated that these two trauma systems serve about 1.6 million people (35% of the state's population). The New Orleans metropolitan area has a population of 1.2 million, and the Shreveport metropolitan area has a population of 390,000.

In areas distant from the two trauma centers, injured patients have historically been transported to the closest facility, or to the facility believed to be the most appropriate by the transporting EMS personnel. EMS providers had no consistent policy guidance or a true ability to match patients to available resources.

Few hospitals have demonstrated a full-time, consistent commitment to trauma care, and thus, little or no uniformity or predictability exists regarding resource availability across facilities or even within a single facility over time. No data exist from which individual outcomes can be measured, but the potential for both significant delays in care and suboptimal care is substantial.

A greater concern in this voluntary scheme is the ability of hospitals, once they have signed a memorandum of understanding (MOU), to participate at a certain level of care. Hospitals are allowed to change their level of service and capability to accept certain patients on a daily basis, or even more frequently. This is the antithesis of a system. While it is somewhat commendable to deal with resource realities, the constant reconfiguration of patient flow patterns may, in the end, prove more costly and inefficient, and it may potentially undermine patient outcome and the "greater good". Consideration of more stringent compliance with the pledged level of service(s) may become necessary.

Since its formation, LERN has recruited 78 hospitals, located primarily in the 6 DHH/LERN regions distant from a trauma center, to participate in a voluntary centralized dispatch program. Under this program, patients meeting activation criteria based upon ACS standards are matched to available facilities by one of two regional LERN call centers (LCCs). Destination decisions are made by paramedic LCC staff using frequently updated information provided by hospitals about resources available. The LERN call center paramedic attempts to match the patient's needs to the closest hospital within the region that can provide the necessary resources. It was indicated to the site visit team that, at the time of the consultative visit, no functional policy exists for EMS transport out of the region. Additionally, it was stated that, if no hospital within the region has undergone designation as a trauma center, then patients are assigned to a given hospital by rotation. LERN reported that they have developed an interregional transfer agreement to transport patients outside of the region when definitive care resources are unavailable. An implementation plan is, reportedly, being developed to educate on the use of the statewide transfer protocol.

Since the inception of the LCC, EMS providers have felt that it has greatly improved EMS efficiency, shortened transport times, and generally provided better patient matching to appropriate facilities. Individual EMS units are no longer forced to search for an accepting hospital, or to transport to a nearby hospital that does not have the necessary resources.

In establishing this system, LERN conducted an inventory of hospital resources through a self-reported questionnaire. On the basis of information provided, participating hospitals have been "categorized" as level 2, 3, or 4, roughly based upon ACS criteria for hospital trauma center verification. The accuracy of hospital self-reporting is not verified by LERN, and hospitals are allowed to modify their status based upon resource availability at any given time. The

hospital level of categorization and the real-time modifications are tracked on a web-based application, and this information is used by the LERN call center paramedics for destination decisions. LERN tracks a set of system performance indicators, which enables some assessment of outcomes such as transport time and disposition of patients from the destination hospital ED. Hospital data are not collected, and thus, patient outcomes cannot be tracked.

The centralized triage and destination function of the LCCs is strongly felt to have improved the prehospital phase of care in the regions where it is active, primarily outside of the spheres of influence of the two established centers. The LERN leadership has specifically refrained from any process of ensuring the resource availability of destination hospitals, and it has limited authority for transporting patients across regional borders. Therefore, the patients are more effectively triaged, but they are most often sent to hospitals with inconsistent and unverified ability to provide appropriate trauma care. This problem is complicated by a lack of established guidelines for the transfer of trauma patients to a higher level of care, a decision made by individual providers at a given facility. However, recently developed interregional transfer protocols exist as approved by the LERN Board in June 2009 which, when fully implemented could help address some of these issues.

LERN has no established system to ensure consistent standards of resource availability, staffing, staff training, or ongoing education within the participating hospitals. Similarly, no established system for quality assurance and ongoing verification of self-designated capabilities is operational.

RECOMMENDATIONS

- **Establish rules for trauma center certification that ensure level-appropriate resources are consistently available at all times.**
    - **All hospitals should be a participating trauma hospital certified at an appropriate and sustainable level.**
    - **ACS standards for trauma center verification at levels I, II, and III are a reasonable starting point.**
    - **One or two lower certification levels should be established to allow facilities without significant surgical or inpatient resources to be categorized as participating trauma hospitals and to serve as points for stabilization and transfer.**
- **Eliminate the ability of participant hospitals to vacillate with regard to a certified level of service.**
- **Develop and certify at least one or two additional level I or level II trauma centers that are geographically located to improve trauma center access.**

- Establish a process for ongoing verification that ensures that standards for certification are being met, and that the level of trauma center certification remains appropriate.
- Require all hospitals that provide emergency care to be certified as a trauma center at an appropriate level.
- Establish trauma center level-specific requirements for collection and submission of hospital data.
- Develop consistent policy guidelines for LERN call centers to determine appropriate destination based upon trauma center certification, including the ability to transfer appropriate patients beyond regional boundaries to appropriate facilities.
- Develop consistent policy guidelines for transfer of patients between participating trauma hospitals and trauma centers based upon patient need for higher level of care.
- Encourage the development and certification of at least one pediatric trauma center.

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 certified 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 noncertified or level III to V centers provides an opportunity to limit the transfer of only the most severely injured patients to Level I or II facilities, thus preserving a limited resource for patients most in need. It also provides patients with lesser injuries the possibility of being cared for within their community.

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

well as the rates of primary and secondary overtriage basis, and corrective actions should be instituted when problems are identified. Data derived from tracking and monitoring the timeliness of access to a level of trauma care commensurate with injury type and severity should be used to help define optimal system configuration.

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

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

OPTIMAL ELEMENTS

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

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

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

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

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

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

CURRENT STATUS

As a result of internal and external assessments after the Katrina and Rita hurricanes, the state of Louisiana established LERN. The LERN provides oversight to 9 regional commissions. In order to expedite the rapid and appropriate transfer and transport of major trauma patients within these regions, LERN has established LERN Call Centers (LCCs). The LCCs are staffed 24/7 by paramedics. LERN has placed major emphasis on prehospital and interfacility transfers, but little attention has been paid to patient flow past ED disposition at this time.

Theoretically, EMS agencies and EDs can use the LCCs to assess available hospital resources, matching the patient's needs with the facility that can best meet the needs of the patient. This concept serves as a model in getting the right patient to the right facility at the right time. The LCCs are designed to eliminate factors which result in transports to inappropriate destinations and prolonged times to those destinations. The LERN obviates the need for EMS personnel and referring facilities to shop for the right destination when the resources to provide for appropriate treatment of the major trauma patient are not readily available.

The LCCs are the foundation of the LERN operations and function as described below in the following patient flow scenario:

- Injury occurs
- 911 is called
- 911 dispatches the EMS unit
- Primary triage is conducted by EMS providers
- LCC is contacted if the patient meets the LERN Entry Criteria
- Secondary triage is performed by EMS providers with LCC assistance
- The LCC determines the hospital availability status and the patient's destination
- Patched communications link EMS providers with the receiving facility for on- line medical direction
- The transport is initiated
- Patient care transferred to hospital
- Patient care record is completed and reported to the Emergency Resources Information System (ERIS). ImageTrend Software was purchased to function as the ERIS.

Presumably a similar scenario could occur with an ED physician initiating a call to find a hospital with resources matching the patient's needs. The referring ED would then coordinate inter-facility transfer of the patient.

LERN has established prehospital and hospital triage protocols based on the ACS's field triage guidelines. A standard destination protocol has also been established to match LERN Entry Criteria. Specialty care criteria for pediatrics, burns, and SCI were not evident. The purpose of the protocols is to facilitate appropriate, timely field and interfacility triage and transport. However, field triage protocols may vary. The parish medical societies have the authority to approve and modify triage protocols. In addition, it is not mandatory for hospitals and EMS agencies to follow the guidelines. Standardized air medical activation guidelines do not exist.

Currently, 80% of hospitals are reported to participate in LERN through an MOU process for hospitals. EMS agencies participate through a similar process of written agreements with LERN. This MOU process seeks to assure that LERN patients are identified, protocols are followed, and data are acquired and submitted to the ERIS.

After an EMS provider contacts the LCC for the patient destination and confirms that the patient is a major trauma patient through minimal secondary triage, the LCC paramedic has the capability of patching the EMS provider directly to the destination hospital for on-line medical control. The LCC has redundant communications capabilities including: 800/700 MHz, cell phones, satellite phones, Ham radios, voice over Internet protocol (VoIP), and internet.

RECOMMENDATIONS

- Evaluate compliance with triage guidelines and appropriateness of trauma patient transports and transfers.
- Regularly assess the patient entry criteria for the major trauma patient.
- Establish a mechanism to monitor the flow of the major trauma patient throughout the continuum of care, including the phase of acute care as well as specialty care and rehabilitation.
- Use the Emergency Resources Information System (ERIS) system to assess the frequency of hospital unavailability and reasons for diversion status.
- Ensure patients requiring specialty care, such as pediatrics, burns, and spinal cord are included in the Patient Entry Criteria destination protocol for inter-facility transfers.
- Define a process to measure patient outcomes relative to trauma patient transfers.

- Develop standardized air activation guidelines, in collaboration with stakeholders and the EMS Office, to expedite scene transports or intercepts.
- Develop criteria to repatriate patients back to community hospitals.
- Develop and implement strategies to expedite and facilitate the efficiency of patient throughput at hospital level institute measures to decrease length of stay in ED, ICU, floor and rehabilitation.

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 certified 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

Rehabilitation is not currently integrated into the LERN, and minimal efforts have been made to embrace these providers to date. The state has approximately 56 in-patient rehabilitation services. It is estimated that two-thirds of these services are located in acute care hospitals and the remaining one-third are free-standing facilities. Ten services are Commission on Accreditation of Rehabilitation Facilities (CARF) accredited. Two rehabilitation services have specific TBI capabilities, one has specific SCI capabilities, and one service cares for pediatric patients. The rehabilitation unit at the level I trauma center has not been functional since hurricane Katrina, but it was reported that the rehabilitation unit may be reinitiated.

None of the rehabilitation services were reported to have ventilator rehabilitation or ventilator-weaning capabilities. Ventilator patients are transferred from acute care hospitals to long term acute care facilities (LTACs) for weaning, and others are transferred out-of-state for rehabilitation depending on bed availability and payer status. Little is known about the availability of outpatient and home rehabilitation services. The number of physical medicine and rehabilitation (PM & R) physicians and their locations were not reported.

Rehabilitation services and patient evaluations by PM & R physicians are reportedly initiated in an appropriate and timely fashion at the level I and pending level I trauma centers. However, little is known about rehabilitation practices at non-trauma centers and community hospitals.

Participants reported that inadequate rehabilitation services and beds are available within the state. As occurs nationally, access to rehabilitation services is limited by payer status, and difficulties moving patients to rehabilitation often creates a “log jam” in acute care hospitals. This problem may be accentuated in Louisiana given the absence of a rehabilitation service that accepts ventilated patients.

When queried as to incentives which would foster rehabilitation participation in the LERN, the rehabilitation representatives placed priority emphasis on reimbursement. Rehabilitation services do not have access to “disproportionate share” funds as the state does not have a system of “charity” rehabilitation services that parallels the acute care hospital system.

The availability and quality of rehabilitation data are unknown except, perhaps, at the CARF-accredited facilities. The *Build Out Plan 2008-2012* does not address rehabilitation and related activities.

RECOMMENDATIONS

- Fill the designated rehabilitation position on LERN Board.
- Assemble a Rehabilitation Work Group so that rehabilitation professionals are fully integrated into the state trauma system.
- Conduct an inventory and characterize hospital-based rehabilitation units and free-standing rehabilitation services in the state and bordering states, much the same as has been done with acute care hospitals.
    - Include long term acute care hospitals in the inventory.
- Construct a system to match available rehabilitation resources to patient needs, similar to that process used to categorize hospital resources for trauma care.
    - Consider mandatory participation in LERN rather than the memorandum of understanding process that permits facilities to vacillate between levels of service
- Facilitate the development of interfacility agreements for hospitals to transfer patients to rehabilitation centers providing specialized care for spinal cord injury (SCI) and traumatic brain injury (TBI) rehabilitation.
- Determine a minimum rehabilitation data set with a data dictionary for the state's trauma registry.
- Identify potential financial and other incentives for rehabilitation services to provide care for trauma patients that meet LERN entry criteria.
    - Consider legislation to allow for rehabilitation services to access disproportionate share funds as one potential incentive.
- Assess the need for and a strategy to acquire ventilator rehabilitation capabilities within the state.

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 noncertified 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

Legislation was passed, without accompanying funding, for the formation of LERN in 2004. However, it was not until 2006, out of the tragedy associated with the Katrina and Rita hurricanes, that legislation was passed funding LERN to begin development. One objective of LERN is to facilitate and ensure that the victims of a disaster are appropriately triaged and expeditiously transported to a facility available and capable to meet their needs. The Legislature was unable to fully fund LERN, in part due to the current economic conditions.

The LERN concept is emerging as a model for ensuring hospital and prehospital resources are integrated and ready to respond in the event of a disaster. The daily operations of the LCCs allow for the basic infrastructure to be in place,

enabling the coordination and communication between hospitals and EMS providers to direct mass casualty patient flow. Essentially, the system is designed to ensure that the right patient gets to the right facility, at the right time. This is a basic tenant of trauma system design. However, all EMS providers, all hospitals (including rehabilitation), and all injured patients need to be participants in this vision for the trauma system to be inclusive and effective. For disaster preparedness, this perspective is essential in order to appropriately triage, treat, and transport patients with minor and moderate injuries, as well as, patients with major injuries.

The state is to be commended for its extensive assessment and mitigation efforts for disaster preparation and response. Both internal and external disaster reviews were completed. In addition to the establishment of LERN, the state legislature recently passed the Uniform Emergency Volunteer Health Practitioners Act, which has been sent to the Governor for signing. This will place Louisiana in an elite group of states, joining Arkansas, North Dakota, Oregon, and Oklahoma.

The role and function LERN will play in the state's incident command (IC) structure is unclear, not fully defined, and perhaps not fully realized. LERN currently has no role in providing personnel, equipment, or supplies. However, LERN has participated in regional exercises and has the inherent capability to provide real-time information for trauma services and resources. Through the LCCs, patients are assessed based on initial information from the field and established criteria, then routed to the most appropriate facility for definitive care. This is an obvious disaster response capability and function. The LCCs have the ability to assess real-time capabilities of hospitals that submit data to the EMsystem used for disaster preparedness. Ensuring that data entry is timely and accurate is essential to successfully match patients to appropriate resources for stabilization or definitive care.

The LCC's have redundant communications capabilities which include: 800/700 MHz radios, land line phones, satellite radios, HAM radios, cell phones, internet, and voice over Internet Protocol (VoIP). They have interoperability capabilities and can patch the EMS provider directly to the destination facility.
Within the Build Out Plan 2008-2012, LERN has established priorities for disaster preparedness specific to trauma system development. LERN has established a mass casualty incident (MCI) plan and uses the red, yellow, green methodology for disaster triage. EMS and hospitals appear to be familiar with that system and have trained and exercised using these disaster triage criteria. It was unclear how patients are tagged after triage, if it is standardized, and if there is a system in place to track patients throughout the continuum of emergency care.

RECOMMENDATIONS

- Fully fund LERN to ensure a well integrated emergency healthcare delivery system is adequately prepared to respond to disasters.
- Actively pursue opportunities for LERN leadership to have a “seat at the table” for state and regional disaster planning.
- Collaborate with the Hospital Preparedness Program (ASPR grant) and Department of Homeland Security to address gaps and needed resources for the trauma system.
- Establish clear roles for LERN within Emergency Support Function-8 (ESF-8) and the state incident command structure.
- Prioritize implementation of all the planned LCCs to enable effective routing of patients throughout the 9 regions in the event of a disaster.
- Ensure the LERN call centers have the capability and resources to “surge up” in the event of a disaster.
- Assess the timeliness of data entry of hospital resources into the EMsystem.
- Regularly assess the unavailability status of hospitals.
- Enhance the patient entry criteria to adequately manage the routing of burn patients in the event of a disaster.
- Regularly exercise the disaster response capabilities of the LERN call centers and the LERN Operations Center.
- Strive to meet the deadlines for the Disaster Preparedness Key Measures of Success identified in the LERN *Build Out Plan 2008-2012*.
- Secure funding to support training, conduct exercises, and acquire the necessary resources to support the trauma system in the event of a disaster.

System-wide Evaluation and Quality Assurance

Purpose and Rationale

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

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

To promote participation and sustainability, the lead agency should associate accountability for achieving defined goals and trauma system performance indicators with meaningful incentives that will act to cement the support of key constituents in the health care community and general population. For example, the costs and benefits of the trauma system as they relate to reducing mortality or decreasing years of productive life lost may make the value of promoting trauma system development more tangible. A facility that achieves trauma center verification/certification 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

To date, system performance improvement (PI) has been limited to measuring the impact and efficiencies of the LCC's. One small study indicated time-to-transfer arrangements between a smaller facility and definitive care was reduced by an average of 1 hour and 55 minutes, based on previously reported time-to-transfer baselines. Such efficiencies, if sustained systemwide, have the potential to significantly impact patient outcomes for the subset of patients requiring high levels of trauma care. Unfortunately, due to the current unavailability of clinical data, that assumption cannot be confirmed.

As noted elsewhere, the LERN Board is to be commended for the establishment of centralized destination determination. This function is often missing in other statewide systems. However, until regions 1 and 7 are fully engaged in the system, a full understanding of the potential impact of the LCC process on the appropriate routing of injured patients cannot be fully assessed. Care should be exercised during the process of bringing regions 1 and 7 into the LCC system to ensure that existing routing systems are not disrupted, as local stakeholders report they are working well.

System monitoring and evaluation functions have been assigned to the LERN Board's Design System Work Group. To date, no clinical evaluations have been conducted. This work group should examine the ERIS database to determine if

the physiologic parameters included in the 65 data elements are recorded. Initial PI indicators could revolve around ensuring the consistent capture of key data elements and inter-rater reliability testing concerning incoming data at the LCC.

Some TSC participants have knowledge of, and access to, datasets pertaining to injury in Louisiana. While the LERN Board and stakeholders await the full implementation of a statewide trauma registry, other datasets, such as UB04 and crash data, should be explored to answer fundamental questions concerning injury in Louisiana. While these datasets may have limitations, they serve as potential portals that could further describe the injury problem, response, and outcomes in Louisiana.

It was broadly assumed that the verified level I trauma center and the facility awaiting ACS verification participate in PI activities. These activities were described as being both intra-facility and inter-facility in nature. Regularly scheduled, multidisciplinary, system PI occurring on a regional or subregional level was not described by either facility. Performance improvement among self-designated facilities at any level was not described nor is it monitored.

EMS agency PI was stated to be the responsibility of the local medical director. It is unclear how that medical director or agency personnel would routinely be engaged in trauma system PI activities.

The participants expressed a need to wait for the implementation of the trauma registry and EMS data systems prior to full trauma system PI activities. Delays in the initiation of PI activities while waiting for the perceived optimal system monitoring are not in the best interest of either the developing trauma system or the citizens of Louisiana. Challenges that will likely further delay trauma system PI activities once the trauma registry and EMS data systems are in place include the following: data submission is not currently required, and the data input and reporting processes are untested.

Concerns regarding discoverability were noted to be an impediment to system PI activities. The need for clarification and potential change in protective statutes was, likewise, noted.

RECOMMENDATIONS

- Charge the Design the System Work Group with the development of a minimal number of performance improvement measures that can be answered with existing LERN call center data, longitudinal examination of other existing datasets, or by existing trauma registry data.
- Implement and report those measures.
- Identify the initial priority trauma system measures to be evaluated as the trauma registry and EMS data systems begin to be populated.

- Begin system measure monitoring at the earliest possible point in the trauma registry and /EMS data system implementation.

Trauma Management Information Systems

Purpose and Rationale

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

The lead agency should maintain oversight of the information system. In doing so, it must define the roles and responsibilities for agencies and institutions regarding data collection and outline processes to evaluate the quality, timeliness, and completeness of data. There must be some means to ensure patient and provider confidentiality is in keeping with federal regulations. The agency must also develop policies and procedures to facilitate and encourage injury surveillance and trauma care research using data derived from the trauma MIS. There are key features of regional trauma MISs that enhance their usefulness as a means to evaluate the quality of care provided within a system. Patient information collected within the management system must be standardized to ensure that noted variations in care can be characterized in a similar manner across differing geographic regions, facilities, and EMS agencies. The composition of patients and injuries included in local registries (inclusion criteria) should be consistent across centers, allowing for the evaluation of processes and outcomes among similar patient groups. Many regions limit their information systems to trauma centers. However, the optimal approach is to collect data from all acute care facilities within the region. Limiting required data submission to hospitals certified 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

Except at the verified level I and the pending level I trauma centers, no trauma registry data are available for system planning, development, monitoring, PI, or research. Additionally, the lack of a unified, electronic prehospital database further exacerbates the trauma system's inability to capture essential data on the quantity, location, severity, disposition, and outcome of injured patients in Louisiana. The recent purchase of web-based software for both trauma registry and prehospital patient care records will, over time, provide a wealth of information that will help fill this important information void.

The TSC participants confirmed that they felt engaged and informed during the development and evaluation of the request for proposal for the trauma registry and prehospital software systems. Issues pertaining to National Trauma Data Standard (NTDS) and National EMS Information System (NEMSIS) standards were appropriately taken into account during the selection process. A consultation with the NEMSIS Technical Assistance Center further informed their decisions. The fact that LERN purchased an "all site" license for both the trauma registry and prehospital data collection system is noted as a key feature of the software solution.

Concern was expressed about the transfer of legacy data from the level I and pending level I trauma centers to the statewide registry. The same electronic trauma register platform (LANCET ™) exists in both of these centers. However, those systems, while also reportedly NTDS compliant, differ from the recently purchased statewide platform. Translation and transfer "patches" have been requested in the statewide software contract with Image Trend ™. Testing of any data conversion and transfer has not yet occurred.

While the new web-based platforms are currently available, LERN staff members reported that it would be a minimum of six months before hospitals began entering data. This lag time is to allow for recruitment of facilities to voluntarily submit data and local trauma registrar training. LERN will collaborate with the

Louisiana Hospital Association to assist with this initial phase of registry information. It was unclear how quickly EMS data collection might commence.

When asked what strategy will be used to encourage trauma registry data submission, the strategy was reported to be giving something back to the facilities that they have never had before – information. The extent to which this "carrot" will be successful in offsetting resistance relative to increased data entry workloads and associated costs is not clear.

LERN staff will manage the trauma registry data and are in negotiation with the BEMS concerning the management of the prehospital patient care record database. The magnitude of those tasks will not be clearly known until the tasks of data transfer, entry, cleaning, and reporting begin.

RECOMMENDATIONS

- Establish a trauma registry user's group comprised of trauma medical directors, trauma managers, and trauma registrars with the responsibility for establishing trauma registry inclusion criteria, confirming that the National Trauma Data Standard data definitions are used statewide, identifying the minimum data set for level IV and non-verified centers, and establishing state submission criteria.
- Design the comprehensive data collection system for trauma care to include the capability for patient tracking throughout the continuum of care.
- Execute agreements with the current level I and the pending level I trauma centers to transfer legacy data and begin regular and timely submission of data on an ongoing basis.
- Identify incentives for hospitals to participate, beyond the promise of returning information (e.g. offsetting training costs and offsetting data entry costs).
- Recruit hospitals to submit data to the trauma registry and train their registrars to properly complete the data submission process.
- Empower the trauma registry user's group to oversee the data quality on an ongoing basis.
- Determine an appropriate "home" for management of the EMS data, and execute a contract with that entity or individual to oversee and manage that aspect of the information system.
    - Ensure that this contract includes assurances of cooperation and collaboration relating to data linkage and joint evaluation processes.

- Seek opportunities to link trauma registry data with other population-based datasets to further enhance knowledge of the magnitude of injury in Louisiana and to monitor response to injury control activities.

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 certification.

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 certification, each hospital will continually work to improve the trauma care as measured by patient outcomes. **(B-307)**

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

CURRENT STATUS

Currently, the LERN leadership does not facilitate and encourage trauma-related research through processes designed to make data available to investigators. While the *Build Out Plan 2008-2012* does address research, it does not clearly

outline the extent to which research activities are required by the individual participants or the LERN.

Multiple entities exist that have an interest and expertise in research related to various aspects of health care, including clinical care, health care access, health resources management, systems of health care, policy, finances, and ethics. Examples of such entities include the DHH; university schools of public health, law, nursing, medicine, social work; level I trauma centers; and residency programs in surgery, emergency medicine, and PM &R. Opportunities for traditional and nontraditional trauma systems research could involve state data sources such as traffic records, EMS data, trauma center registry data, hospital discharge data, and vital statistics.

What does not seem to exist is the organization and coordination that can match expertise, resources, and interest with potential researchers. No single identified leader of research initiatives exists, and the LERN Board does not have a research work group. The LERN Board does not seem to recognize that research conducted by individuals and entities using local, regional, state, or national data may be of importance to LERN. For example a level I trauma center researcher has published a large number of peer reviewed research projects using that center's trauma registry, and these studies should be considered LERN-related research.

The participants expressed that research efforts must wait for a trauma registry and LERN data which are accurate and complete. It is important to recognize that other data sources may have information that can credibly answer certain research questions. Each data source, however, must be critically evaluated for appropriateness and utility to provide valid answers to research questions. Appropriate data sources may not exist to answer questions in all cases, and then "ad hoc" prospective data may need to be collected.

LERN currently has no research agenda or set of questions that could address the many aspects of trauma care and trauma systems. No process is in place or being considered for institutional review board (IRB) approval of research specifically conducted by LERN participants as a group under the express sponsorship of LERN leadership.

RECOMMENDATIONS

- Establish a LERN Board Research Work Group.
- Formulate a research agenda and/or a series of trauma system research questions or hypotheses that include all trauma system components.
- Assure terms of network participation (all types of participant/providers) include collection and sharing of data.

- Assure that the trauma system registry and EMS databases includes the proper elements to provide information that will answer research questions.
- Ensure that the LERN registry software product has the flexibility to accommodate user-defined fields to facilitate “ad hoc” research activity.
- Inventory population-based administrative, clinical, and other databases for availability, accuracy, completeness, and utility for research.
- Embrace and recruit research entities and their resources to actively participate as LERN stakeholders.
- Create a research representative position on the LERN Board and consider a research representative position on the regional commissions.
    - Identify a research leader to fill the new LERN Board position
- Identify a LERN staff person to be responsible for seeking appropriate funding opportunities and assist with grant application process.
- Explore the process of IRB approval that will be obtained for research done under LERN aegis.
- Consider all research done on LERN patients and within the boundaries of LERN as LERN research.
    - Inventory and catalogue all trauma-related research done by entities within state borders.
- Submit data to the National Trauma Data Bank (NTDB) to facilitate access to that database for research queries and comparison of LERN data to national data.
- Link LERN PI activities and their analyses to research and publications.

Focus Questions

FOCUS QUESTION 1: Given that Louisiana is a rural state, with currently only two level I trauma centers, and our desire to have an "inclusive statewide system," how many trauma centers need to be created or developed, and where should they be geographically distributed to meet the needs of our population? How many level I's, level II's, level III's should be verified?

It is difficult to answer this question without some sense of patient volume, severity, the nature of injuries, and the distribution of occurrences. However, given the current LERN participating hospital levels of actual or intended certification and their locations, it seems as though the geographic distribution of non-level I trauma centers is adequate between the ACS verified and pending verified level I trauma centers. Conceivably, an additional level I trauma center, or potentially a level II trauma center could be positioned in Region 6 and/or Region 2. This suggestion is predicated on the caveat that ALL hospitals strictly maintain and do not deviate from their agreed upon level of certification and capability, in any way and at any time. Without compliance with this caveat, the question is unanswerable as the number and distribution of any level center will be constantly changing.

LERN is currently only addressing the needs of patients with serious injuries, those most likely to need level I and II trauma centers. If LERN integrates the trauma care needs of patients with less severe injuries, it will be essential to look at the number and distribution of certified level III and IV trauma centers and other participating trauma hospitals.

With regard to an inclusive trauma system, ALL hospitals of any verified or certified level for trauma care should each be philosophically and functionally considered a LERN participant. As such, they should be assigned and committed to their appropriate roles, responsibilities, and accountabilities related to patient care, education, and maintenance of competency, data collection and submission, and PI activities. These terms of participation should apply to all hospitals that receive LERN trauma patients routinely or on rare occasions (e.g., deaths on arrival or stabilization before transfer), regardless of the length of stay at that hospital and care that extends beyond the ED.

RECOMMENDATIONS

- Consider the addition of a level I or II trauma center in Region 6 and/or Region 2.
- Establish rules for trauma center certification that ensure level-appropriate resources are consistently available at all times.

    - All hospitals should be a participating trauma hospital certified at an appropriate and sustainable level.
    - ACS standards for trauma center verification at levels I, II, and III are a reasonable starting point.
    - One or two lower certification levels should be established to allow facilities without significant surgical or inpatient resources to be categorized as participating trauma hospitals and to serve as points for stabilization and transfer.
- Consider expanding the range of trauma patients that LERN addresses in its trauma system to include patients with minor and moderate injuries.

FOCUS QUESTION 2: What are the minimum data points or outcome measures that should be collected in order to evaluate the efficiency of our statewide trauma system with regard to mortality rate, morbidity rate, LOS, resource utilization, treatment delay, and ISS scores? Please describe the data sets and provide examples. Thinking that a Statewide System database may be different than a hospital based Trauma Registry – what are those critical elements of data that must be captured for a statewide trauma system? How do you recommend that hospitals be encouraged to participate in providing this information, how will data be shared, and how do you recommend data be processed and protected?

The key to this question is to begin with the end in mind. As part of the development of a quality or performance improvement process, it is essential to frame the initial set of questions you would like answered. The manner in which the question is framed will have already identified some of the questions about which you are curious. Some of these questions can be measured with aggregate trauma registry data and some cannot. For instance, determination of mortality and morbidity rates requires more than just trauma registry data; rehabilitation data and vital statistics data are also needed. Preventable mortality estimates can be computed mathematically based on the TRISS methods of analyzing the abbreviated injury score/injury severity score (AIS/ISS) and other factors and by looking for unexpected deaths and survivors. This method provides only a gross estimation of true preventability. Preventable mortality is traditionally derived either by a multidisciplinary review panel process or an autopsy study. Both methods have limitations. However, in the panel review study process, the panel most often identifies opportunities for system and patient care improvement across all phases of care. Morbidity data can again, only be estimated using aggregate registry data, particularly without a linked rehabilitation data set.

The optimal trauma information system is able to track patients across all phases of care, including multiple agencies and institutions. For instance, if a patient injured in rural Louisiana is transported by a ground EMS agency to a Critical

Access Hospital and is then transferred to a level II trauma center via helicopter and then rehabilitation, the ability to track that patient throughout the entire care process will inform LERN about if and how well the trauma system is working. If it is discovered that in an incident a delay occurred in making the decision to transfer the patient from the CAH to the level II trauma center, then an opportunity has been identified for some individual QI. If 50 such cases with the same delay are found, then it is a trauma systems issue that must be addressed more globally.

The critical elements revolve around being able to collect sufficient data to determine if the various certified trauma centers are adhering to the terms of their certification contract. For example, if criteria state that a surgeon needs to be available when the patient arrives, then it is important to have the ability to measure and monitor this parameter. The second set of essential data are those necessary to determine that the right patient is getting to the right place in the right amount of time.

All facilities and agencies submitting data want to have something back in return. Mostly, they will want reports provided that enable them to push the button on their hospital registry and to get better reports faster. Examples include comparative and aggregate data that can be used to further bolster their PI program or to sell the utility of their services to the hospital CEO, the board, or the public. If the end-users cannot be provided with this commitment, then the only other way to collect the data is to require data submission in statute or to pay facilities or agencies for it. Such payment could be made indirectly through "pay for performance funds" or a greater share of other resources.

Several other strategies contained in the System-wide Evaluation and Quality Assurance, Trauma MIS, and Research sections of this report further answer this question.

FOCUS QUESTION 3a: What is the amount of funding necessary to start up a state wide trauma system and ideally how would that funding be allocated? Once fully operational, what is the amount of funding per year required to keep operating the infrastructure support for the system? Ideally, how are funds allocated? How have other states developed the financial incentives to create a willingness to participate and comply with ACS verification? What sustainable funding mechanisms for trauma systems have proven effective over time?

Louisiana has been blessed with a significant appropriation for the start-up and infrastructure of the LERN. Most state trauma systems would be envious of the amount of funding LERN has received. Louisiana has identified the costs of creating the LERN Board for the development of a comprehensive trauma system plan, however, the costs of all aspects of implementing an inclusive trauma system are unknown. Because each state's system is organized so

differently, it is not possible to recommend an appropriate amount of annual funding for the infrastructure operations.

The state has not yet considered: the costs of implementing a process to certify trauma centers, providing readiness funds to help hospitals reach and maintain a level of verification, modifying responsibilities of the LCCs to facilitate interfacility transfer to a higher level of care, or integrating rehabilitation into the trauma system. Some of these functions could be accomplished with limited additional funds. These functions could include hiring additional personnel to manage the verification process, establishing guidelines for interfacility transfer and developing relationships with vendors, and involving rehabilitation experts into the planning process for the trauma system.

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

When considering trauma system finances, it would be useful to have a full accounting of the funds spent each year on providing trauma care across the state, for all levels of injury. No budget or report summarizes the total cost of injury care at the state (infrastructure and system coordination), region, local, institutional, agency, and practitioner level. While the intent of LERN is to address this issue, additional detail and having the ability to obtain access to current hospital and EMS financial information is essential.

The budget provided in the PRQ pertains to the administrative aspects of the LERN infrastructure and its resources. It provides an incomplete picture of fiscal and human resources across the state. The burden of uncompensated care is not documented in an aggregate form that is available to the LERN. A gross estimate of the uncompensated care burden for injured patients is 25-35%, based on surveys in other states. Because Louisiana hospitals receive “disproportionate share” funds, perhaps the amount of uncompensated care is less.

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

Some states encourage hospitals to collect charge and payment data, as well as payment source in their trauma registries. Hospitals then to submit this information in aggregate form to the state at designated reporting times. This information can help track percentages and costs of uncompensated care, and it can help document the costs of injury hospitalizations (not including physician charges and other costs) by different payer sources (e.g., Workers' Compensation, Medicare, Medicaid, and private insurance).

Once a budget is fixed for trauma system development and monitoring activities within the LERN, the trauma stakeholders and legislature will be very interested in tracking both programmatic progress and fiscal expenditures associated with those appropriated funds. Eventually, a cost-benefit analysis of the system (cost per life saved) should be attainable. It is important to share this financial information with the public and the legislature.

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

- Some EMS and trauma care equipment needs are funded by state capital improvement funds.
- Federal, state, and private funding partnerships (e.g. Alaska Code Blue Project).
- Federal grants. The absence of a specific grant program for trauma system development, such as those previously funded through the Title XII Trauma and EMS Program, make it more difficult to find sources of financial support from the federal level. However, states have helped build trauma system infrastructure with the following federal grants: ASPR, Department of Homeland Security, Department of Transportation National Highway Traffic Safety Administration 402 and 408 funds, HRSA Rural Hospital FLEX, CDC Block Grants, Maternal and Child Health Block Grants, and EMSC grants.

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

RECOMMENDATIONS:

- Survey participating hospitals to determine readiness costs needed to support continuous preparedness to function at the self-selected trauma center level.
- Consult with other states regarding the cost of a state implemented trauma center verification process. The Trauma Managers Council of the National Association of State EMS Officials could facilitate contacts with state trauma managers.
- Determine a methodology for providing financial assistance for hospitals certified by the state as trauma centers to assist with the cost of readiness.
- Develop a strategy to seek all available revenue resources to support and sustain the trauma system.

FOCUS QUESTION 3b: LERN has developed 2 Call/Communications Centers to use approved protocols to route trauma patients to the closest hospital with resources available to best treat the patient. How have other states developed an entry point to the statewide system? What percentage of resources has been allocated to entry point mechanisms?

Very few states have developed LCCs for the same purpose as Louisiana. Call centers are often used to coordinate medical direction and may in some cases be required for activation of air medical transport. Some rural states would like to have a central communication center to help facilitate interfacility transfer to higher levels of care. Most states have developed triage and destination guidelines that are adhered to by EMS agencies. In some cases, the states have systems similar to Louisiana's EMsystem available on line that enables the EMS providers to monitor which trauma centers are on diversion and to go to the next closest available trauma center. Because of the various ways that states use communication centers, it is not possible to recommend a percentage of resources that should be allocated for the LCCs.

The LCCs will either turn out to be one of the crown jewels or the albatross of the Louisiana trauma system. In their infancy they appear to be working well. However, the two regions with ACS verified (or pending verification) centers reported that the system they have either was or still is working well, independent of the LCC. In order to become maximally effective, the LCC must be able to serve as a "one call does it all" resource so that individual physicians in remote locations are not speed dialing multiple institutions simultaneously to find a place to send a critical patient and a resource to get them there.

Where operational, the LCC has helped the prehospital phase of care but appears to have done little to solve interfacility transfer issues across the state. The resources must be more equitably distributed to facilitate the development of

an inclusive system with much more capacity so that moving patients to higher levels of care becomes less of a coordination issue.

FOCUS QUESTION 4: In reviewing the pertinent legislation in Louisiana – is the current legislation appropriate? What gaps are identifiable? Recommendations on additional legislation (data, liability, etc.)?

See the main body of the report, section on Statutory Authority for the answer to this question.

RECOMMENDATIONS

- Establish, in statute, the operational infrastructure of LERN as the lead agency for trauma system development within the Department of Health and Hospitals to ensure that the standards and rules promulgated by the LERN Board are consistently enforced statewide.
- Propose legislation to provide the Department of Health and Hospitals, LERN, and system participants with peer review protection of all data collected and analyzed for performance improvement and research.

FOCUS QUESTION 5a: What data systems or/and PI programs are necessary to positively impact delays in patient care?

No generic data systems or PI programs exist to evaluate delays in patient care – nor perhaps, should there be. Each trauma system must strategically decide which type of delays should be evaluated. Examples can include response times, scene times, transport times, inter-facility transfer times, or time to pertinent prehospital or hospital-based clinical interventions (e.g., IV start, blood transfusion, intubation, chest injury management, or surgical delay).

Once the specific delay is identified, the specific questions to be asked about those delays must then be decided upon. Then the data elements needed to answer those specific questions must be identified, and an assessment of that data availability, completeness, and accuracy is necessary to ensure a satisfactory degree of confidence in the validity of the answers to those questions. Ultimately, information about the delay must be linked to outcome, whether that be clinical (e.g., reduction in death or morbidity), process (e.g., reduction in hospital or ED length of stay), or financial (e.g., cost savings from reductions in length of stay or complications). This will allow cost/benefit assessment and determination of the value from reduction of delay.

If a delay reduction proves to be valuable, then specific strategies to promote reduction in delays must be designed for the particular resources available and assumptions of what will work, such as education (individual versus group, didactic versus practical, electronic, web-based, etc.), regulations, financial

incentives or disincentives (e.g., pay for performance), or others. The cost of fixing the problem must also be factored into the decision of how to address the problem. Finally, a post-intervention evaluation is necessary to prove the efficacy and value of reducing delays by the selected intervention.

One example of an attempt to study and reduce delays in medical care is the LERN project conducted in Region VII during 2008. This small pilot study, conducted in a limited and well-controlled portion of the state compared time to definitive care before and after initiating the LERN protocols and an LCC. Evaluation of inter-facility transfer time in 18 patients over approximately 2 months revealed a reported reduction by 1 hour and 55 minutes on average. While this pilot study is commendable, no patient outcome measures were evaluated. This is a failure to address the "so what" factor. The study also did not factor in the cost of training and other aspects of instituting the LERN protocol. Outcome variables could have been acquired from the receiving trauma center's trauma registry, and perhaps data would have been available for a cost benefit or value analysis, such as cost per life saved.

LERN has already taken the appropriate first steps by planning to establish a statewide trauma registry. This will lead to a robust data collection system after establishing the specific criteria needed to evaluate the trauma system and ensuring that the data elements meet national standards. The minimum data elements included in the trauma registry should be consistent with NTDS and NEMSIS data standard. The data collected should be inclusive of the continuum of care from dispatch to rehabilitation. Linkage to other data sources is key to the success of accurately describing the injury in the state, assessing care, and developing targeted injury prevention programs.

Having the minimum data elements to assess the continuum of care is extremely important. Ensure that data are collected to assess the following: response times; inter-facility transfer times, and times to pertinent prehospital and hospital-based clinical interventions (e.g., IV start, blood transfusion, intubation, chest tubes, surgical delay, and delay to rehabilitation).

All LERN participants should be required to submit data (all acute care facilities, EMS providers, and rehabilitation services). LERN should investigate the potential to partially fund data collection, and to fully cover the costs for system analysis and generating feedback to participants.

In order for PI to be performed, statutory protections must be in place for state and regional reviews. LERN can develop fact sheets and reports with aggregate data and publish them regularly on the website to provide data to the public, the media, and to elected officials. The development of a web-based public access database or integration into one that already exists within DHH is also recommended. A few states have developed web-based query systems that

allow hospitals or EMS providers to query their own data and to compare their data with similar facilities and providers.

Ultimately, the lead state agency should process the data for the statewide trauma system. The capacity to process data at the regional and provider levels is also essential for the trauma system's successful data collection. However, for the consistency and validity of the data submitted, the lead state agency should have a process to clean and validate the data, ensuring that the data are accurate and complete. Only when this process is performed can the lead agency be confident that findings are true and accurate.

RECOMMENDATIONS

- Identify the specific type of delay in patient care that LERN would like to investigate, and then determine the specific questions to ask to evaluate the issue.
- Assess the data elements to be collected in the prehospital database and state trauma registry to determine if all needed data will be collected to study the issue.
- Collect data from all participating LERN EMS agencies and hospitals. Perform data cleaning, validation, and assessment for complete data.
- Propose legislation to provide the Department of Health and Hospitals, LERN, and system participants with peer review protection of all data collected and analyzed for performance improvement and research.

Focus Question 5b: What education and or practice guidelines have been developed to prevent over and under triage? How have other states consistently deployed effective education programs? What are the characteristics of these education programs?

States have employed various strategies to deploy effective education programs. In many cases the educational programs are offered by level I and II trauma centers as part of their outreach obligation for ACS verification. Education may be offered by trauma center educators during conferences or the provision of educational programs such as Advanced Trauma Life Support (ATLS) and Prehospital Trauma Life Support (PHTLS). Another potential educational program, the Rural Trauma Team Development Course (RTTDC), is an effective program for hospitals that have a primary role in stabilization of injured patients prior to transfer. This course may be offered by level I and II trauma centers, but it could also be a course provided by LERN, particularly to rural and critical access hospitals that have less of an opportunity for providers to obtain trauma education.

Acronyms Used in the Report

ASPR – Assistant Secretary for Preparedness and Response
ATLS – Advanced Trauma Life Support

BEMS – Bureau of Emergency Medical Services

CARF – Commission on Accreditation of Rehabilitation Facilities
CDC – Centers for Disease Control and Prevention

DHH – Department of Health and Hospitals

ED – emergency department
EMS – emergency medical services
EMSC – Emergency Medical Services for Children
EMTs – Emergency Medical Technicians
ERIS – Emergency Resources Information System
ESF – Emergency Support Function

FARS – Fatal Analysis Reporting System

HRSA – Health Resources and Services Administration

IC – incident command
IRB – institutional review board
IRPP – Injury Research and Prevention Program

LCC – LERN Call Center
LERN – Louisiana Emergency Response Network
LOC – LERN Operations Center
LTAC – long term acute care

MADD – Mothers Against Drunk Driving
MCI – mass casualty incident
MOU – memorandum of understanding
MTSPE – Model Trauma System Planning and Evaluation

NEMSIS – National EMS Information System
NREMT – National Registry of Emergency Medical Technicians
NTDB – National Trauma Data Bank
NTDS – National Trauma Data Standard

PHTLS – Prehospital Trauma Life Support
PI – performance improvement
PM & R – physical medicine and rehabilitation

PRQ – pre-review questionnaire

RTTDC – Rural Trauma Team Development Course

SCI – spinal cord injury
STEMI – ST Elevation Myocardial Infarction

TBI – traumatic brain injury
TSC – trauma system consultation

VoIP – Voice over Internet Protocol

Appendix A: Review Team Biographical Sketches

ROBERT J. WINCHELL, MD, FACS- TEAM LEADER

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

Dr. Winchell has been involved in trauma center and trauma system design and operation throughout his career, in a wide variety of settings covering the spectrum of system development. He was involved with both the day-to-day operations and ongoing development of the San Diego County trauma system for over ten years and served as chair of the San Diego and Imperial County Committee on Trauma. He participated in operation and ongoing development of the Washington state trauma system, serving on the state advisory board, and as chair of the Southwest EMS region. Since coming to Maine, Dr. Winchell has worked to develop the Maine state system, is a member of the state advisory board, and is currently the chairman of the Maine State Committee on Trauma. Dr. Winchell is an active member of the Trauma Systems Evaluation and Planning Committee of the American College of Surgeons and also serves as a site reviewer for the trauma center verification program of the College.

Dr. Winchell is Board certified in General Surgery, with added qualifications in Surgical Critical Care. Dr. Winchell is a Fellow of the American College of Surgeons as well as a member of the American Association for the Surgery of Trauma, the Association for Academic Surgery, the Southwest Surgical Congress, and the Society of Critical Care Medicine. He is author of more than 40 scientific papers and book chapters, and has given over 100 regional, national, and international presentations.

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 the1999 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 Diplomat of the American Board of Surgery, Dr. Esposito has a Certificate of Added Qualifications in Surgical Critical Care. He is a Fellow of the American College of Surgeons and Vice-Chair of the Chicago Committee on Trauma of the ACS. He is also a member of the national ACS/COT.

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

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

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

RONALD F. MAIO, DO, MS,FACEP

Dr. Maio received DO degree, in 1976, from Michigan State University's College of Osteopathic Medicine (MSUCOM). After completing his internship and serving in the US Army in Germany as general medical officer, he did an Emergency Medicine Residency at MSU affiliated hospitals in Lansing, Michigan, and is

board certified in Emergency Medicine. In 1988 he received an MS in Clinical Research Design and Statistical Analysis from UM SPH.

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

Dr. Maio has practiced emergency medicine in both the rural and non-rural setting, was an assistant medical director for two EMS systems in Michigan, and, served on the board of the Huron Valley Ambulance Association based in Ann Arbor, Michigan. Dr. Maio has also served on numerous state and federal committees and panels and has served as the chair for the National Association of EMS Physicians' (NAEMSP) Research Committee.

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

DREXDAL PRATT

Chief Drexdal Pratt heads the Office of Emergency Medical Services in the Division of Health Service Regulation of the North Carolina Department of Health and Human Services. His agency manages Emergency Medical Services and Trauma and the Assistant Secretary for Preparedness and Response (ASPR) Hospital Preparedness Cooperative Agreement.

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

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

Mr. Pratt served two terms as Chair of the Region I EMS Advisory Council. He received the National Association of County Commissioner's Achievement Award

for coordinating the development of the Stokes County NC computer-aided dispatch program.

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

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.

JOLENE R. WHITNEY, MPA

Jolene R. Whitney has worked with the Bureau of Emergency Medical Services, Utah Department of Health for 28 years. She spent the first 6 years of her career as a regional EMS consultant. She became Assistant Training Coordinator in 1986. She has been a program manager for EMS systems and trauma system

development since 1991. She is currently the Deputy Director for the Bureau of EMS and Preparedness, which includes Trauma System Development, Chemical Stockpile Emergency Preparedness, Hospital Surge Capacity Planning, ED, Trauma and Pre-hospital databases, EMS Licensing and Operations, and EMS for Children.

She spent 250 hours in the Olympic Command Center, serving as an EMS liaison for the 2002 Winter Olympics in Salt Lake City, Utah. She has been involved with all aspects of EMS including ambulance licensure, EMS councils, certification and training, computer testing, and curricula development. She has experience in statute and rule development, grant writing, system plan development, coalition building, and disaster preparedness.

She has served on several national committees and teams, which involved conducting a state EMS system assessment for NHTSA, reviewing rural trauma grant applications, and developing the HRSA model trauma system plan, the NASMESO trauma system planning guide, and the NHTSA curriculum for an EMT refresher course.

Jolene has a Masters in Public Administration from Brigham Young University and a B.S. in Health Sciences, with an emphasis in Community Health Education from the University of Utah. She was certified as an EMT-Basic in 1979. She also obtained certification as an EMT instructor and became certified as an EMT III (Intermediate) in 1983. She has attended numerous conferences, courses, and workshops on EMS, trauma, and disaster planning and response. She also completed a course for investigator training from CLEAR. Jolene is a co-author of three publications on domestic violence and surge capacity planning.

She is the current Chair for the National Council of State Trauma System Managers/NASEMSO and served as Vice- Chair for the previous two years. She is a member of the American Trauma Society, and previous member of the National Association of State EMS Training Coordinators.

In 2005, she was nominated by her staff and received a Utah Manager of the Year Nominee Award from the Governor. She also received recognition from the Utah Association of Emergency Medical Technicians in 2006.

Appendix B: Participant List

Last Name	First Name	Title	Company
Alexander	Kenneth E.	Vice President of Quality and Regulatory Activities	Louisiana Hospital Association
Ashford Barrow	Regina	State Representative	Louisiana House of Representatives
Baker, MD	Chip C.	Chairman & Professor of Surgery	LSUHSC - New Orleans Department of Surgery
Ball	Jane	ACS Consultant	
Barrett, RN, MHA	Coletta	Vice President of Mission	Our Lady of the Lake Regional Medical Center; LERN Board Chair, Region 2: Metro Hospital Council
Baxter	John	DOA Financial Analyst - LERN	Division of Administration - Baton Rouge
Bellard	Shane	Region 4 Commission Member	Region 4 Commission
Blackwell	Jeff		Creative Video
Bond, RN	Marsha	Director of Emergency Services	BRGMC
Branton	Joey	MEDCS Operations Manager	
Brignac	Sharon	Administrative Assistant	LERN Staff
Brown	Doris	Public Health Executive Director	Office of Public Health
Cangelosi	Celia	Attorney	LERN - Baton Rouge
Chehardy, EdD	Peggy	Director of Tulane Life Support Center	EMS-Children; Assist Prof of Clinical Surgery
Chugden, MD	Robert	Past LERN Board Member	West Jefferson Hospital; LERN Design the System
Clark, Jr., MD	William "Beau"	Medical Director	Bureau of EMS; ACEP
Collett, RN, JD	Margaret	Vice President of Legal Affairs	St. Tammany Parish Hospital; LERN Board - LHA Svce District Hospital
Colligan, RN	Ted	Tri-Regional Coordinator, Regs. 2, 4, 5	LERN Staff
Davidson, RN, JD	Cindy	Region 1 Commission Member, DHH/HHS DRC	Region 1 Commission
Day Rainey	Pat	Facility and Accreditation Manager	LSU Healthcare Services Division
Duchesne, MD	Juan	LERN Tri-Regional Medical Director	Tulane
Dupree	Nichole	Program Manager	Injury Prevention, DHH/OPH
Dupuis, RN	Mary	Region 2 Commission Member	Region 2 Commissioner
Esposito	Tony		Loyola University Medical Center
Ford, RN	Kathleen	Director or Nursing, Region 2 Commission Member	West Feliciana Hospital Region 2 Commission
Ford, MD	LaDonna	Region 8 Commission Member	LSU Conway; Region 8 Commission
Francois, MD	Rony	Assistant Secretary	DHH, Office of Public Healh
Fryun	Mark		Acadian Ambulance
Fuselier	Amy	Administrative Regional Coordinator	LERN Staff
Gardner, RN	Bridget	Injury Prevention & Outreach Program Director	Program Coordinator, Level 1 Trauma Center, Interim LSU Public Hospital
Gastandaduy	Mariella	Injury Research & Prevention	OPH
Glynn, MD	Gary	Chairman, LSU PM & R	LSU School of Medicine, PM&R Dept.
Goldstein	Marc		Creative Video
Gomez	Rudy	Partner	SSA Consultants
Graff	Frank	Region 1 Commission Member	Region 1 Commissioner, Care Ambulance, Region 1 EMS, DRC

Green Smith, MHA	Asha	Emergency Preparedness Associate	Louisiana Hospital Association
Guidry, MD	Jimmy	State Health Officer	Department of Health & Hospitals
Hamilton, MD	Scott	Region 4 Commission Member	Region 4 Commissioner
Harvey	Linda	Interim CEO	West Feliciana Parish Hospital
Hensarling	Tricia	LERN Board Member	DHH Office of Mental Health, LERN Board
Hineman	Bill	Program Manager	Bureau of EMS
Hunt, RN	Gaynell	Tri-Regional Coordinator, Regs. 1,3,9	LERN Staff
Hunt, III, MD	John	ACS State Chair	ACS Committee on Trauma
Hursey	Denise	Health Information Analyst	Louisiana Hospital Association
Jackson	Katrina		Louisiana Legislature Black Caucus
Johnson	Lester W.	Past LERN Board Chair	LSU Monroe Conway Hospital
Jones	Gary	Region 7 Commission Member	Region 7 Commission
Jones, MD	Johnny	Emergency Medicine	Baton Rouge General Hospital: Region 2 Commission
Judice, MD	Ross D.	Medical Director, LERN Board Member	Acadian Ambulance
Lagarde, MD	Gina	Pediatrics	DHH, Office of Public Healh
Loyacono	Tommy	Director of Operations and Region 2 Commission Member	East Baton Rouge EMS; Region 2
Majors	Mark	Owner/Operator; Region 6 Commission Member	Med Espress; Region 6 Commission
Maio	Ron		University of Michigan
Martinez	Fred	Chief Executive Officer	St. Charles Parish Hospital; Rural Hospital Coalition Rep on LERN Board
McNorton	Terri	VP Corporate Communications	: Region 2 Commission
McSwain, Jr., MD	Norman E.	Professor of Surgery	Tulane Health Sciences Department of Surgery; Vice Chair of Board; Leader pf Design the System
Mederos, RN	Eileen	QI/PI Systems Director	LERN Staff
Mencer, MD	Ernest	Burn Unit Medical Director	Burn Unit Med Dir; Baton Rouge General Hospital
Merrill, Jr.	Richard	Advanced EMS	
Meuchel	Jessica	Administrative Intern	Our Lady of the Lake RMC
Michaels	Holly	ACS Program Coordinator	
Munn	Cindy	Vice President of Patient Care Services, BRGMC	Region 2 Commissioner
Narang, MD	Steve	Pediatric ER Doctor	Our Lady of the Lake
Pottschmidt	Ross	Program Manager	LERN Staff
Prats, MHA, ScD	Rosanne	Executive Director	Department of Health & Hospitals, Emergency Preparedness
Pratt	Drexdal	NC EMS Director	
Putnam	Kobe		
Rhorer, MD	James	Medical Director	Our Lady of the Lake Regional Medical Center; Region 2 Commission
Sanddal	Nels D.	CIT FDN	
Shaver, RN, MBA	Pamela	LERN Executive Director	LERN Staff
Slaughter, PhD	Christel		SSA Consultants

Slaughter, PhD	Bill		SSA Consultants
Songy	Donald	Sup of Schools - Ascension Parish	Superintendent of Schools, Ascension Parish
Spann, RN	Deb	Region 8 Commission Member	Region 8 Commission
Sullivan, MBA	Pete	Service Line Administration	Our Lady of the Lake RMC
Summers	Anthony	Region 2 Commission Member	Region 2 Commissioner
Townsend, MD	Roxanne	Assistant Vice President	LSU Health System, Health Care Services Division
Trevino, MD, PhD	Chris	LERN Medical Director	LERN Contractor
Weltman	Alex		Creative Video
Wester	Scott	Chief Executive Officer	Our Lady of the Lake Regional Medical Center; Region 2: Design the System
Whaley-Martin	Allyn	Hospital DRC	OLOL; Region 2
White, Jr.	Mack "Bodi"	Representative	Louisiana House of Representatives
Whitney	Jolene	ACS Consultant	
Williams, MD, MPH	Mallory	Assistant Professor of Surgery	LSU-Shreveport Department of Surgery: ACS Committee on Trauma LERN Board
Williams, MD	William	Chief Medical Director	Slidell Memorial Hospital
Winchell	Robert	ACS	
Woodar	Ken		
Zembo, MD, MBA	Michele	Director of Medical Staff & GME	Medical Center of Louisiana; Louisiana State Med. Soc. - Peds, LERN Board, Design the System

Appendix C: Summary of Trauma Systems and Funding Mechanisms by State

State	ACS Trauma System Consultation	ACS BIS Facilitation	Legislated Trauma System?	Is that System Funded?	Fines/Fees on Moving Violations	Fines/Fees on Other Criminal Penalties	Motor Vehicle Registration/License Plates or Driver's License Renewal Surcharge	Cigarette Excise Tax	Gambling	General Revenue Funds	Surcharge on 911 calls	Other	
Alaska	2008	575	Yes	No									
Alabama			No	No									
Arkansas	In Discussion		No*	No									*Hearings in 2008 for possible legislation in 2009.
Arizona	2007		Yes	Yes				**X**	**X**				
California	2002*		No	Yes	**X**								*Marin County (San Rafel, CA)
Colorado	In Discussion		Yes	Yes			**X**						
Connecticut	2006		Yes	No									
Delaware			Yes	No									
D.C.	In Discussion		No	No									
Florida			Yes	Yes	**X**								
Georgia	2009		No	No						**X** *			* Not a permanent funding source.
Hawaii	2005		Yes	Yes				**X**					
Iowa			Yes	No									
Idaho			No	No									
Illinois	2006		Yes	Yes	**X**	**X**							
Indiana	2008		Yes	No									
Kansas		2008	Yes	Yes	**X**								
Kentucky			Yes	No									*No Permanent Funding Source
Louisiana		Possible 2009	Yes	No									
Massachusetts			Yes	No									

Maryland			Yes	Yes			**X**						
Maine			Yes	No									
Michigan			No*	No									*Development of System in Progress
Minnesota	2007		Yes	Yes						**X***			*$ from General fund, but generated from a hospital license fee of all Hospitals & money from Dept of Health
Missouri			Yes	Yes			**X**					**Weapons License, ATV registration, Boat registration**	
Mississippi			Yes	Yes	**X**		**X**	**X**					
Montana	1999		Yes	No									
North Carolina	2004		Yes	No									
North Dakota	2008		Yes	No									
Nebraska			Yes	Yes			**X**						
New Hampshire			Yes	No									
New Jersey	2008		No	No									
New Mexico			Yes	Yes						**X***			*Yearly Legislative Appropriation. The surcharges to Pre-hospital/EMS.
Nevada	2004*		Yes	No									*Clark County (Las Vegas, NV)
New York			Yes	No									
Ohio	2002*		Yes	Yes		**X**							*Tri-State Trauma Coalition (Cincinnati, OH)
Oklahoma			Yes	Yes	**X**		**X**	**X**					

Oregon			Yes	Yes						**X**			
Pennsylvania	2007		Yes	Yes	**X**	**X**							
Rhode Island	2004		No	Yes	**X**								
South Carolina			Yes	No									
South Dakota			No	No									
Tennessee	2008		Yes	Yes				**X**					
Texas		2005*	Yes	Yes	**X**						**X**		*Southwest Region
Utah		2005	Yes	Yes	**X**	**X**							
Virginia		2005	Yes	Yes	**X**		**X**						
Vermont			No	No									
Washington			Yes	Yes	**X**		**X**					Surcharge on sale or lease of a new vehicle	
Wisconsin			Yes	Minimal						**X***			*Partial funding for Trauma Coordinator position and $50, 000 for RTAC development and infrastructure
West Virginia	poss 2009		Yes	No									
Wyoming	2004		Yes	No									