The following report is the result of an analysis of the Minnesota statewide trauma system by a multidisciplinary team of national experts. The Minnesota Department of Health together with its State Trauma Advisory Council and the EMS Regulatory Board will collaborate with industry stakeholders to analyze the report, establish priorities and determine what modifications are necessary as the trauma system continues to develop.
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Executive Summary

Trauma System Consultation

State of Minnesota

Bloomington, Minnesota

November 4 - 7, 2007

Methodology

The Minnesota Department of Health (MDH) and its Trauma System Program located within the Office of Rural Health and Primary Care (ORHPC) requested this trauma system consultation, which was conducted under the auspices of the American College of Surgeons (ACS), Trauma System Consultation program (TSC). The multidisciplinary site visit team (SVT) consisted of: two trauma / general surgeons, one emergency medicine physician, one former state emergency medical services director, a trauma system coordinator, a rural trauma and prehospital specialist, and a pediatric and public health specialist. Biographical sketches for the team are included as Appendix A of this report.

Prior to the visit, the SVT reviewed the ACS Pre-Review Questionnaire (PRQ) completed by the MDH. The format of this report correlates with the components outlined in the ACS Trauma Systems Consultation document. The SVT also reviewed a number of supporting documents provided by the Trauma Systems Program.

The SVT convened in Bloomington, Minnesota on November 4-7, 2007, to review the state of the Minnesota Trauma System. The meetings during the three day visit consisted of plenary sessions during which the SVT engaged in interactive dialogue with a broad range of representative trauma system participants. There was also an opportunity for informal discussion with the stakeholders, and time was devoted to questions and answers. During the survey, the SVT also met in sequestered sessions for more detailed reviews and discussion, for the purpose of developing a team consensus on the various issues and recommendations involved in the survey.
Overview

In 2003 the Minnesota Commissioner of Health appointed a committee to “develop and publish a comprehensive statewide trauma system plan” based on the overarching principle that the system would be voluntary and inclusive, both being core values identified by constituents. Since that time, Minnesota’s trauma system has been on a relatively rapid development track. Based on previous trauma system development efforts, the Minnesota Department of Health (MDH) acknowledged system impediments and shortcomings, sought outside guidance from other state agencies and consultants, and began development of a “comprehensive statewide trauma system plan”.

Steps in the process included:

- A committee was appointed to create a statewide trauma plan using a mix of new and veteran leadership.
- Values identified were for the trauma system to be inclusive and to keep referral patterns intact.
- The system was built on a foundation of previous work.
- Shortcomings and known problem areas were acknowledged.
- Participation and feedback from the Minnesota Hospital Association was sought.
- Stakeholders convened and the trauma plan was developed. The plan was vetted in a process that was devised to encourage consensus building.
- The trauma plan was pilot-tested, and the lessons learned were published.
- Level I & II trauma centers were brought into the process.

Concurrent with these steps, the MDH gathered political support for the creation of enabling legislation. In August of 2005 enabling legislation for the trauma system was enacted into law. The MDH was exempted from rule making. This permitted system development to be based on the state trauma plan and allowed some flexibility to change the plan as development progressed. The Commissioner of Health must submit a report to the legislature in September 2009. The Trauma Systems Program is currently funded from hospital licensing fees at $352,000. The challenge of the Minnesota trauma system is to balance the trauma ideals with Minnesota’s rural reality.
Current Status

The lead agency for the Trauma Systems Program is the MDH. Of importance to trauma system development, Minnesota is one only of three states in the country in which emergency medical services (EMS) is regulated by an independent state agency, the EMS Regulatory Board (EMSRB). The EMSRB is overseen by a Board of 19 members, 15 of whom are appointed by the Governor. The day to day work is carried out by a staff of 16. The EMSRB is responsible for administering state statutes and rules that regulate EMS services and personnel. The presence of these two agencies has resulted in a shared leadership model between the Trauma Systems Program and the EMSRB, and there is cross fertilization between the entities in an effort to coordinate activities.

Governance

The State Trauma Advisory Council (STAC) is comprised of 15 members, 13 of whom are appointed by the Commissioner of Health. The remaining 2 members are the Commissioner of Public Safety (or designee) and the State EMS Medical Director from the EMSRB. The role of the STAC is to advise, consult with, and make recommendations to the Commissioner of Health regarding the development, maintenance, and improvement of a statewide trauma system. The STAC has an executive committee, an applicant review committee and two established workgroups (Data/QI and Education). Other ad hoc workgroups can be established as needed.

The Trauma Systems Program currently has personnel amounting to 2.75 FTE. This includes the trauma system coordinator (1 FTE), the trauma designation coordinator (1 FTE), information technology support (0.5 FTE), and administrative support (0.25 FTE). Hiring of a part-time research analyst is planned. In-kind epidemiologic support is also provided by the Injury and Violence Prevention Unit (IVPU), and some additional support is provided from the ORHPC.

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The state trauma registry, MnTrauma, was created by an outside firm (Image Trend, Inc.). The Minnesota Trauma Data Bank (MTDB) is the legacy state trauma registry that will soon have data merged into MnTrauma. Two other databases have been designed to function in an integrated manner with MnTrauma. MnStar is the database used to report EMS services, and is administered by the EMSRB. MnTrac was developed for the MDH Office of Emergency Preparedness to track hospital bed status, and it can be used to monitor hospital diversion. MnStar is currently fully utilized. MnTrac is operational in the Twin Cities metro area; training and implementation are systematically being rolled out throughout the rest of the state. MnTrauma is operational as a direct data entry and reporting tool. The uploading functionality from other commercial trauma registries will soon be functional. The MTDB legacy data come from the Universal Billing (UB92) Hospital Discharge Data, the Traumatic Brain Injury/Spinal Cord Injury Registry, and vital records.

Substantial progress in system development has occurred since the authorizing legislation was passed in 2005. Criteria for trauma center designation were developed, specifically for Level III and Level IV. Level I and Level II trauma centers follow the ACS criteria and verification process. Level III designation can be sought using the ACS criteria and verification or the state’s process. Several Level III and Level IV trauma centers have been designated. Grants and consultation were provided to hospitals to prepare for the designation process. Site reviewer training and contracting has occurred. Support for purchase of four TraumaMan simulators is expected to enable greater availability of Advanced Trauma Life Support (ATLS) training. The Comprehensive Advanced Life Support (CALS) program is also widely available to support training needs for rural facility trauma designation status.

Resources & Advantages/Assets

- Enabling legislation
- Committed leadership through the MDH and EMSRB
- A committed State Trauma Advisory Council
- A written trauma system plan
- Funding for trauma system development
- Trauma center designations and the integration of Critical Access Hospitals
  - Level I — 4
  - Level II — 3
  - Level III — 3
  - Level IV — 6
  - Additional Level II trauma centers are available for the population in the neighboring states of North Dakota, South Dakota, and Wisconsin.
- Mechanism for the education of rural trauma care providers
- Information system framework to support future quality improvement activities
- Excellent injury surveillance support
Challenges

The following were among the challenges to the implementation of a statewide inclusive trauma system:

- A complex organizational structure (two separate agencies) for trauma system management
- Lack of consistency in adhering to trauma center criteria for designation
- Trauma center designation is voluntary, rather than based on need
- The three databases are not functioning in an integrated manner as designed
- A lack of outside benchmarking for quality improvement activities
- Specialty populations (pediatrics, cultural groups) are not well addressed by the trauma system
- Declining volunteer EMS provider base

Opportunities

- Written protocols for EMS for trauma triage and transport
- Protocols and location of air medical services to improve access to trauma care
- Integrated databases to support the state and local quality improvement programs
- Commitment to supporting rural hospital participation by placement of the Trauma System Program within the Office of Rural Health and Primary Care.

Key Recommendations

Leadership

- Utilize the executive committees of the STAC and the EMSRB to form a Joint Policy Committee that routinely meets to maximize the efficacy of the existing administrative structure of EMS and the Trauma System Program to achieve consensus on policies and approaches to reach the mutually beneficial goals of establishing a comprehensive trauma system in Minnesota.

System Development

- Use the Joint Policy Committee (JPC) of the EMSRB and STAC to drive system development beyond coordination between EMSRB and STAC to an integrated trauma system with clear goals and objectives.

Legislation

- Promulgate rules and regulations to help institutionalize and specify criteria for participation in the trauma system
Finances

- Conduct a financial assessment of trauma system funding needs and distribute the report widely.

Injury Prevention and Control

- Implement the Minnesota injury control plan in collaboration with the Trauma System Program, and make available a menu of effective injury prevention program strategies that can be used by Level I trauma centers, thus providing an ongoing focus on key injury issues and an opportunity for program evaluation.

Prehospital Care

- Hire a State EMS medical director and ensure duties include supporting local service EMS medical directors in their prescribed roles and responsibilities, implementing the prehospital component in the evolving inclusive trauma system.
- Establish regulatory oversight of non-transporting units.
- Obtain statutory authority to require medical oversight for dispatch of air and ground ambulances.

Definitive Care Facilities

- Implement current trauma patient destination policies, with minimal regional variation.
- Designate and re-designate trauma centers based upon established criteria, and performance to those standards.
- Engage specialty pediatric resources and current trauma centers to establish at least one ACS-verified pediatric trauma center, ideally at Level I status.

Information Systems

- Achieve integration of all three elements of the information system to allow optimal opportunity for investigation of questions relative to injury epidemiology and outcomes in the state.

Evaluation

- Ensure adequate legal protection of the peer review process, and address this in legislation if not currently in place.
Administrative Components

Leadership

Purpose

There should be a trauma system lead agency with an identified key person. The lead agency will usually be a government agency with the authority, responsibility, and resources to lead the development, operations, and evaluation of the trauma system. The statutes, regulations, policies, or guidelines should direct that the lead agency will:

- Ensure the integration of the EMS system, including all prehospital components
- Coordinate system design
- Establish minimum standards for system performance and patient care
- Create a Trauma System Advisory Committee that is composed of prehospital personnel, hospital personnel, rehabilitation personnel, payors, consumers, and public interest groups. This committee should serve to guide system planning activities, define system criteria (number of centers, volume), recommend system standards (triage, timelines), and review system performance
- Have sufficient staffing, including a trauma system coordinator experienced in trauma system development and implementation
- Identify the key person in the lead agency

The trauma system should have a strong role for a trauma physician(s) as an integral part of its leadership component. This physician, Trauma Medical Director, should be qualified to participate in the planning of the trauma system, work with the lead agency, be incorporated into the system, and be responsible for design and implementation of the trauma system, medical accountability, and ensuring an appropriate medical response to the trauma patient.
CURRENT STATUS

The trauma system in Minnesota is a voluntary, inclusive system. The Commissioner of the Minnesota Department of Health (MDH) has authority for the state trauma system, including all levels of trauma hospital designation. The commissioner of the MDH is appointed by and reports directly to the governor.

Within the MDH, the State Trauma Program is located within the Office of Rural Health and Primary Care (ORHPC), which is located in the Division of Health Policy. ORHPC partners with communities, providers, policy-makers and other organizations so that innovative approaches are developed and tailored to assist diverse populations. This administrative “home” for the State Trauma Program allows for direct integration with the wealth of resources and relationships of the ORHPC. For example, ORHPC has longstanding relationships with the state’s rural hospitals, including the state’s 79 critical access hospitals (CAHs). This administrative home facilitates the State Trauma Program’s efforts to develop an inclusive trauma system incorporating all hospitals.

According to the PRQ the State Trauma Program has 2.75 FTE’s including the system coordinator (1 FTE), the hospital designation coordinator (1 FTE) and an administrative support person (0.25 FTE). Additionally, the trauma system program pays for Information Technology (IT) support (0.5 FTE), housed in the MDH Injury and Violence Prevention Unit (IVPU), to primarily support the state trauma registry. The IVPU also provides the State Trauma Program with an unspecified amount of in-kind data analyst/epidemiology support for special data projects, as time is available. The State Trauma Program is identifying additional in-kind IT support in order to free up resources to hire a 0.3 FTE Research Analyst to conduct trauma-specific data analyses.

EMS in Minnesota is governed by an independent state agency called the Minnesota EMS Regulatory Board (EMSRB) which is primarily governor-appointed. The executive director of the EMSRB is hired by and reports to the Board. All EMS-related trauma regulations are under the authority of the EMSRB. The EMSRB has 19 members, with 15 appointed by the governor, 2 legislators and 2 non-appointed positions (one for the Commissioner of Health and one for the Commissioner of Public Safety, or their designees).

The EMSRB has approximately 15 FTEs including 5 field staff and a field supervisor. The EMSRB staff license and inspect ambulance services. Minnesota has 284 ambulance services, including 75 ALS services, 195 BLS services, 23 part time ALS services, 9 air ambulance services, and 14 specialized ground services. The EMSRB has approved 151 EMS training programs. The EMSRB certifies EMS personnel, and provides funding to the 8 EMS Regional Councils. A volunteer and ambulance training grant, a volunteer longevity award program, and the Comprehensive Advanced Life Support (CALS) program are also supported. The EMSRB is responsible for investigating and taking appropriate action on EMS complaints.
The EMSRB has an EMS web-based data system (MnStar) that is the repository for all ambulance runs since 2003.

By July 1, 2009, legislation (MN Statute §144E.604) requires all ambulance services to have trauma transport guidelines consistent with the criteria issued by the State Trauma Advisory Council (STAC) and approved by the EMSRB. The EMSRB may approve a request for deviations to the criteria, e.g., due to the availability of local or regional trauma resources, if the changes are in the best interest of the patient. For example, transport to the closest trauma center for a particular injury may be more appropriate than to by-pass it for a higher designated center that is further away.

While there are multiple agencies with authority for various aspects of the trauma system, some continuity and collaboration for trauma system oversight between the MDH and the EMSRB is apparent. The Commissioner of Health (or his/her designee) is a permanent member of the EMSRB. The position of State EMS Medical Director, a physician member of the EMSRB, is a permanent member of the STAC. The team was informed that most of the trauma system effort to date has been to designate trauma centers, so the EMSRB has not yet begun to work with the STAC to develop a process to approve the trauma transport guideline deviation requests. Without a mechanism for ongoing communication and close collaboration between the EMSRB, STAC and associated staff, a high potential for disagreement and divergence between EMSRB and the STAC exists as the trauma system continues to be implemented and addresses ongoing and new issues.

The State Trauma Advisory Council (STAC) is a 15 member advisory council to the Commissioner of Health. The Commissioner appoints 13 of the members to staggered four-year terms from various disciplines as defined in legislation. The STAC has no consumers or payors as members, and the legislation does not require them in the 13 appointed disciplines. The remaining two seats are non-appointed and non term-limited, filled by the EMS Medical Director and the Commissioner of Public Safety (or his/her designee).

The STAC is advisory in nature and has no authority to act. It was established by legislation to advise, consult with, and make recommendations to the Commissioner of Health regarding the development, maintenance and improvement of a statewide trauma system. The STAC seeks to decrease the time it takes injured patients to reach definitive care by ensuring the patients’ needs are appropriately matched with hospital resources. They hope to accomplish this goal through trauma hospital designations for nearly all hospitals in the state, implementation of statewide EMS trauma triage and transport guidelines, and data-supported local and statewide performance improvement programs.

The first meeting of the STAC was in December 2005. The STAC has met eight times and made several recommendations to the Commissioner of Health, including the designation of Level I (4), Level II (3), Level III (3) and Level IV (6) trauma centers. These trauma centers were all designated as recommended by the STAC.

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The Commissioner of Health was granted an exemption to rule writing when the trauma system legislation was enacted to enable the system to develop quickly. The Commissioner of Health must make a legislative report in 2009 on the implementation of the voluntary trauma system, with recommendations on the need for including the trauma system criteria in rule.

The Trauma System Program has no Trauma Medical Director, and there are no plans to identify one in the future. Select members of the STAC are currently serving this role.

The state Trauma System Coordinator, functioning as system administrator, has expertise in trauma system development. He provides day-to-day oversight and coordination of the system. He communicates with the Commissioner of Health, the STAC, and other partners in the system.

Trauma partners providing assistance to the Trauma System Coordinator include the Minnesota Trauma Registrars Alliance (MTRA), the state American College of Surgeons Committee On Trauma (ACS COT), the Minnesota Hospital Association (MHA), the Minnesota Ambulance Association (MAA), and the eight Regional EMS Programs.

The Comprehensive Advanced Life Support (CALS) program provides education to rural physicians and rural trauma teams focusing on rapid assessment and intervention and transfer. Most rural hospitals could not participate in the trauma system if the CALS education and rural outreach were not available.

The MDH Office of Emergency Preparedness supports the trauma system by including it in the distribution of its federal Hospital Preparedness Program grant funds. This ongoing support since 2002 has been crucial for the development of the state trauma system.

RECOMMENDATIONS

- **Utilize the executive committees of the STAC and the EMSRB to form a Joint Policy Committee that routinely meets to maximize the efficacy of the existing administrative structure of EMS and the Trauma System Program to achieve consensus on policies and approaches to reach the mutually beneficial goals of establishing a comprehensive trauma system in Minnesota.**

- **Hire a part time trauma medical director to work with the EMSRB’s EMS medical director to address clinical care issues within the trauma system and to ensure local medical directors are knowledgeable in the various aspects of the trauma system.**
System Development

Purpose

The trauma system lead agency should have a defined planning process for trauma system development that addresses:

- Identifying trauma care resources, including resource deficits within the defined area of the trauma system
- Developing and implementing trauma care plans and systematically reviewing plans over time
- Including health professionals, consumer groups, and payors in trauma system planning
- Approving the trauma system plan
- Establishing, reviewing, and revising trauma system standards of care, including policies, procedures, and protocols for both the prehospital and hospital personnel
- Analyzing the financial impact of developing and implementing the trauma system.

The trauma system should be integrated with the EMS system and should include a mechanism to interface with and incorporate other EMS plans, such as disaster and mass casualty. It should also have a mechanism to integrate managed care entities in the area.

CURRENT STATUS

Between February 2003 and December 2004 Minnesota’s “Comprehensive Statewide Trauma System Plan” was developed and tested. Key stakeholders included hospital administration, prehospital providers, trauma care providers and various professional associations. Consumers and payors were not included in the process, and they are not represented on the STAC.

A physician and a trauma program nurse manager were hired as consultants to further the planning efforts. Surveys were sent to every general surgeon in the state to help determine appropriate and feasible surgeon response times. Barriers to widespread participation by rural hospitals were determined and addressed, and the initial draft plan was pilot tested for appropriateness and feasibility by seven rural hospitals. The Minnesota Hospital Association conducted a cost analysis of the pilot tests to determine the financial feasibility and costs/benefits for rural hospitals. Lessons learned from the...
pilot tests and the cost analysis were widely distributed and published. This information was used as a basis for a new Trauma Designation Planning Grant program for rural hospitals, to assist them in obtaining equipment and training to achieve trauma center designation.

Public meetings were held related to the state trauma plan, and over 12 pages of questions and concerns were collected. Each concern was addressed in the final state trauma plan.

Implementation of the state trauma plan began in 2005 following the passage of legislation. The focus of implementation to date has been on the refinement of the required criteria for trauma center designation and the designation of trauma centers. No special process has been initiated to identify and assess trauma resource needs.

Rehabilitation is not currently included in the implementation of the system, nor does a process exist for setting realistic timeframes for its inclusion. All other components are being implemented concurrently.

EMS trauma and transport guidelines are under the authority of the EMSRB and are not required, under law, until July 2009. The EMSRB is currently hiring an EMS Medical Director to, in part, oversee this component. Deviations from the state criteria can be granted by the EMSRB on a case-by-case basis. While EMS issues are referred to the EMSRB for action, it is not apparent that ongoing communications and policy planning occur between the EMSRB and the STAC.

The trauma system has produced a number of templates and guidance documents to assist hospitals in developing their individual trauma system programs, but these documents are not mandated by law or rule and their use is voluntary. Use varies from accepting them as written, modifying them to meet local needs, or ignoring them.

The system has not published a “standards of care” document. The system criteria do prescribe educational standards for trauma care providers, and they establish minimum response standards for medical staff that must be met to obtain designation as a trauma center.

The Trauma Systems Program has a relationship with the Office of Emergency Preparedness, but collaborative efforts are not extensive at this stage as trauma system development is focused on designating hospitals, not on operational or disaster planning.

No plans exist to integrate the trauma system planning with managed care entities. No information is available regarding how incentives have changed the trauma system, and no formalized process to assess changes and incentives exists. The Trauma Systems Program has no information regarding what impact managed care has had on trauma care reimbursements.
The state trauma plan addresses care for all ages of patients. System criteria require all designated hospitals to be equipped to care for trauma patients of all ages. In part this includes equipment, transfer agreements, and treatment guidelines.

The 2007 Trauma Designation Planning grants allow hospitals to purchase equipment recommended by the American Academy of Pediatrics for the care of children. Trauma Systems Program staff serve as members on the Minnesota Emergency Medical Services for Children Resource Center Advisory Committee.

**RECOMMENDATIONS**

- Use the Joint Policy Committee (JPC) of the EMSRB and STAC to drive system development beyond coordination between EMSRB and STAC to the development of an integrated trauma system with clear goals and objectives
- Publish an inclusive Standards of Trauma Care for patients in the State of Minnesota
- Establish a timeframe for the implementation of all system components
- Develop a plan to identify and assess trauma resources needs
- Complete the *Model Trauma System Planning and Evaluation* document’s Benchmarks, Indicators, and Scoring assessment tool in order to prioritize system development needs and to demonstrate progress prior to the 2009 report to the legislature
Legislation

Purpose

- Comprehensive legislation is essential for trauma system development. The creation of statutes and regulations to develop the trauma system sets in place the necessary legal authority to move forward without concerns about anti-trust issues. Comprehensive statutes and regulations can provide for the process of planning, implementing, and funding the trauma system. Key provisions in trauma legislation include the ability to work through constituency groups to:

- Develop a comprehensive trauma system plan
- Integrate the trauma program with the existing EMS system
- Incorporate prevention programs and activities
- Establish or adopt guidelines for the prehospital, acute hospital, and the rehabilitation phases of trauma care
- Collect data and evaluate system performance
- Provide for confidentiality of trauma records, reports, and quality of care reviews
- Establish authority to designate trauma centers
- Provide authority for the inter/intrastate and international planning and implementation of trauma systems, without regard to jurisdictional boundaries.

Additionally, trauma legislation should include a dedicated funding mechanism and an administrative structure for trauma management and should ensure fiscal support for all components of the system, including the legal authority to ensure that third-party payment is coordinated within the trauma system.
CURRENT STATUS

The Minnesota Trauma Systems Statute was passed in 2005. The legislation places the trauma system under the MDH and charges the Commissioner of Health to adopt criteria to ensure that severely injured people are promptly transported and treated at trauma centers appropriate to their severity of injury. Minimum criteria must address EMS trauma triage and transportation guidelines, designation of hospitals as trauma centers, inter-hospital transfers, a trauma registry, and a trauma system governance structure. The system is voluntary and no authority to mandate exists. All EMS-related trauma issues fall under the authority of the EMSRB. It is responsible for the triage and transportation guidelines that must be implemented by 2009. The EMSRB has statutory authority to regulate ambulance services.

A 15 member State Trauma Advisory Council (STAC) was established by the legislation. The Commissioner of Health appoints 13 members from a variety of disciplines for 4-year staggered terms. Two members (the State EMS medical director of the EMSRB and the Commissioner of Public Safety or his/her designee) are not appointed by the Commissioner of Health, and they do not have limited terms.

The legislation calls for a voluntary hospital designation system. Criteria have been established that hospitals seeking designation must meet, but only if they choose to participate in the system.

The legislation provides for an annual budget of $352,000 to fund the trauma system from the general fund. While part of the general fund, the money comes from a hospital licensure fee, assessed as a base fee plus a fee per licensed bed. This funding has been used primarily to support Trauma Systems Program staff, designation site visits, the trauma registry and grants to rural hospitals. Additionally the State Trauma Program, through its parent agency ORHPC has leveraged other funds from such sources as the federal FLEX program, the state Rural Health funds, the federal HRSA bioterrorism funds, and the federal trauma/EMS grants to try and address various system priorities.

The legislation does not specifically address injury prevention or performance improvement though both activities are required within system criteria. Nor does the legislation provide for the anti-trust protection, adoption of standards of care or specific confidentiality protection for quality improvement.

The legislation requires the Commissioner of Health to report to the legislature by September 1, 2009 on implementation of the voluntary trauma system, including recommendations on the need for including the trauma system criteria in rule.
RECOMMENDATIONS

Following the 2009 report to the legislature seek legislation to:

- Promulgate rules and regulations to help institutionalize and specify criteria for participation in the trauma system
- Ensure protection for peer review
- Integrate all components into the trauma system from injury prevention through rehabilitation
- Secure additional funding for long term support for essential trauma system staff and other needed resources
Finances

Purpose

Evaluating the health of a trauma system's finances is still in its early development stages. This section outlines generally accepted business financial principles that are used as baseline.

At all levels of evolution, the trauma system should demonstrate through its trauma system lead agency financial accountability. This accountability should first include lead agency reporting of financial stability. Second, the lead agency should show the development of routine financial reporting by component, which reflects the financial health of the system. Trauma system components include system management, prehospital, trauma facilities, acute care, rehabilitation, and prevention programs. The lead agency should have established the following processes:

Lead Agency Financial Accountability

- A standardized model accounting report that lists costs and is used consistently with standardized definitions throughout the system
- A process to develop, review, approve, and monitor expenditures and revenues by line item
- A process to develop, review, approve, and monitor each component's costs over time
- A process that allows the trauma system financial costs to reflect its relationship to the trauma plan outcome measures
- A process for maintaining at least two years of audited financial records that meet accepted financial accounting principles
- A process to audit the financial health of the trauma system over time
Component Financial Accountability

- A process that defines how trauma centers integrate alternative delivery systems (payor systems) into the trauma program
- A process that defines how rehabilitation centers integrate alternative delivery systems (payor systems) into the trauma program
- A process that defines the incremental component costs associated with trauma system participation

Overall, the lead agency financial component should be integrated with other existing plans of the emergency medical service system to include, but not be limited to, disaster, prehospital, trauma facilities, acute care, rehabilitation, and prevention programs.

CURRENT STATUS

The Trauma Systems Program receives annual funding of $352,000 from the general fund. Funds are generated from a hospital license fee of all hospitals in Minnesota, not just those participating in the voluntary trauma system. Funds from the Trauma Systems Program, along with additional funds from MDH totaling $275,000, were made available in $5,000 grants to 55 hospitals to assist rural hospitals in their efforts to meet trauma system criteria. These funds do not include state monies administered by the EMSRB for CALS education.

The $352,000 primarily funds the Trauma Systems Program staff, designation site visits, and the trauma registry. Grants to local hospitals to help them meet trauma system criteria were awarded from unused site visit funds, thus establishing the grant program that MDH has continued to support. The MDH has established a three-year trauma budget that addresses priorities with the Trauma Systems Program base funding and additional funds from the Federal Flex program, State Rural Health Funds, Federal Small Hospital Program Funds, Federal (HRSA) Bioterrorism Funds, and Federal Trauma/EMS grants. Even so, funding is still insufficient for development, implementation and evaluation a trauma system.

The Trauma Systems Program develops a budget each year based on needs and submits it through the MDH budget channels for acceptance, making revisions until it is incorporated into the final MDH budget.

Trauma system finances are reported by summary but not by component.
Minnesota has no state standard for trauma center tracking and measuring trauma costs by patient, diagnosis, length-of-stay, facility, etc. While data are submitted to the MDH, analysis by service type (e.g., trauma, surgery) is not possible. Additionally, the trauma system is not able to equate costs to relative value gained. MDH collects payor mix utilization in aggregate, but the data are not broken down by service type.

RECOMMENDATIONS

- **Conduct a financial assessment of trauma system funding needs and distribute the report widely (See Financial Analysis of Florida’s Trauma System, 2002)**
- Align existing funding short term to hire a trauma research analyst to ensure future funding requests will meet trauma system goals and development needs.
- Study the mechanisms other states have used successfully to fund the trauma system.
- Projections of system development and management costs should be included as a component of the STAC planning effort.
Operational and Clinical Components

Injury Prevention and Control

Purpose

A comprehensive injury control system includes prevention and rehabilitation in addition to acute care. The ultimate goal of an organized trauma care system is to prevent injuries, just as the ultimate goal of medicine is to prevent disease. Consequently, the trauma care system should participate in the establishment of a system-wide injury control coalition (SICC). One form is an IPC or injury prevention center. Composed of members from public and private sectors interested in prevention activities, this coalition will create prevention partnerships to reduce fragmentation and intensify community interventions.

- Jointly with the SICC, a plan to promote injury control should be developed and implemented that will:
  
  a) Heighten awareness of injury as a public health problem
  
  b) Educate elected officials and the public about the need for trauma care systems and injury control to promote the passage and implementation of legislation aimed at reducing injury
  
  c) Educate the public about current trauma system development
  
  d) Educate the public about how to safely approach an injury scene, access the trauma care system, and provide assistance to the injured person until professional help arrives
  
  e) Involve public/voluntary organizations to aid system financing
  
  f) Conduct injury surveillance
  
  g) Develop a system-wide consensus approach to injury control interventions using needs assessment and intervention evaluation
  
  h) Communicate key trauma prevention strategies.
  
- The trauma care system should do a needs assessment to identify priority injury problems (including identification of high-risk groups and environmental factors)
  
- With the support of the trauma care system, the SICC should develop and implement priority injury control interventions that follow the injury control plan
• The SICC should carry out a public information program that follows the injury control plan

• The SICC should evaluate the success of injury control interventions. Outcome evaluations using trauma system data are preferable

• The SICC should integrate the potential of an organized entity to promote prevention activities within the system.

CURRENT STATUS

The Injury and Violence Prevention Unit (IVPU) within the MDH is a strong partner to the Trauma Systems Program. The mission of the IVPU is to strengthen Minnesota’s communities in injury and violence prevention by:

• Collecting and interpreting data on injury and violence,
• Developing and evaluating prevention programs and policies, and
• Providing tools, technical assistance, and information to others.

The IVPU helps raise awareness of injury as a public health problem through its website and printed publications. Many special reports of injuries to the population are available, and the injury database is available to the public for production of customized injury reports. These widely accessible data can be used to educate elected officials and the public about injury and the need for trauma care systems, and to promote policy change.

Efforts have been made to educate the public, hospitals, and health professionals about trauma system development through MDH press releases and trade publications.

The IVPU conducts state injury surveillance using multiple databases and registries. Examples of data resources include the Minnesota Trauma Data Bank (MTDB), the EMS database (MnStar), hospital discharge data, emergency department data, death certificates, motor vehicle crash data, and brain injury and spinal cord injury registries. The state received CODES grant funding and the IVPU performs data linkage between multiple databases. Federal grants provide much of the financial support for injury surveillance activities. The IVPU has the epidemiology expertise for injury surveillance. Resources are available to perform analyses of injury issues for injury coalition partners. For example, falls cause a higher mortality in Minnesota than in the nation and, while factors associated with the higher mortality rate have been investigated, the increased rate is still largely unexplained. Investigations of firearm mortality have revealed that suicide is the major intent.

The IVPU identified a few key partners for an injury coalition, but recognized that trauma centers had never previously been identified as a coalition partner. The coalition members identified include the MTDB, Injury Free Coalition for Kids, Toward Zero American College of Surgeons Committee on Trauma
Deaths, Safe Kids Coalition of Minnesota, Minnesota Trauma Registry Alliance, Upper Midwest Trauma Coordinators (representing MN, ND, and SD), and the Traffic Records Coordinating Committee. With the recent increased activity with the Trauma System Program and a postponed release of the injury control plan, it was reported that the coalition has not met for a couple of years. Several potential coalition partners could be added to strengthen the coalition, such as university injury programs, Fire and EMS, organizations representing special population groups such as the elderly, Native Americans, and other cultural groups.

An injury control plan *Preventing Injury and Violence in Minnesota: A Working Plan for 2010*, was completed in 2005, but editing has delayed its release until the end of 2007. The plan focus is on the prevention of drowning, falls, bicycle injuries, motor vehicle crashes, child maltreatment, intimate partner violence, traumatic brain injury, etc. Pediatric injury is addressed in the plan, but few goals have a pediatric focus. Implementation of the plan will begin after its release.

The IVPU special injury prevention and control program focus areas include sexual violence prevention and home safety. Prevention programs are developed primarily when grant funding is available. Resources of effective injury prevention strategies have not been made available to trauma centers or to the coalition through the IVPU.

Trauma centers have been engaged in injury prevention activities in their catchment areas, such as seat belts, car safety seat inspection, bicycle helmet use, fall, and prevention. The majority of trauma center activities have been educational. Evaluation of injury prevention activities is often not performed.

**RECOMMENDATIONS**

- **Implement the Minnesota injury control plan in collaboration with the Trauma Systems Program, and make available a menu of effective injury prevention program strategies that can be used by Level I trauma centers, thus providing an ongoing focus on key injury issues and an opportunity for program evaluation.**

- Develop and strengthen associations between the IVPU and university-based public health and injury prevention programs to expand available resources for the following:
  - injury surveillance,
  - identification of effective injury prevention strategies for targeted injuries in the injury control plan,
  - implementation and evaluation of injury prevention strategies.

- **Strengthen the injury control coalition with the addition of trauma centers, EMS and Fire, university-based injury programs, and other groups representing special populations, and conduct regular meetings to support implementation of the Minnesota injury control plan.**

- **Ensure that the needs of children and other special population groups in the state are addressed in future injury prevention planning and strategies.**
• Educate the public about injury in Minnesota and the need for a trauma system to care for the injured.
Human Resources

Workforce Resources

Purpose

The trauma system should have a distinct process for evaluating the adequacy of human resources available (within and outside the hospitals) to support normal system activity. The process should:

- Match resources with patient needs
- Define the optimal number and type of prehospital personnel and resources to be available to care for trauma patients
- Define the optimal number and type of hospital personnel and resources to be available to care for patients in all areas of the hospital
- Address periodic reevaluation of resources through an initial needs assessment and identification of trauma care workforce resources and matching resources to patient care
- Determine a plan for dynamic flexible response for optimal management of patients during peak periods of activity that stress the system (both prehospital and hospital resources should be included in the plan)
- Address recruitment and retention of qualified personnel
- Identify current numbers of certified prehospital personnel and their level of certification
- Identify current hospital personnel resources, including physicians and their specialties, nurses, and other health care personnel
- Evaluate resources and personnel in trauma specialty care units for pediatric, burn, spinal cord, head injury, and rehabilitation centers
- Identify the number and severity of injured patients cared for by hospitals and individual surgeons
- Assess the impact of system operations on existing levels of professional resources within the community, including limited physician specialists, such as neurosurgeons, orthopedic surgeons, anesthesiologists, and so on
• Identify the number and severity of injured patients cared for by emergency physicians.

CURRENT STATUS

Minnesota’s trauma system is experiencing many of the same human resource challenges that exist nationwide. The leadership of the various components have taken steps to assess and quantify the shortages, disseminate the information obtained, and develop plans to address the needs identified.

System Infrastructure

The Trauma System Program, housed in the MDH Office of Rural Health and Primary Care, has 2.75 dedicated FTE’s, as described in earlier sections. The Trauma System Program has identified the need for a dedicated part time research analyst for development of the trauma system quality improvement program, and this position is the most critical staffing need at this time.

Prehospital

The selection process has been initiated for the first part-time State EMS Medical Director to be hired by the EMSRB. The EMSRB has a staff of 15, who also support the eight EMS regional grantee programs. Each of the EMS regions have medical directors, as do all licensed Basic and Advanced Life Support ambulance agencies.

The EMS system is in rural Minnesota is heavily dependent on volunteers. EMS volunteerism is decreasing throughout Minnesota, but particularly in the rural areas. It is increasingly difficult for volunteers to respond to EMS calls during the daytime when they are working, and few services able to pay daytime staff, despite charging for services as their call volumes are not high enough. Retention is also a problem, which impacts maintenance of training levels. The ORHPC reported on this issue in 2002 in a document entitled: A Quiet Crisis: Minnesota’s Rural Ambulance Services at Risk. Subsequently a report on recruitment and retention by the Minnesota Ambulance Association was published in 2006, and a report by the fire service was completed in the past few weeks. Participants stated that the shortage of prehospital personnel has worsened in the years since the 2002 report was published.

Some BLS units have received permission to function under lower ambulance staffing levels than the required 2 EMT-B’s. Creative approaches to prehospital recruitment and retention have been initiated in some areas of the state, such as paying for education in exchange for a work commitment for a period of time and assisting returning military personnel with relocation and education in paramedicine. Other efforts have focused on developing or enhancing mutual aid resources, such as supplying regional incident command response units from other services so the local service can focus on providing patient care. Sharing of prehospital resources within regions is a good strategy to decrease costly duplication and should be continued and expanded.
Retention strategies such as flextime, job sharing, and other benefits valued by employees could be utilized and expanded wherever possible.

There are 9 licensed air medical services in the state.

Hospitals

Trauma centers reported shortages and retention problems for nurses, particularly critical care nurses, and ancillary staff such as physical therapists, occupational therapists, and radiology technologists. This shortage feeds into bed closures, bed shortages, emergency department patient holding, and trauma center diversion within the Twin Cities metropolitan area. The Twin Cities have a diversion policy which allows only two hospitals to be on divert status simultaneously, and automatically removes all hospitals from divert status if a third hospital requests diversion. Policy limits diversion status to 4 hour increments for each hospital.

The rural hospitals do not divert patients due to their large geographic catchment areas. Some of these hospitals, staffed primarily by midlevel practitioners, have difficulty getting a physician to respond on-site to see a trauma patient within 30 minutes. Some towns and hospitals have begun offering employment opportunities to spouses of medical personnel in order to augment recruitment and retention efforts.

Reported trauma center physician shortages involve trauma surgeons because of retention issues and neurosurgeons because of the number in practice. Other specialists in short supply are oral surgeons, plastic surgeons, and microvascular surgeons. While taking call is generally a requirement in hospital Medical Staff By-Laws, it is not always enforced, adding to on-call physician shortage issues. Providing valued benefits such as block operating room time has been successful in maintaining the support and participation of orthopedic surgeons for trauma care.

The ORHPC tracks the availability of about 12 medical specialists, including physicians, in a Workforce Development project. All critical access hospitals have a relationship with at least one larger hospital, allowing them access to various resources that are outside their own capacity.

RECOMMENDATIONS

- Explore and utilize creative recruitment and retention strategies in both prehospital and hospital environments.
- Regionalize EMS response strategies to increase the efficiency and effectiveness of existing EMS personnel.
- Engage in proactive planning to assist ambulance services in jeopardy to develop alternate strategies to avoid unnecessary ambulance service closures.
- Utilize alternate staffing strategies, including first responders to assist in transport, with appropriate waivers, to help to stretch the short supply of higher level EMS personnel.
Education

Purpose

The trauma system should have adequate education for all levels of trauma care personnel, both hospital and prehospital. The trauma plan should address:

- Standards for the credentials, educational preparation, certifications, and continuing education requirements (including injury prevention and control) for all personnel
- Incorporation of injury control information in educational standards for all trauma care personnel
- Quality management monitoring of courses and instructors
- Processes for state credentialing, certification, recertification, and decertification of trauma care personnel
- An organized needs assessment prior to developing new or additional educational activities.

CURRENT STATUS

System

Minnesota has continuing education requirements for physician, nursing, and EMS relicensure. Minnesota has two medical schools, many nursing programs, and about ten paramedic education programs.

System-wide trauma educational requirements exist for physicians, midlevel providers, and nurses in designated trauma facilities. Physicians and midlevel providers must take either Comprehensive Advanced Life Support (CALS) or Advanced Trauma Life Support (ATLS). Nurses must have appropriate trauma education which may include CALS, Trauma Nursing Core Course (TNCC), Course in Advanced Trauma Nursing (CATN), Advanced Trauma Care for Nurses (ATCN) or in-house training that meets the trauma system training objectives. Pediatric Advanced Life Support (PALS) and Emergency Nursing Pediatric Course (ENPC) are available in the state but not required for trauma system education.

Trauma system funding was utilized to purchase simulator manikins for the ATLS course in an effort to make them more available to those who need to take them.
Hospitals seeking Level III and Level IV status identified challenges in meeting educational requirements for facility designation. While able to meet guidelines for the initial application, concern was expressed about meeting educational guidelines for re-designation, as the amount of required trauma-related education may interfere with education required for other purposes.

Development, maintenance, and support for the CALS course in this state is a definite strength. The CALS program is investigating the use of a simulation skills lab that can be offered in rural areas as an alternative to the animal skills lab available only in the Twin Cities area. This alternate strategy, if successful, would reduce travel by participants and enable more rapid completion of the educational requirements.

Prehospital

Initial EMS provider education is based on the federal Department of Transportation curricula. In addition to the continuing education requirements for recertification every two years, EMS personnel must work toward meeting educational requirements related to emergency preparedness.

Hospitals

The trauma centers support and coordinate many of the standardized trauma courses listed above. Some report having outreach coordinators to facilitate educational activities. Examples of additional educational offerings for their referring hospitals include case reviews and educational follow-up on patients transferred. A Trauma Speakers Bureau and designation application assistance are also offered by some of the Level I and Level II trauma centers. Annual educational conferences which include trauma topics are provided by various trauma centers. Some education is provided through tele-health education centers.

RECOMMENDATIONS

- Conduct an educational needs assessment of physician, nursing, and prehospital personnel to pinpoint gaps in education and to enable better planning to meet the needs for future trauma education.
- Hire an Education Coordinator for the Trauma System Program to assess needs, promote statewide trauma education, and reach local jurisdictions in need of trauma-related education and effective injury prevention program strategies.
- Pediatric and trauma continuing education should be added to the continuing education requirements for the recertification of prehospital providers.
- Alternative methods of education (e.g., tele-video, web-based, blended learning, shadowing) should continue to be utilized, expanded, and evaluated.
Prehospital Care

Emergency Medical Services Management Agency

Purpose

Each system should identify an agency that is ultimately responsible for prehospital care.

The administration of this agency should include:

- A medical director familiar with, experienced in, and currently involved in prehospital care
- A medical director whose qualifications are commensurate with his/her scope of responsibility in the EMS system
- Quality improvement education and monitoring functions performed by the medical director or designee
- Sufficient support staff, including a system administrator experienced in prehospital management

Educational programs should include:

- Trauma education integrated with the prehospital training program
- Continuing education tied to the quality improvement system

Criteria evaluated by the agency should include:

- Triage, patient delivery decisions, treatment, and transfer protocols integrated with the EMS and trauma system
- Ongoing quality improvement of triage/treatment/transfer criteria
- Policies, procedures, and/or regulations regarding on-line and off-line medical direction

Certification to provide patient care by the agency should be based on standardized written and practical examinations given at regular intervals.

A system-wide quality improvement program should be established by the lead agency.
CURRENT STATUS

In 1995 the Minnesota Legislature created the Emergency Medical Services Regulatory Board (EMSRB) with the authority for all medically-related transportation including EMS personnel. Members of the EMSRB are primarily appointed by the governor. The agency has fifteen staff members including an executive director.

The state is largely rural and is divided into eight EMS regions. Within these regions are approximately 300 ambulance services, 6900 Emergency Medical Technicians (EMTs) providing 372,000 runs per year within designated primary service areas (PSAs). A PSA is covered by one ambulance service exclusively, and the service is required to care for everyone in the PSA regardless of ability to pay.

Services are licensed by the EMSRB at the Basic Life Support (BLS) level (199 services), Advanced Life Support (ALS) level (72 services), ALS level Part time (7 services), Specialized level (30 services including air medical services and ALS and BLS ground Interfacility transport). First Responder services are not licensed, but may register as Medical Response Units with the EMSRB if they have medical direction. EMTs are certified by the EMSRB. First Responders are registered by the EMSRB. Initial certification at all levels is based on successful completion of a EMSRB approved course and testing by the National Registry of EMTs. Recertification requirements vary by provider level, as determined by the statutes enforced by the EMSRB.

A State EMS medical director position has been approved and funded (0.2-0.4 FTE). Each EMS region has a medical director that functions in various roles. All ambulance services require a medical director. The requirements and responsibilities of the medical director are outlined in the EMS statutes and rules, and include the responsibility for maintaining a continuous quality improvement program. Information concerning the content of the local quality improvement programs is not shared with the EMSRB.

No prescribed statewide prehospital trauma training is required in general or to target special populations such as pediatric or geriatric patients. The individual services determine training content.

Current triage, treatment, and transport protocols are determined locally. By 2009 these protocols must include trauma triage and transfer guidelines, be age-appropriate and meet the criteria issued by the STAC, unless otherwise approved by the EMSRB.

RECOMMENDATIONS

- **Hire a State EMS medical director and ensure duties include supporting local service EMS medical directors in their prescribed roles and responsibilities, implementing the prehospital component in the evolving inclusive trauma system.**
- **Specify minimum medical oversight training requirements for administrative medical directors, including web-based training for rural physicians.**
• Develop a communication network (e.g., a list-serve) with all local service EMS medical directors to maximize information dissemination and to stimulate discussions on topics of common interest.

• Mandate local service medical directors to communicate their continuous quality improvement activities to the EMSRB on a periodic basis, not only for tracking purposes, but as a resource for effective quality improvement activities that can be shared.

• Develop and institutionalize specific and ongoing prehospital educational opportunities for trauma including the pediatric and geriatric patient.
Ambulance and Non-Transporting Medical Unit Guidelines

Purpose

*Each system should establish guidelines for non-transporting medical units (for example, quick response units) and for ground and air transportation that consider regulations, medical control, geographic boundaries, and topography.*

- Personnel should, at a minimum, be trained and certified/licensed at the EMT-basic level and should have off-line medical direction. On-line medical direction should be available.

- Safe, reliable ambulance transportation, whether by ground, air, or water, is a critical component of an effective system. The type of transport should be matched to the system’s topography and demography. Distribution of ambulances should facilitate appropriate and timely emergency response for the trauma patient.

- Standards, policies, or procedures governing hospital destination must be in place.

- Protocols concerning the mode of transport of the trauma patient (air or ground) should exist. The method of coordination between air and ground and procedures for rendezvous should be specified by protocol. These protocols should be carefully coordinated between the emergency medical services system and the trauma system.

- Protocols should exist concerning the interface between transporting and non-transporting units.

- A process for ambulance certification/licensing and decertification must be in place to ensure that vehicles and services meet minimum standards, including the minimum equipment recommended by the American College of Surgeons and/or state lead agencies.

- Mutual aid agreements must be in place among emergency medical services providers to provide adequate ambulance coverage when resources within a system have been exhausted.

- There must be interagency agreements with public safety agencies (for example, police and fire) that address security and safety of the injury scene.
Medical Non-Transporting Unit Guidelines

- A process for medical non-transporting unit (for example, quick response units, rescue units providing a medical response, and so on) certification/licensing and decertification must be in place to ensure that vehicles and services meet minimum standards.

- Personnel should, as a minimum, be trained and certified/licensed at the first-responder level and should have off-line medical direction.

- Protocols should exist concerning the interface between transporting and non-transporting units.

- There should be a placement strategy for non-transporting medical units to ensure they are located in areas where ambulance response may be delayed.

- There should be written agreements between non-transporting and transporting units clarifying, among other things, when non-transporting unit personnel ride with transporting units.

CURRENT STATUS

The minimum staffing requirement for a BLS ambulance is two EMT Basics, unless a special variance has been allowed by the EMSRB to permit ambulance staffing of one EMT basic and a First Responder in areas with critical personnel shortages. The minimum staffing for an ALS ambulance is one EMT Paramedic and one EMT Basic. Each PSA is covered by one ambulance service which provides adequate coverage when staffed with adequate personnel. However, more than 60% of the EMTs across the state are minimally-paid volunteers. This saves the state healthcare system an estimated 40 million dollars a year. But the supply of volunteer EMTs is dwindling, and this factor will result in an ongoing negative impact for the provision of timely emergency response in some areas. It was estimated that the loss of EMS volunteers results in the loss of one to two ambulance services each year. Each ambulance service is required to develop at least one mutual aid agreement with a bordering PSA to assist with ambulance coverage.

Mode of transport, facility destination and non-transport unit interface protocols are determined locally.
Ambulance inspection and licensure is handled by the EMSRB. A minimum required equipment list is specified by the EMSRB but the list does not reference a standard such as the joint guidelines of the American College of Surgeons, American College of Emergency Physicians, and National Association of EMS Physicians. Non-transporting units may voluntarily register with the EMSRB as Medical Response Units. Those that are registered with the EMSRB must have medical direction, but most non-transporting units are not registered and likely do not have medical direction. Placement and utilization of non-transporting units are accomplished on a local level.

The extent of interagency agreements between ambulance services and public safety agencies is unknown as they occur on a local level and are not tracked. However, it was the general opinion of the participants that law enforcement and fire services do show up at the scene when needed to assist with security and safety.

RECOMMENDATIONS

- **Establish regulatory oversight of non-transporting units.**
- Engage city and county governments and the general public in discussions concerning the need to pay for EMS personnel in areas of dwindling volunteers.
- Objectively review current air transport capability to maximize utilization and control costs.
Communications System

Purpose

Each system should develop a prehospital communications system that is fully integrated with the remainder of the EMS and emergency/disaster preparedness systems. Beginning with the universal systems access number, the communications network should provide for prioritized dispatch, postdispatch instructions, dispatch-to-ambulance communication, ambulance-to-ambulance communication, ambulance-to-hospital communication, and hospital-to-hospital communication to ensure adequate EMS system response and coordination.

- Medical direction and dispatch should be coordinated.
- An EMS dispatch protocol should be utilized.
- A 911 or enhanced 911 system should be in place and should receive all public calls that request EMS response to trauma patients.
- All dispatch centers, vehicles, aircraft, and base stations should be equipped with adequate communications systems. Equipment must ensure that there are minimal geographic areas where communications cannot be established and that at least 95% of communications attempts are successful.
- Priority dispatch and postdispatch instruction protocols should be in place.
- A quality improvement program should be in place.

CURRENT STATUS

Statewide enhanced 911 is operational, although wireless enhanced 911 is not fully implemented. Pre-arrival instructions are available in 57 of the 87 counties, often from hospital-based dispatch centers where all calls from surrounding areas get routed.

Dispatch standards and protocols are determined locally. No state requirements exist for dispatch medical oversight or a dispatch quality improvement program.

Emergency communications have been enhanced by the development of an 800 MHz system in the Metro area and a $500 million budget to finish the remainder of the state. This system will include interoperability with older communication systems in the state. Currently there is a reported failure-to-communicate rate of 5% or less for dispatch-to-ambulance and 5-20% for ambulance-to-hospital depending on geography, weather and distance.

American College of Surgeons
Committee on Trauma
RECOMMENDATIONS

- Obtain statutory authority to require medical oversight for dispatch of air and ground ambulances.
- Develop statewide dispatch protocols for air and ground ambulance.
- Develop or otherwise secure basic dispatch training, making it available in multiple formats.
- Complete the implementation of the statewide MHz system and ensure interoperability.
Emergency/Disaster Preparedness Plan

Purpose

Each system should develop a prehospital emergency/disaster preparedness plan that is fully integrated with the remainder of the EMS system, local government, private sector, and acute care facilities.

- The system should have periodic educational exercises with post exercise review.

CURRENT STATUS

The statewide emergency preparedness regions geographically align closely with the majority of the EMS regions. Facilities are required to regularly exercise their disaster response capability, which should include the prehospital component.

Disaster training occurs on the local level with a focus on incident command courses and START triage. No specific all-hazards response training is required for EMS providers, but some have undergone such training as a matter of local and regional expectations.

The state trauma plan is not integrated with the state disaster plan.

EMS communications and organization were identified as weaknesses during a recent local disaster response event.

RECOMMENDATIONS

- Provide prehospital training utilizing an all-hazards approach such as provided by the American Medical Association’s Basic and Advanced Disaster Life Support Courses.
- Utilize the trauma system concept as a template for disaster response and fully integrate the Minnesota trauma system as it evolves.
- Continue development of the statewide communication system, and include basic communication refresher training for emergency providers who seldom access the communication system.
- Develop additional regional incident command response teams to support communities with limited disaster resources.
Definitive Care Facilities

Trauma Care Facilities

Purpose

Injured patients should be delivered in a timely manner to the nearest appropriate facility. Regionalization of trauma care involves participation of hospitals that have the resources necessary to provide care for injured patients. A needs assessment study will provide an inventory of available resources, both human and physical, in the area to be regionalized. Trauma systems should be "inclusive" in nature, which means that the trauma care system will:

- Address the needs of all injured patients requiring hospitalization for injury
- Utilize all qualified medical resources

The trauma system plan should integrate all facilities into an inclusive system or network of definitive care facilities to provide a spectrum of care for all injured patients.

Trauma Centers

- The trauma system lead agency should provide uniform standards for trauma centers (The criteria established by the American College of Surgeons Committee on Trauma and the Resources document are examples.)

- The trauma system lead agency should determine the optimal level and number of trauma centers, based on anticipated volume, available resources, and geography. This determination should be based on the needs assessment study. Reevaluation should be based on the quality management process plus volume and need.

Other Trauma Care Facilities

- The role and responsibility of other acute care facilities within the system should be defined and integrated in the evaluation process.

- The role and responsibility of specialty centers (pediatric, burn, spinal cord injury) should be defined and integrated in the evaluation process.
**Designation Process**

- *Describe the process for selecting and designating trauma centers.*
- *Describe the process for monitoring all treatment.*
- *Describe process for re-designation and de-designation.*
- *Describe the process for adding other centers or deleting existing centers.*

**CURRENT STATUS**

Minnesota currently employs three functional approaches to trauma care, determined by geography and population density.

- A well organized system exists within the Twin Cities area which has three ACS-verified Level I trauma centers. These hospitals have a long history of commitment to trauma care, close ties with the sophisticated local EMS system, and extensive education, outreach, prevention, and research programs. Trauma triage criteria are well-defined, as are local destination protocols, and injured patients are reliably transported to the appropriate facility. Similar local systems are seen in the other larger urban areas, centered around the state’s other ACS-verified Level I trauma center in the Rochester area, utilizing 2 ACS-verified Level II trauma centers in the Duluth area, and 1 ACS-verified Level II trauma center in the St. Cloud area. It is noteworthy that pediatric trauma care is provided by the adult trauma centers. Pediatric-specialty hospitals are minimally involved in initial trauma care, though they do serve as a resource for hospital-to-hospital transfers.

- In the regions surrounding the larger population centers, non-designated hospitals provide a significant proportion of initial trauma care. The most severely injured and certain injury subsets may bypass local hospitals for transportation to urban centers, but most injured patients are initially evaluated at non-designated hospitals which vary widely in both physical and human resources. EMS triage protocols are locally controlled and non-uniform. Choice of destination hospital is largely at the discretion of the individual transporting unit, based upon perception of the patient’s status and historical patterns. Decisions to transfer patients to designated trauma centers are made after initial emergency department (ED) evaluation, based upon the match of patient requirements to available resources, and the transfer decisions are highly specific to the individual hospital. Transfer destination is based upon historical referral patterns, which derive from a combination of geographic, financial, and service-related criteria. Transport times to urban centers are relatively short, and relationships with urban trauma centers are generally well-established.
The remaining portions of the state are sparsely populated rural areas, served by smaller non-designated hospitals, where transport times to the larger urban areas exceed 1 hour, even by air medical transport. These areas are served by small and largely volunteer EMS services, operating under local protocols and local medical direction. Patients perceived to be the most severely injured may be transported by air directly from the scene, however some locales may request air medical services at the time of initial dispatch under certain circumstances. Initial hospital destination or the decision for air medical transport from the field are at the discretion of first responders and transporting agencies. Patients not immediately transported by air are taken to small non-designated local hospitals for initial evaluation, and subsequently transferred to urban centers based upon patient needs. A great deal of variability exists in the physical and human resources available at individual hospitals. Hospital transfer destinations are chosen based upon historical referral patterns.

Special populations, including pediatrics, burns, and traumatic brain and spinal cord injuries are handled based upon historical patterns. Little specific attention has been directed to pediatric trauma patients, who tend to follow the referral patterns for adults. The same is true of brain injury and spinal cord injury patients, who also tend to follow established patterns for all injured patients. Two American Burn Association-verified burn centers located in the Twin Cities and one other non-verified burn facility in Duluth serve the state’s burn population.

In the balance, the timeliness and sophistication of trauma care provided to an individual patient is highly dependent upon the specific geographic location of the incident, the judgment of the individual first responders and ambulance crews, and the protocols under which they operate, as well as the season, weather, and the time of day. The quality of care delivered to severely injured patients varies greatly from state-of-the-art care to cases in which significant delays are likely and the potential for suboptimal management is high.

Minnesota has made efforts to establish a statewide system of regionalized care for over 20 years, culminating in the current state trauma plan published in December of 2004. The stated goal is “to match facility resources with the needs of the patient as quickly and efficiently as possible.” The guiding concepts put forward in the plan’s introduction, in abbreviated form are to:

- design a system to care for severely injured patients, not minor injuries
- avoid disruption of existing referral patterns, while improving the quality of care
- support local hospitals to care for appropriate patients locally
- provide a “universal feel” with local variation.
- establish an inclusive trauma system, ideally with the voluntary cooperation of all hospitals

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1 Minnesota Comprehensive Statewide Trauma System Plan, December 2004, pg ii
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Enabling legislation was passed in 2005, and trauma system implementation then began. Efforts to date have largely focused upon designation of hospitals as trauma centers, with state designation dependent upon ACS verification for Level I and Level II trauma centers. Hospitals seeking Level III designation may choose either ACS verification or designation according to state requirements, and Level IV trauma centers are designated according to state requirements. To become designated through the state process, a hospital must fill out a self-assessment of resources, provide assurances of institutional commitment, and pass a site review conducted by the state. Designation is valid for a three year period. The state has the authority to de-designate hospitals that do not reach or maintain appropriate standards. No attempt has been made to determine trauma center designation based upon geographic need — the decision to seek designation and the level of designation sought are the choice of the individual hospital. Response by Minnesota hospitals has been good, to the point that a significant backlog exists in processing designation requests.

State guidelines for field identification and triage of trauma patients have been developed, but their use is not mandated at the local level. However, current legislation requires each agency to adopt its own specific criteria for field identification and triage consistent with state guidelines by 2009. Similarly, the system has adopted a broad destination guideline which dictates that trauma patients will be taken to the highest-level designated trauma center within 30 minutes transport time. However, a provision permits local EMS agencies to request a deviation from this general policy from the EMS Regulatory Board. The destination guideline does not specifically address pediatric, burn, or brain and spinal cord injury patients. This law does not go into effect until July 1, 2009. As such, it is not apparent that the impact of trauma system implementation has had material effects on patient flow to date.

The system has not addressed issues of cost related to the distribution of trauma patients, nor have payors been involved in the process of establishing standards for patient flow.

The component pieces required to ensure identification and transportation of severely injured adult patients to the most appropriate facility have generally been well addressed by the state trauma plan. The Trauma Systems Program has made good progress in encouraging hospital participation, and in moving forward with the state designation process. Given the relatively short time between passage of enabling legislation, and the heterogeneous nature of trauma care at baseline, this represents a tangible success.

The short-term keys to broader implementation of the regional system will center on the dissemination and uniform enforcement of the rules derived from the plan. The identification of injured patients as major trauma victims should have no regional variability. Selection of the destination hospital should be based on the match between the needs of the patient and the capabilities of the hospital, as verified by the system. This has potential to disrupt historical referral patterns, but is a key component of system-based care. Equally, the basic capabilities of hospitals designated at the same
level should be uniform with respect to major central components such as general surgical and orthopedic coverage. To this end, the system may wish to re-evaluate existing designation criteria or define new ones rather than endorse major deviations within the same designation level.

Intermediate and long-term goals should include more broad-based structural changes in the system. Steps should be taken to develop resources for the care of pediatric patients, incorporating both the existing trauma centers and the specialty pediatric resources available within the state. Ultimately, the distribution and level of designated trauma centers, as well as patient flow, should be based upon the needs of the patient rather than on market forces and historical referral patterns. Given the impact such patient flow changes will have, payors should be involved with and understand the process of policy development and the quality of care issues it is based upon.

In a general sense, the desire to tread lightly is understandable and politically expedient; however it is essential that uniform definitions and standards be in place to reduce local variations in care. This will ultimately require some loss of local control, and some willingness on the part of EMSRB and STAC to hold the line on standards outlined in the trauma plan.

RECOMMENDATIONS

- Implement current trauma patient destination policies, with minimal regional variation.
- Designate and re-designate trauma centers based upon established criteria, and performance to those standards.
- Engage specialty pediatric resources and current trauma centers to establish at least one ACS-verified pediatric trauma center, ideally at level I status.
- Implement the current EMSRB/STAC protocol for triage of the trauma patient statewide.
  - Adopt the protocols for field triage uniformly across the state with minimal to no regional variation.
- Develop special population- and condition-specific triage and destination protocols (pediatric, burns, spinal cord injury, TBI).
- Determine the need for, and designation of, higher level (I, II, III) trauma centers based upon system need, both geographical and volume-based, rather than on hospital preference.
  - Establish clear geographical catchment districts for designated trauma centers, based upon patient needs and resource optimization.
Interfacility Transfer

Purpose

Central to the concept of an inclusive trauma system is the provision for appropriate and expeditious transfer, when necessary, of injured patients between acute care facilities. The decision to transfer a trauma patient should be based on objectively agreed upon criteria that pertain to transfers to both higher and, where appropriate, lower levels of care. Established transfer criteria will minimize discussions about individual patient transfers and ensure optimal patient care. It is essential that the transfer agreements include provisions required under the Consolidated Omnibus Reconciliation Act (COBRA) and subsequent revisions of the Act.

Interfacility transfer is particularly important in the following situations:

- **Linkage between the urban and rural components of a trauma system**
- **patients requiring specialty facilities, such as pediatrics, burns, and spinal cord injury, or the need for further rehabilitation**
- **Movement of patients between acute care facilities and trauma centers**
- **Appropriate transfer of patients between trauma facilities**
- **Movement of patients from trauma facilities back to local communities when appropriate**

The process of transferring injured patients from acute to rehabilitation care facilities will be facilitated by establishing written transfer agreements between acute and rehabilitation care facilities in the system. The decision to transfer spinal cord injury (SCI) and traumatic brain injury (TBI) (severe/ moderate TBI) patients to rehabilitation facilities that provide specialized programs in SCI and TBI should be based on objectively agreed upon criteria.

**Inherent in the transfer of any trauma patient is feedback from the receiving to the transferring facility.**

- **The trauma system should ensure that interfacility transfers occur in a timely fashion commensurate with patients’ clinical needs**
- **The trauma system should establish standards for the mode of transportation and qualifications of transport personnel**
- **The trauma system should have a model transfer agreement**

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• The trauma system should ensure that all interfacility transfers are based on patient needs and are in the best interest of the patient

• Trauma centers should have transfer agreements with rehabilitation centers that provide specialized programs in SCI and TBI

• Trauma centers should have transfer agreements with rehabilitation centers that provide inpatient and intensive outpatient rehabilitation for patients with diagnoses other than SCI or severe/moderate TBI, such as mild TBI, amputations, burns, or other major injuries deemed appropriate for rehabilitation

• The trauma system should be cognizant of the cost issues and ensure the most cost-effective strategies that are consistent with optimal care

• A process (CQI) to measure patient outcome as it relates to transfer should be in place.

CURRENT STATUS

The current patterns for interfacility transfer were established predominantly with the development of specialized trauma centers in the major urban areas. As these trauma centers evolved and worked to maintain standards for ACS verification, they have individually established referral networks consistent with standards in the ACS optimal resource document. These standards include basic transfer agreements, communication protocols, and contact protocols that are broadly consistent with ACS principles, but specific to each institution. The trauma system has required trauma centers to have transfer agreements as a condition of designation, and the Trauma Systems Program has provided a model transfer agreement that includes provisions for patient return to sending facilities when appropriate.

For individual referring hospitals, the choice of transfer destination is based upon a blend of historical, financial, and service-based criteria that are highly specific to the individual hospital, and perhaps to the individual transferring provider. The decisions regarding which patients to transfer and the timing of that transfer are also high variable.

The Trauma System Program developed transfer guidelines based upon anatomic and physiological criteria, making them specific to the designation level of the transferring hospital. Adoption of such specific guidelines is a requirement of designation, but the trauma system has allowed wide latitude for individual hospitals to modify the criteria based upon their resources, which may vary day-to-day. The trauma system has plans to track and evaluate the appropriateness and timing of transfers on an ongoing basis, but to date this process improvement work has only been performed by individual receiving trauma centers working with their own populations and transferring hospitals.
Beyond very general recommendations current transfer patterns do not specifically address special populations, particularly pediatrics.

The trauma system does not currently address transfer agreements with rehabilitation facilities.

The trauma system does not currently address issues of cost, nor has the trauma system engaged payors in the process of establishing transfer policies.

The trauma plan provides for the basic components to facilitate timely and appropriate interfacility transfers. As is the case for immediate transportation to acute care facilities, the short-term strategies for reducing variability in transfer practices will center on the dissemination and enforcement of the rules derived from the existing plan. The physiological and resource-based criteria to initiate transfer, and the timeliness of transfer should be uniform across the state. Intermediate and long-term goals should include establishment of a pattern of transfer destination that is based upon the needs of the patient rather than on historical referral patterns. Additionally, consideration of cost issues involved, and involvement of payors in the process of determining interfacility transfer policy should occur.

RECOMMENDATIONS

- Implement current STAC transfer protocols at all designated trauma centers, with minimal local variability.
  - Establish transfer protocols for special populations and conditions (pediatric, burns, spinal cord injury, TBI)
  - Use the physiological and resource-based criteria to initiate transfer, and the timeliness of transfer uniformly across the system
- Make STAC transfer protocols available to non-designated hospitals immediately and encourage their use, regardless of the hospital's designation status.
- Establish system-wide quality improvement filters to track and evaluate patient transfers and timeliness of transfer.
Medical Rehabilitation

Purpose

As an integral component of the trauma system, rehabilitation centers provide coordinated post-acute care for trauma patients who have sustained catastrophic injuries, resulting in permanent or long-standing impairments.

The trauma system should demonstrate strong linkages and transfer agreements between designated trauma centers and rehabilitation centers located in its geographic region (in or out of state).

- The trauma system should convene a joint liaison committee to be comprised of appropriate health professionals from designated trauma centers and rehabilitation centers (for example, trauma surgeon, physician with expertise in rehabilitation, physical therapist, occupational therapist, nurse case manager, hospital administrator, and so on).

- Input from payors should be sought.

- The trauma system should ensure that the rehabilitation process begins in the acute care facility as soon as possible.

- To maintain clinical expertise and skills, each rehabilitation center that provides specialized programs in SCI and TBI should have a critical mass of patient volume in SCI and TBI.

- Each rehabilitation center that provides a specialized program in TBI should have an appropriately qualified Medical Director for TBI. It is recommended that the Medical Director of the TBI Program meet all of the following requirements: (a) have two years of experience in brain injury rehabilitation and/or completed a fellowship in brain injury, and (b) have board certification in a specialty field of medicine.

- Each rehabilitation center that provides inpatient and intensive outpatient rehabilitation for trauma patients should have an appropriately qualified Medical Director for Rehabilitation. It is recommended that the Medical Director of Rehabilitation meet the following requirements: (a) have two years of experience in rehabilitation and/or completed a fellowship in a rehabilitation specialty, and (b) have board certification in a specialty field of medicine.

- The trauma system should encourage clinical pathways for the major traumatic diagnoses that affect patients’ rehabilitation outcomes.
• The trauma system should identify and collect, at appropriate times, the necessary data elements for analyzing patient outcomes and evaluating the effectiveness of the trauma system. Data to be collected may include:
  o new injury admissions per year of SCI, TBI, and dual-diagnosis patients to each rehabilitation center
  o indicators of patient severity, including complications (for example, ASIA classification system for SCI, Glasgow coma scale for TBI)
  o time between acute care and initiation of rehabilitation
  o acute care length of stay
  o length of stay at rehabilitation center
  o functional independence measure (FIM) score
  o facility or location to which patient was discharged
  o type of outpatient rehabilitation care received (for example, hospital-based, home, nursing home).

• The trauma system should have data exchange procedures that will provide feedback (for example, patient outcomes, effectiveness of delivery system, and so on) to the trauma, acute care, and rehabilitation care providers.

• The trauma system should conduct long-term outcome research in rehabilitation of trauma patients and provide for appropriate dissemination of research results.

CURRENT STATUS

At present, each hospital has established individual relationships with community rehabilitation resources. It has been the impression of the STAC that the current rehabilitation resources are adequate. In urban areas, the ACS-verified trauma centers have incorporated rehabilitation early in the acute hospital course as required by the ACS optimal resource document. State requirements for designation at level III or level IV have no provisions for the integration of rehabilitation services.

Beyond designating one seat on the STAC for a rehabilitation specialist, the trauma system has not directly addressed rehabilitation. Specifically, there is no joint liaison committee, no system-based quality improvement, no data collection, and no system-wide provision for feedback.

The planning process for the trauma system has not incorporated rehabilitation to a significant degree, perhaps due to the broad perception that rehabilitation services and access to them is adequate across the state. In the short term, efforts should be made to encourage early involvement of rehabilitation services in all designated trauma centers, to initiate quality improvement activities, and to facilitate transfer of patients to appropriate facilities at the optimal time. Long term goals should include better incorporation of rehabilitation facilities in long-term trauma system planning, development of methodologies to assess cost and benefits of rehabilitation services, and involvement of payors in the process of determining rehabilitation policies.
RECOMMENDATIONS

• Modify state level III and level IV designation criteria to include requirements for early involvement of rehabilitation personnel in the care of patients admitted to the facility, and to require specific plans for utilization of rehabilitation facilities for patients admitted to the facility.

• Identify rehabilitation resources for specialty populations and conditions (pediatric, burn, spinal cord, brain injury)

• Develop a work group under the auspices of the STAC to facilitate integration of rehabilitation resources into the system

• Develop treatment guidelines for rehabilitation, especially for specialty populations and conditions (pediatric, burn, brain injury and spinal cord injury).
Information Systems

Purpose

The ideal trauma care system has an information system which provides for the timely collection of data from all providers in the form of consistent data sets with minimum standards. 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. An important use of this information is to develop, implement, and influence public policy. Policies and procedures to facilitate and encourage injury surveillance and trauma care research should be developed, including:

- System-wide plan for collection and collation of trauma care data and cost data should be encouraged
- Definition of minimum data sets
- Well-defined roles and responsibilities for agencies and institutions regarding data collection
- Process to evaluate the quality, timeliness, and completeness of data
- Process to ensure appropriate patient and provider confidentiality
- Data acquisition from all the appropriate sources. These can include:
  1. Law enforcement, crash, and incident reports
  2. Prehospital care reports / run sheets
  3. Emergency department data
  4. Trauma registry
  5. Hospital discharge data, including rehabilitation and specialty care facility
  6. Medical examiner/coroner records
  7. Death certificates
  8. Payor records
- Attempts to benchmark outcomes against larger data sets (such as NTDB)
CURRENT STATUS

The Trauma Systems Program, working in conjunction with the IVPU and the EMSRB, has been working arduously over the last several years to develop an information system that will, in structure and function, yield population-based health surveillance and evaluation data, for both acute and chronic traumatic injury and injury prevention. This project is still in evolution, and the information system is neither fully developed nor fully functional at this time. Given the current developmental status of the trauma system and the administrative structure governing it, the current status of the information system is not unexpected. In fact, by most measures, Minnesota has made substantial progress over a short period of time, and the information system holds great promise in its future capability. This is in large part due to the passionate efforts and considerable expertise of the staff of the respective units involved on the project.

The foundation of the information system is built on several so called “legacy databases” that have served the state for many years. They include, but are not limited to, the UB92 Discharge Database, Motor Vehicle Crash Database, Death Certificate data, and the Minnesota Trauma Data Bank (MTDB). The MTDB is the long-standing state trauma registry which is populated primarily by verified trauma centers utilizing CDM TraumaBase. Data are uploaded to the National Trauma Data Bank (NTDB). The cornerstone of the MTDB has been the comprehensive Traumatic Brain Injury and Spinal Cord Injury Database (TBI/SCI) which is mandated by the legislature and has yielded population-based injury surveillance information for many years. Major injury as defined by the Trauma Systems Program is captured by the MTDB from the participating trauma centers, while all injuries of patients admitted to other hospitals are captured by the UB92 Discharge Data set.

Three additional data custom applications constituting an integrated data and information engine have been developed by Image Trend, an outside software development company, in collaboration with the members of the Trauma Systems Program, IVPU, the EMSRB, and the Office of Emergency Preparedness.

- MnTrauma is a web-based application which has both comprehensive and minimum data set capabilities. It is supported by a staff in the IVPU (0.3 FTE) and ORHPC Staff (0.2 FTE) The database is maintained by the IVPU and administered by the Trauma Systems Program. It has interface capabilities with MTDB, vital statistics data, UB92 information, and mortality information. It will upload to the NTDB. At present, the MTDB and MnTrauma are parallel and redundant systems, but MnTrauma has not been fully adopted by those trauma centers utilizing MTDB.

- MnStar, administered and maintained by the EMSRB (1.5 FTE), is a web-based prehospital data management system which uploads to the National Emergency Medical Systems Information System (NEMSIS). This system is fully engaged by Minnesota EMS services where individual unit web-entry capability exists or manual entry is performed at the state level for those without web access.
• MnTrac is maintained by the Office of Emergency Preparedness (OEP) (1.0 FTE). This database is utilized for both real-time bed space tracking for surge capacity in the event of a disaster and for trauma center diversion tracking.

Some challenges in the information system administration and capability currently exist:

• While all three systems are reportedly fully integrated through a compatible platform, a firewall has been created between MnTrauma and MnStar at the direction of the State Attorney General relative to concerns regarding patient privacy. This is has caused considerable limitation in the utility of the information system and, unless a solution is found, plans for achieving a data-driven comprehensive population-based approach to injury epidemiology and system-wide quality improvement will be hampered.

• The oversight of the information system is fractionated between two distinct agencies (and three working groups within those agencies); while this does not appear to be a substantial limiting factor at present, it could be in the future.

• As a result of decisions made in deference to local control of data, current plans describe only the use of aggregate system data to measure trauma system performance. Individual system component performance tracking will be in the hands of local entities. Moreover, critical linkages between MnTrauma and MnStar are readily available, but these linkages cannot be engaged without permission from both the definitive care facility and the local EMS units involved.

• While it appears that the current personnel infrastructure supports system maintenance, resources for data analysis and report production are limited.

• As a result of the tri-partite administrative structure, there are three separate maintenance contracts with Image Trend which is probably not be the most economically efficient approach.

RECOMMENDATIONS

• **Achieve integration of all three elements of the information system to allow optimal opportunity for investigation of questions relative to injury epidemiology and outcomes in the state.**

• **Adopt a more cohesive oversight structure which integrates the Trauma Systems Program, EMSRB, OEP, and IVPU for the development of strategic direction, goals, objectives and tactical solutions relative to information systems development.**

• **Make a full conversion from MTDB to MnTrauma for both a minimum data set for all hospitals and a comprehensive data set for Level I and Level II Trauma Centers.**
• Build consensus around a centrally-mediated approach to outcomes investigation which enables the Trauma Systems Program and the EMSRB to analyze component outcomes and act upon them.

• Hire the trauma system program research analyst to bolster the current personnel infrastructure, so data can be turned into useful trauma system information.

• Investigate the opportunity for economy of scale relative to the three maintenance contracts with Image Trend for the information system components; perhaps one contract will be more economically advantageous.
Evaluation

Purpose

The trauma care system should monitor its own performance and the performance of its components. This evaluation should include continual reassessment of system operations and goals as they relate to patient needs, availability of appropriate resources, and costs. It is essential to measure compliance to standards, document system effectiveness, and identify quality improvement opportunities. System evaluation should include:

- System-wide quality management plan
- Lead agency responsible for system quality management plan
- Monitoring of system performance and performance of individual components
- A periodic review and update of system standards as they relate to patient needs, system resources, and costs
- Periodic review and update of trauma facility standards
- A quality improvement process that assesses the effectiveness of the trauma system
- A quality improvement process that measures the compliance to standards by each agency and institution
- A process to ensure patient and provider confidentiality
- A process to require and ensure appropriate facility quality management programs and appropriate interaction between facility quality management programs
- A process to determine the changes and incentives (risks and benefits) in caring for trauma patients
The STAC has formed a Data/QI Workgroup which has met three times. The focus of this workgroup is on data availability, data completeness, and data reliability. The described plan for system evaluation would place the quality improvement activities primarily in the Data/QI Workgroup, which would report the overall results and identified issues to the STAC. It is not certain that the trauma system peer review process has legal protection from discoverability.

System-wide trauma registry data are not yet available, but reports have been run from the data currently available in the MTDB and MNTrauma databases, in addition to the UB92 data accessed by the IVPU’s lead epidemiologist. The STAC has made attempts to identify areas for quality monitoring, but the result has been a lengthy list of variables, some of which may measure institutional performance rather than trauma system performance.

The EMSRB has protection for peer review activities at the individual EMS agency level. No plans were described for joint quality improvement activities with the STAC, or involvement of EMS when trauma system quality improvement involves EMS-related issues. MnStar data cannot be integrated with the MnTrauma data for peer review purposes at this time, based on legal opinion. EMS performance improvement activities are included in the responsibilities of the local medical directors, but limited reporting on the findings of such activities is available.

The STAC is depending on data analysis and the system quality program to drive any needed change as the trauma system develops. The assumption expressed was that if the data demonstrate a need for change, the change will be more easily accomplished. When MnTrauma is activated, hospitals will have the ability to view their own data online and compare their performance with aggregate data from other hospitals in the state. It is anticipated that the medical community desires to improve the care they provide and, when data identify areas for improvement, caregivers at all levels will make efforts to improve, given the means.

System quality improvement issues are those that involve more than one component of the system, more than one agency, or occur in more than one area of the state. These issues are difficult or impossible to be addressed by any single entity, and therefore should be considered priorities for inclusion in a system quality program. The STAC’s vision and value statements will yield high priority quality measures to be analyzed for compliance.

Building extreme complexity into the new system quality improvement program will actually decrease the ability to manage it and produce results. It is advisable to initially choose and work with a small number of issues, moving on to include additional issues as the program matures.
Level I and II trauma centers have well developed internal quality improvement programs as required by the ACS. A hospital quality improvement program is one of the five components for trauma center designation required by the state criteria for all designation levels.

The ORHPC is considering the use of Rural Hospital Flexibility Grant program funds to provide support for critical access hospital quality improvement activities.

RECOMMENDATIONS

- Ensure adequate legal protection of the peer review process, and address this in legislation if not currently in place.
- Overcome existing barriers in linking trauma and EMS data.
- Ensure full functionality and integration of existing databases for access to the complete spectrum of patient care for system evaluation.
- Develop a trauma system quality improvement plan.
  - The Trauma System Program should request consultation from the National EMSC Data Analysis Resource Center (NEDARC) or other resources, to assist them in developing their quality program and for data support.
Research

Purpose

The system should facilitate and encourage trauma-related research. The system should facilitate epidemiological research in pre-hospital care, acute care, rehabilitation, and prevention.

- There should be a process to facilitate access to data for trauma-related research, including, but not limited to:
  - Cost-effective research
  - Outcomes research
  - Epidemiology
  - Injury control research
  - Quality-of-life research

- There should be a process to acquire funding for research.

- There should be a definition of the research requirements from each system component and for each type of facility.

CURRENT STATUS

Trauma research exists on two levels in Minnesota. The first is research conducted at Level I trauma centers; the second is general epidemiologic reporting.

Little information was provided regarding the body of literature being generated at the Level I facilities. A search of the MedLine using Boolean combinations of “injury” “trauma” “wound” “care” and “Minnesota” yielded few results.

The MDH’s IVPU has been prolific in the publication of various epidemiologic profiles on injury in the state. These reports have been useful in targeting injury prevention and control activities. The IVPU has ongoing relationships with one or more schools of public health. The broader trauma system has not accessed those potential resources effectively.
Effective system research is essential for the identification and implementation of “next generation” approaches to trauma systems and trauma care. While it is a challenge to conduct such research during a period of system development and maturation, it is clearly essential for system improvement. The Institute of Medicine (IOM) notes in its volume titled *Hospital-Based Emergency Care: At the Breaking Point*:

“Emergency and trauma care research are vital to the health of Americans. They address the care of patients in their most vulnerable moments — when injury… strikes. While most Americans have a need for emergency care only rarely, they count on it to be there when needed… Traumatic injury is the leading cause of death among non-elderly adults. Unlike the vast majority of patient encounters in medicine, the quality and speed of the care that is provided in the relatively brief emergency care encounter can mean the difference between life and death or a prolonged period of disability.” (p. 227)

The importance of research activities is further underscored by the IOM focusing one of its key recommendations on the development of new investigators.

“To address the shortage of training for new investigators in emergency medicine, the committee recommends that academic medical centers support emergency and trauma care research by providing research time and adequate facilities for promising emergency care and trauma investigators…” (p. 230)

The Centers for Disease Control and Prevention’s National Center for Injury Prevention and Control (CDC) developed a research agenda, which outlined research priorities in 7 broad injury categories: injuries at home; sports; transportation; domestic violence; suicide; youth violence; acute care; disability; and rehabilitation. It also identified four cross-cutting research priorities: translating research into programs and policies; improving parenting and controlling alcohol abuse; identifying the costs and consequences of injury; and building the research infrastructure.

In 2005, the CDC updated the Acute Care chapter of the 2002 Research Agenda. This revision identified 7 research priorities:

- better translation of findings into patient care through guidelines
- evidence-based protocols
- how trauma systems improve care
- how mass casualty impacts acute care
- clinical prevention
- psycho-social impact of injury
- short term and long term outcome measures development
The report also called for the enhancement of research capacity through four actions: the development of acute care injury research networks; the development of research derived by mining current and future databases; the development of new investigators though training grants; and reductions in the institutional barriers to research, such as EMTALA regulations. Finally, it noted the need for more research on morbidity and disability outcomes (National Center for Injury Prevention and Control, 2005).

Based on these findings and recommendations from the IOM and CDC, it is clear that the research component of the Minnesota’s trauma system should evolve concurrently with the other aspects and components of the system. Structures and processes to promote such research should be implemented early in the system development.

RECOMMENDATIONS

- Establish a research committee of the STAC whose purpose it would be to identify essential system research and develop clear guidelines, policies and procedures for accessing data from MnTrauma, MnStar, MnTrac, and the legacy databases to facilitate research regarding system structure, process and outcomes.
- Provide researchers at the Level I trauma centers, schools of medicine and public health with a list of essential trauma system research topics, access to existing data, and technical support to encourage the completion of the essential trauma systems research.
- Publish and present findings in peer-reviewed journals and scientific forums.
- Refine existing trauma system structure and processes to continually improve outcomes based upon research and evaluation data.
Focused Questions

Question Posed

1. What is included in a top notch quality management program and how should we set one up?

Surveyor Response

Authority and Protection
To have a top notch state quality management program, the Trauma Systems Program must first ensure that the authority to conduct a state trauma system performance improvement (PI) process is clearly stated in the enabling legislation. In addition to the authority, the process itself must have clear protection for the data collection system and performance improvement process.

In order for all hospitals to report trauma registry data accurately, the reviewers recommend that the data elements, data dictionary, inclusion criteria and reporting timelines for trauma data be established in regulatory standards. This will allow the trauma program to measure compliance to standards by EMS providers and hospitals.

Multi-disciplinary Team
The Trauma Systems Program recently established a multi-disciplinary Data/QI work group, accountable to the STAC, which is tasked to develop a state trauma system PI process. This workgroup may begin by identifying and testing several system audit filters which can assess different components of the patient care event. The state PI program should address sentinel events, as well as, system processes, system components, and trauma system trends. The PI process should also include evaluation of the structure of the trauma system and patient outcomes.

State PI Plan
Having a PI plan in place is important to the success of the PI process. PI plans are available from several states, as are consultants knowledgeable in PI processes that can assist in the development of the PI plan. These plans outline the process and various components of a top notch state PI program that includes:

- Trauma system quality definitions
- Goals for the PI process
- Goals of the PI workgroup and STAC
- Overview of the PI program
- Facility indicators for internal review
- External indicators for system review
- Problem solving methodology
- Descriptive reports
- EMS system indicators

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• Process, structure and outcome measures

Until the plan is developed, the Data/QI workgroup could select a few system audit filters to review rather than establishing a complete “menu” of filters that review all components of the entire trauma system. These filters could be system issue driven, such as the appropriate use of the field triage criteria for under- and over-triage, or the appropriate utilization of ground and air ambulance resources.

What seems to be an isolated incident should be investigated through data analysis to identify whether it really is a more widespread system issue than previously thought. Trauma centers may be asked to further drill down causes of variability through the use of their own quality data so that more widespread causes can be identified and addressed at the system level.

Lessons learned through individual cases may be shared with staff from other trauma centers in the system quality forum. Also, system-wide issues may be identified through presentation of individual cases in an educational case review forum.

Comprehensive System Data
The integration of the MnTrauma and MnStar data collection systems will provide the Trauma Systems Program with a strong foundation for assessing patient care events with complete patient care records. Access to EMS data is essential to enable the performance improvement process to assess the continuum of care provided to the severely injured patients. All hospitals should be reporting trauma registry data as well, to ensure that the right patient has gone to the right facility at the right time.

A state trauma PI process should undergo a regular review of system standards as they relate to patient needs, system resources and costs. As the PI process and trauma system mature, the base of information should be expanded to include cost and rehabilitation data. It is important to assess trauma mortality outcomes through the state PI process. It is equally as important to assess the patient care outcomes related to the process of care. Though cost data are difficult to acquire, efforts should be made to identify sources of this information for analysis by the Trauma System Program. Integration and inclusion of rehabilitation data should be a long term goal for the trauma PI program.

Reports
Once data are collected from trauma centers, it is essential to provide feedback that allows a hospital to compare its performance to that of similar facilities using the aggregated state data. Feedback reports to EMS and trauma centers should be developed from data within MnTrauma and MnStar. The focus of these reports can be established in the STAC with input from the EMS regions, trauma centers, and Trauma Registrar Alliance and based on the performance measures established in the state PI plan.
The development of fact sheets that focus on specific topics relevant to trauma system development such as over- and under-triage, air ambulance utilization, head injuries, trauma system demographics and trends, all-terrain vehicle injuries, and falls might also be helpful in addressing specific areas that have been targeted by the state PI process. These fact sheets can provide valuable information for the development of state and local treatment and triage policies, as well as, to direct education efforts and injury prevention intervention programs and activities. These fact sheets can also be provided to the public and elected officials by placement on the trauma program website to garner support and understanding of the trauma system.

The state trauma PI process is the basis for all future development of the system. Utilizing the integrated trauma system databases for assessing system standards can be the basis for a publishable Annual Trauma System Report, and provide the impetus for change in established standards of care and system processes. The report should be made available to the public and elected officials to ensure their support for future development of the trauma system and in acquiring the needed resources to enhance the system.

**Data Inconsistencies and Reliability**
Comparing the trauma registry data with the UB92 hospital discharge data to ensure data validity is a commendable effort. However, it does not guarantee that all patients that should be entered into the trauma registry are correctly identified by the users (e.g., trauma registrars, trauma coordinators, trauma center directors) when using the established inclusion and exclusion criteria.

Establishing a user group for each data collection system (MnStar and MnTrauma) to ensure that data entry is consistent among users has been a very beneficial practice for many states. This user group provides a forum for discussion to review the data elements and improvements or clarifications to the inclusion criteria and data dictionary. The user group could be comprised of the Minnesota Trauma Registry Alliance and others to ensure that integration of data and data consistency are continually monitored between the MnTrauma system and trauma center trauma registry software. Edit checks in the trauma registry data collection systems should be in place to ensure complete data entry.

Using the expertise of the IVPU, the Trauma Systems Program should continue its plan to validate data entry by reviewing samples cases from the MnTrauma data collection system.
PI System Education
The implementation of a PI workshop might be helpful for non designated hospitals and for EMS service medical directors. A trauma nurse manager from the trauma center and Trauma System Program staff can provide a trauma case review for rural and non designated facilities to encourage trauma patient PI. The workshop can be provided for emergency department (ED) staff, including ED nurses, emergency physicians, risk management personnel, and surgeons, if available. In some cases, it could be advantageous to include the local EMS agency medical director. The trauma staff can customize the PI workshop based on review of the trauma registry data for that particular hospital. This workshop may also be beneficial for laying the foundation for future trauma center designations.

RECOMMENDATIONS

- Ensure that the Trauma Systems Program has clear statutory authority to implement a state PI process
- Ensure confidentiality protection for the PI process
- Utilize a Multidisciplinary PI workgroup to develop and implement a state PI Plan.
- Ensure access to system data and utilize the comprehensive inclusive system-wide data for the PI process.
- Hire a consultant to assist in the development of a state PI Plan which identifies system indicators and filters, and outlines the state PI process.
- Develop a mechanism for developing state annual reports, feedback reports for all system participants and specialized reports.
- Develop a mechanism and forums to discuss and address data inconsistencies, reliability and validity issues.
- Educate system participants about internal and system-wide PI processes.
Question Posed

2. Air Medical Services: There are a myriad of issues that surround this component of the system (eg. flyovers, call initiation, free market competition), especially when it is essentially unregulated. It is an inevitable discussion for the EMSRB and/or the STAC. Is there any wisdom the team can share? Are there any protocols, lessons learned, etc. that could guide us in these future conversations?

Surveyor Response

Existing EMSRB statute Air Medical Service Requirements (144E.12, .121) includes basic requirements for compliance with federal and state regulations, application for licensure, certification of medical personnel, and equipment. These basic requirements do not address the operational issues that arise when attempting to integrate multiple air medical providers into the trauma system, involving both scene transports and interfacility transfers.

In order to fully address this issue a multidisciplinary group of stakeholders should be brought together to openly discuss the issues involved. The Joint Policy Committee (JPC) recommended in the final report, to be comprised of the executive committees of the EMSRB and the STAC, should lead the discussion but air medical service providers, hospital administration, local EMS providers, dispatch organizations, and other stakeholders should be included. A good document to help guide these discussions is entitled "Air Medical Services: Future Development as an Integrated Component of the Emergency Medical Services (EMS) System" (full reference provided below.) This guidance document was developed jointly by the Air Medical Task Force of the National Association of State EMS Officials, the National Association of EMS Physicians, and the Association of Air Medical Services. It contains a wealth of information addressing the regulatory and operational issues involved.

Some of the core principles that should be included in the trauma system's deliberations include:

- the role of the state in assuming regulatory oversight of the medical aspects of air ambulance services,
- the optimal number and staging of air medical resources,
- universal access to quality air and ground transport,
- uniform clinical oversight by physicians,
- uniform quality improvement programs,
- consistent use of national consensus guidelines for both dispatch and post mission use review, and
- safety and risk management programs.
While the Trauma System Program and the EMSRB will need to carefully consider which aspects of the consensus document can be implemented in Minnesota at this time, the document will provide a comprehensive outline for discussion and for short-term and future planning and implementation.

Resources:


Additional reference materials on the topic, including a listing of state regulations (including statutory provisions) on Air Medical Aircraft Services, may be found on this website:  [http://www.nasemso.org/NewsAndPublications/News/Reports.asp](http://www.nasemso.org/NewsAndPublications/News/Reports.asp)
Appendix A: Site Visit Team- Biographical Sketches
MICHAEL F. ROTONDO, MD, FACS- TEAM LEADER

Michael F. Rotondo, MD, Professor and Chairman of the Department of Surgery at The Brody School of Medicine at East Carolina University, is an innovator, educator and national leader in Trauma and Surgical Critical Care. He received his undergraduate degree, as well as a Masters in Cardiovascular Physiology, from Georgetown University. In 1984, after graduating from Georgetown University School of Medicine, he took his general surgical training at Thomas Jefferson University Hospital. This was followed by a fellowship in Traumatology and Surgical Critical Care at the University of Pennsylvania under the tutelage of Dr. C. William Schwab.

In 1990, he accepted a post on the faculty at the University of Pennsylvania as an assistant professor and was promoted to the rank of associate professor of surgery in 1997. His skills in both clinical surgery and administration led to important contributions in the development of the Trauma Center at PENN, a University Level I Trauma Center, and Brandywine Hospital, an affiliate Level II Trauma Center. In 1995, he was named Vice Chief of Traumatology and Surgical Critical Care in the Department of Surgery at the University of Pennsylvania and became the Trauma Program Director in 1997. In addition to holding these positions of leadership, he consistently demonstrated his commitment to mentorship of medical students, residents, and fellows, a facet of his practice that continues today.

In 1999, he became Professor and Vice Chairman of the Department of Surgery at The Brody School of Medicine and Chief of Trauma and Surgical Critical at University Health Systems of Eastern Carolina. He brought world-class trauma and critical care to eastern North Carolina and successfully recruited young, dynamic trauma/critical care surgeons who shared his vision and brought this center to national prominence. In May 2005, he was named Chairman of the Department of Surgery at The Brody School of Medicine at East Carolina University.

He has achieved national and international reputation through his work in damage control surgery and abdominal compartment syndrome and through leadership in the American College of Surgeons Committee on Trauma, the American Association for the Surgery of Trauma, and the Eastern Association for the Surgery of Trauma over which he currently presides as president. He has over 130 publications, abstracts, book chapters and monographs and has delivered over 125 national presentations and visiting professorships.
BOB BAILEY, MA

Mr. Bailey is President of Bob Bailey, Inc. and provides Trauma System Consultation, EMS and EMS for Children system consultation to local, regional, state and federal governments as well as private foundations and organizations. Mr. Bailey currently coordinates EMS Initiative Grants for The Duke Endowment and is a co-principal investigator in a NHTSA grant to the National Association of EMS Physicians to look at technology issues and EMS. For the past two years he has served as the Senior Advisor to the Director, The Centers for Disease Control, National Center for Injury Prevention and Control, Division of Injury Response. From May of 2001-April of 2004 Mr. Bailey served as Executive Director for a federal funded Wireless Enhanced 911 Project, The Director of the Injury Control Center and the Director of Strategic Planning for the Center for Emergency Preparedness at SUNY Upstate Medical University in Syracuse, New York. Mr. Bailey has over thirty-five years of EMS experience.

Prior to starting Bob Bailey, Inc., he served as the Director of the North Carolina State EMS program for fifteen years where he was a leading force in establishing the North Carolina Trauma Program. He is past president of the National Association of State EMS Directors, and was a member of the “EMS Agenda for the Future” Steering Committee. Mr. Bailey received the National Association of EMS Physicians 2000 Ronald D. Stewart, MD award for outstanding contributions in prehospital emergency care. He has participated in twenty-four state EMS and EMSC assessments and has served on a variety of state and federal consensus groups. He served for several years as a member of the National Steering Committee for the federal EMS for Children Program, the AAP PEPP Advisory Committee and is currently a member of the North Carolina State EMS Advisory Council.
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 grantees. Support to the Federal Program Directors often included meeting facilitation, preparation of special reports (such as the Model Trauma Systems Evaluation and Planning document), and consultation on Program issues. Technical assistance often included strategic planning, providing guidance in securing funding, developing and implementing grants, developing injury prevention plans and programs, building coalitions, shaping public policy, conducting training, and producing educational resource materials.

Dr. Ball has authored numerous articles and publications as well as several health care textbooks, including Mosby’s Guide to Physical Examination (6 editions), Child Health Nursing (first edition), Pediatric Nursing: Caring for Children (4 editions), Maternal and Child Nursing (2 editions), and Pediatric Emergencies: A Manual for Prehospital Care Providers (2 editions). One of these texts, Pediatric Nursing: Caring for Children, received the 1999 and 2001 Robert Wood Johnson Foundation Last Acts coalition Outstanding Specialty Book Award. As an expert in the emergency care of children, Dr. Ball has frequently been invited to join committees and professional groups that address the unique needs of children.

Dr. Ball recently completed her term as the President of the National Academies of Practice, an organization composed of distinguished health care practitioners from 10 disciplines that promote education, research, and public policy related to improving the quality of health care for all through interdisciplinary care. She is 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.
MARY SUE JONES, RN, MS

Mary Sue Jones has been Delaware’s State Trauma Coordinator since 1996 and was the Associate Trauma System Coordinator for 2 years prior. Delaware has had an inclusive Trauma System since 2000. Mary Sue was Trauma Coordinator at a Pennsylvania Level 2 Trauma Center for 4 years, during the implementation period of the Pennsylvania Trauma System. Prior to that, she spent 5 years in the Admitting Area of Maryland’s R. Adams Cowley Shock Trauma Center, and later taught for 3 years in a paramedic educational program. Previous clinical experience includes positions in Surgical Intensive Care, as Emergency Department nurse manager, and as hospital shift supervisor in hospitals in Baltimore and suburban Washington, D.C. She has served on American College of Surgeons consultation teams since 2004, and represented State Trauma System Managers on the National Trauma-EMS stakeholders group.
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 also serves as the Director of the Rural EMS and Trauma Technical Assistance Center which is funded by the Department of Health and Human Services, Health Resources and Services Administration. 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. 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 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.
JIM UPCHURCH, MD, REMTP

Dr. Upchurch began his medical career in 1971 as a Special Forces Medic courtesy of the US Army. He graduated from the University of Texas Medical Branch at Galveston in 1982 and completed a Family Practice residency from the University of Oklahoma in 1985. Since 1985, he has served as an Indian Health Service (IHS) Physician on the Crow Indian Reservation in Montana. The majority of his clinical practice involves emergency medicine (EM), Emergency Medical Services (EMS), surgery and obstetrics. He maintains current National Registry certification and state licensure as a paramedic. In 2003, he completed a master’s degree in educational technology from George Washington University.

Dr. Upchurch is a long-standing member of the National Association of EMS Physicians and the American College of Emergency Physicians. Since 1986, he has functioned as EMS medical director for Big Horn County in Montana and guided their basic care program to the advanced life support level, including critical care interfacility transport. He also provides EMS medical direction for Big Horn Canyon National Park and the Incident Medical Specialist Program, US Forest Service, Region VI.

Dr. Upchurch is director of a small non-profit organization, EMS Education & Training. They offer distance and face-to-face educational opportunities to rural and frontier EMS personnel in Montana who desire to advance their level of care. He is an active ACLS, ACLS EP, ATLS and PHTLS instructor. Recently, he authored the Geriatric chapter for the sixth edition of Nancy Caroline’s Emergency Care in the Streets, released in 2007.

Although Montana has no recognized state EMS medical director, Dr. Upchurch has served in that function for many years and represents Montana on the National Council of State EMS Medical Directors of the National Association of State EMS Officials. He functions at the IHS national level as a consultant on EM and EMS issues. He also sits on the Montana Board of Medical Examiners and on the board for the Critical Illness and Trauma Foundation.
JOLENE R. WHITNEY, MPA

Jolene R. Whitney has worked with the Bureau of Emergency Medical Services, Utah Department of Health for 26 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 Section Director for the Bureau of EMS, 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-Elect for the National Council of State Trauma System Managers/NASEMSO. She is a member of the American Trauma Society, Utah Public Health Association 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.
Dr. 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 currently the chairman of the Maine State Committee on Trauma. Dr. Winchell is an active member of the Trauma Systems Evaluation and Performance 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.
Appendix B: List of Participants
American College of Surgeons  
Committee on Trauma  

Minnesota Trauma System Consultation Sign-in Sheet  
November 4th – November 7th, 2007

<table>
<thead>
<tr>
<th>Name</th>
<th>Representing/Affiliation</th>
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<tbody>
<tr>
<td>Kari Lappe</td>
<td>CALS Program</td>
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<tr>
<td>Jess Landerud</td>
<td>Children’s Hospital</td>
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<tr>
<td>Kristi Berg</td>
<td>Children’s Hospital / EMSC-RC</td>
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<tr>
<td>Claudia Hines</td>
<td>EMSC-RC / Children’s Hospital</td>
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<tr>
<td>Mary Hedges, Executive Director</td>
<td>EMSRB</td>
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<tr>
<td>Robert Norlen</td>
<td>EMSRB</td>
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<tr>
<td>James Rieber</td>
<td>EMSRB Chair</td>
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<tr>
<td>Jane Gisslen</td>
<td>Fairview Red Wing / STAC</td>
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<tr>
<td>Molly O’Brien</td>
<td>Fairview Southdale Hospital</td>
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<tr>
<td>Elaine Stevens</td>
<td>Heathleast Hospitals</td>
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<tr>
<td>Brenda Anderson</td>
<td>Hennepin County Medical Center</td>
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<td>Suzanne Gaines</td>
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<td>William Heegaard, MD</td>
<td>Hennepin County Medical Center / STAC</td>
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<tr>
<td>Mohammed Hussain</td>
<td>Kanabec Hospital</td>
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<td>Tom Hock</td>
<td>Long Prairie Memorial / STAC</td>
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<tr>
<td>Buck McAlpin</td>
<td>MAA / North Memorial Medical Center</td>
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<tr>
<td>Allen Brown, MD</td>
<td>Mayo Clinic / STAC</td>
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<tr>
<td>Val Kriegler</td>
<td>Mercy and Unity Hospitals</td>
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<tr>
<td>Ron Robinson</td>
<td>Metro Region EMS Program</td>
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<tr>
<td>Chris Ballard</td>
<td>Minnesota Department of Health</td>
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<tr>
<td>Curtis Fraser</td>
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<td>Mark Kinde</td>
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<tr>
<td>Scott Leitz, Assistant Commissioner</td>
<td>Minnesota Department of Health</td>
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<tr>
<td>Tim Held</td>
<td>Minnesota Department of Health</td>
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<tr>
<td>Jeff Schiff, MD</td>
<td>Minnesota Department of Human Services / STAC</td>
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<td>Rick Kreyer</td>
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<td>Gary Pearson</td>
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<td>J. Kevin Croston, MD</td>
<td>North Memorial Medical Center / STAC Chair</td>
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<td>Michael, McGonigal, MD</td>
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<td>Kory Kaye, MD</td>
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<td>Pat McCauley</td>
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<td>Darel Radde</td>
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<td>Carol Immermann</td>
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<td>St. Francis Hospital</td>
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<td>Jamie Stolee</td>
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<td>Brian Clarkowski, MD</td>
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<td>Steven, Eyer, MD - State COT Chair</td>
<td>St. Mary’s Hospital - Duluth</td>
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<td>Queen of Peace Hospital / STAC</td>
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<td>Linda Vogel</td>
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<td>Merit Care Medical Center</td>
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<td>Deb Syverson</td>
<td>Merit Care Medical Center</td>
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<tr>
<td>O.J. Doyle</td>
<td>Minnesota Ambulance Association</td>
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American College of Surgeons  
*Committee on Trauma*