

**Trauma System Consultation
The State of
North Carolina**

August 1st – 4th, 2004

**American College of Surgeons
Committee on Trauma**

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Executive Summary
State of North Carolina
Trauma System Consultation

Raleigh-Durham, NC
August 1st – August 4th, 2004

American College of Surgeons
Committee on Trauma

Methodology

The Office of Emergency Medical Services for the State of North Carolina requested this trauma system consultation, which was conducted under the auspices of the American College of Surgeons, Trauma System Consultation program (TSC). The multi-disciplinary Site Visit Team (SVT) consisted of: four trauma surgeons, one emergency physician, one State EMS Director, one State Trauma Program Manager, and one injury epidemiologist. In addition, there were two consultants to the ACS Trauma Systems program in attendance, both of whom have extensive experience in trauma system development. Biographical sketches for team members are included as Appendix A. of this report.

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

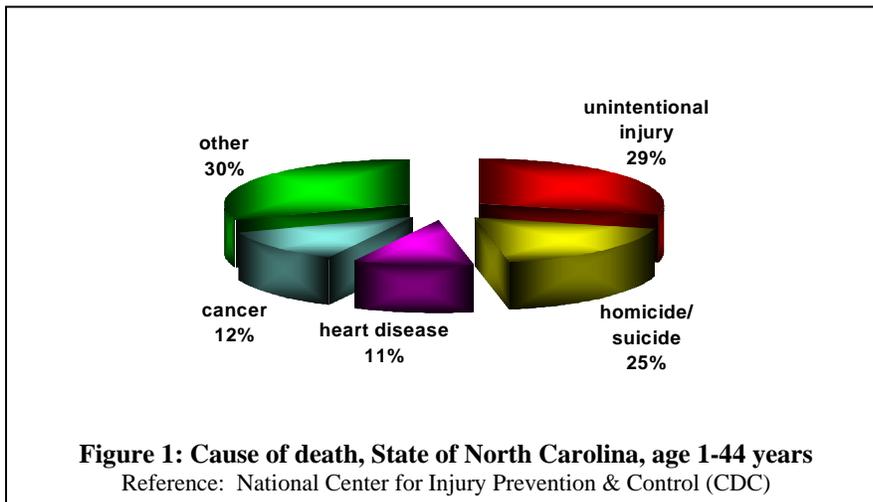
The SVT convened in Raleigh-Durham, NC on August 1-4, 2004, to review the state of North Carolina Trauma System. The meetings during the three-day visit occurred in a plenary forum during which the SVT engaged in interactive dialogue with a broad range of representative trauma system participants. There was also an opportunity for informal discussion with the participants, and time devoted to questions and answers. The final session (exit interview) provided the opportunity for a summary statement and recommendations by the SVT. At this session, the elements and structure of an “inclusive trauma care system” were outlined, as well as the magnitude of the injury problem in the State of North Carolina. The principal strengths, challenges, opportunities, and key recommendations made by the SVT were reviewed. A list of participants that were involved in the discussions and deliberations is included as Appendix B. of this report.

During portions of the visit, the SVT met in private for more detailed review and discussion, and for the purpose of developing a team consensus on the various issues and recommendations involved in the survey. On the last day of the site visit the SVT wrote the initial draft of this

consensus-based report. This report was based on the information contained in the PRQ, information obtained during the formal interactive dialogue, and information obtained in the course of informal interviews during the site visit. The process by which this report was developed was independent of any other trauma system consultations or assessments. North Carolina OEMS staff was given the opportunity to review this report for factual content, and the report has been subsequently reviewed, revised and edited by members of the ACS Committee for Trauma Systems Consultation. It has been approved by the American College of Surgeons.

Overview

The primary objective of this ACS trauma systems consultation is to guide and help promote a sustainable effort in the graduated development of an inclusive trauma system for the State of North Carolina. North Carolina is the 11th most populous state in the country with a population of approximately 8.3 million spread over a total area of roughly 48,707 square miles. North Carolina has experienced a high cumulative population growth rate of 21% since 1991.



Injury in the state of North Carolina accounts for 54% of deaths in ages 1-44, almost double that of cancer and heart disease combined (figure 1). Data provided by the state indicate there were 45,491 and 48,455 trauma admissions in 2002 and 2003 respectively. There were 15,998 deaths from trauma in the years 1999-2002 with motor vehicle crashes being the most

frequent cause. These data underscore the seriousness of traumatic injury as a public health problem in the state. They also provide a strong argument for a continued public health commitment in the development of an inclusive trauma system that will serve the current needs of the state with the capacity to expand in order to accommodate the needs generated by a relatively large population growth in the years to come.

North Carolina has, for years, been a leader in the development of systems of trauma care. Beginning in the mid-1970's with the establishment of the OEMS as the lead agency, and the identification of acute care facilities with the interest and ability to provide comprehensive trauma care, the system has gone on to develop a network of criteria-based designated trauma centers and regional trauma programs supported by Regional Advisory Committees and integrated into local EMS systems. This level of organization and maturity has developed in an

environment of strong, stable leadership, both administrative and medical, and a durable spirit of volunteerism and cooperation.

The current state trauma system in North Carolina is robust; amply supported by key enabling legislation, mature and consistent OEMS leadership, a large state trauma registry, a rich infrastructure of Universities, Medical Centers, and research agencies, and an unwavering commitment on the part of nurses, physicians and surgeons throughout the state. North Carolina is also distinguished by its strong interest in further trauma system development with the goal of continued improvement in the care of the trauma patient.

In a constantly changing environment, every trauma system has challenges and opportunities to improve. In North Carolina, these challenges include: evolving the structure and function of the RACs and STAC to meet the growing demands of the system; cultivating meaningful involvement by non-designated facilities involved in the treatment of injured patients and structuring a truly inclusive system of trauma care; conducting integrated, system-wide performance improvement; and reconciling the developing need for more centralized system governance with the inherent appeal of a system build on voluntary cooperation and goodwill.

The American College of Surgeons, through the Committee on Trauma, shares North Carolina's goal of promoting the delivery of optimal trauma care through the enhancement of its trauma system. The primary objective of this trauma system survey is to work collaboratively with trauma system stakeholders to identify opportunities and actions that will help accomplish this goal, and take the NC trauma system 'to the next level'.

The following consensus recommendations are based on data collected in the PRQ, on site reference materials, and information obtained during the opening session on August 1st, and the interactive plenary sessions on August 2nd and 3rd. The narrative information contained in the "Current Status" sections of this report is based on a combination of written documents, and opinions and facts provided by the North Carolina Trauma System stakeholders during the survey sessions. The recommendations contained in the report reflect the team's consensus opinion, based on this information. The factual information contained in this report has been thoroughly reviewed and corrected to the extent possible. Occasional minor inconsistencies related to the communication and transcription of information passed on to the surveyors during the interactive sessions will not affect the assessment and key recommendations made in the report. Our goal is to produce a highly accurate and cogent report that will help guide the further development of the system of trauma care in the state of North Carolina.

This following is a summary of principal strengths, challenges, opportunities identified by the ACS site visit team. Additional detail may be found in the narrative portions of the report sections. This summary also includes the key consensus recommendations generated by the SVT, with additional, more focused recommendations included at the end of each report section.

Strengths & Assets

- ❑ Strong and consistent state OEMS leadership

- ❑ Strong and consistent medical leadership
- ❑ A legacy of trauma system development, research, and leadership
- ❑ History and culture of collaborative activity in structuring a trauma system
- ❑ Cohesiveness among the multi-disciplinary trauma leadership
- ❑ Disaster preparedness
- ❑ Rich supporting infrastructure: Universities, Superb medical resources
- ❑ Excellent history of trauma systems research
- ❑ Strong & consistent desire/interest in trauma system improvement

Challenges

- ❑ Rapid population growth
- ❑ Limited financial foundation for support of the trauma system
- ❑ Creating an inclusive system
- ❑ Lack of meaningful participation by many of the non-trauma center acute care facilities
- ❑ Relatively limited ability to monitor and ensure compliance with standardized protocols and guidelines
- ❑ Lack of a comprehensive statewide trauma plan
- ❑ Divergent expectations for trauma system regulation between centralized (state) versus de-centralized governance (RAC/county, etc.)

Opportunities

- ❑ Building / leveraging formidable assets
- ❑ Utilization of data collection, linkage, and analysis
- ❑ System leadership and cohesiveness
- ❑ Coordination and linkage of rich research infrastructure
- ❑ Re-engineering the RACs to meet established system goals
- ❑ Translating recent assessments into policy development and assurance

Key Recommendations

The following is a selected list of recommendations identified by the survey team as being critical to the continuing development of the North Carolina trauma system. A comprehensive list of recommendations is contained in each individual report section.

Leadership

- ❑ Reconcile the divergence of opinion among trauma system leaders concerning the expectations, administration and operations of the trauma system in terms of accountability and responsibility.
- ❑ Organize the trauma clinical leadership into a unified team to champion the direction of the system using the state trauma plan.
- ❑ As the system develops, consider a part time trauma physician position in the OEMS, reporting to the EMS Medical Director, for purposes of providing trauma related medical advice and assistance with the operation and development of the trauma system.

System Development

- ❑ Develop State and regional trauma system development plans.
- ❑ Define the regional organizational structures based upon missions and roles, reporting and communication pathways.
- ❑ Convene a facilitated work session to resolve the question of the RAC role and structure.

Legislative

- ❑ Update the EMS and trauma statutes/rules to define the RAC and STAC roles and responsibilities.
- ❑ Update the hospital rules to define EMS medical receiving facilities and hospital participation in the trauma system.

Finances

- ❑ Conduct a financial assessment of trauma system funding needs.
- ❑ Identify the impact of continued population changes on the trauma centers and the trauma system, to include EMS resources.
- ❑ Address over-triage and utilization of scarce resources as the system data begins to produce information that permits analysis of usage patterns.

Prehospital Care

- ❑ Ensure participation of the state EMS Medical Director or state Trauma Medical Director (as mentioned in previous sections) in state level trauma related meetings.
- ❑ Include OEMS participation in appropriate components of NCCOT meetings or other appropriate state trauma meetings to ensure interaction with trauma program medical directors.
- ❑ Identify a method for NCCOT to have more consistent input and interaction with OEMS and NCACEP during trauma-related protocol development and QI activities.
- ❑ Ensure that each county's EMS system plan is performance-based and fully integrated with the trauma plan.
- ❑ Establish triage criteria and destination decision protocols to ensure transport of trauma patients to the most appropriate receiving facility within the inclusive trauma system.
- ❑ Ensure education of prehospital and hospital personnel regarding the technical use of on-line medical direction communications equipment.
- ❑ Continue the activities of the multi-disciplinary planning consortia for domestic preparedness response issues.

Human Resources

- ❑ Institutionalize recent improvements in County EMS Medical Director standardization and accountability.
- ❑ Use the planned Hospital Status System to track hospital capabilities in personnel and resources during both surge and normal volume periods. Include overall hospital diversion status that updates frequently and regularly.
- ❑ Increase OEMS FTE's at the state and local levels as needed to fulfill the new oversight and reporting requirements for the statewide trauma system.

Education

- ❑ Use data trending to plan System and RAC Performance Improvement and educational programs.
- ❑ Develop and provide a Trauma Triage course for all prehospital providers to teach them their role in the North Carolina Trauma System.
- ❑ Continue to pursue implementation of the COT Rural Trauma Team Development Course in concert with the Rural Health Office.

Injury Prevention & Control

- ❑ Perform an inventory of all injury prevention and control activities related to the trauma patient being performed throughout the state.
- ❑ Create an annual report stressing the cost effectiveness of proven injury control programs already functioning within North Carolina and disseminate to the Legislature and the media.
- ❑ Analyze NCHES and PreMIS data – to refine the targets for injury control specific to North Carolinians.

Definitive Care Facilities

- ❑ Develop a statewide consensus as to which trauma patients should be transferred to Level I and II, and which patients should be transferred to Level III facilities.
- ❑ Perform analysis to determine the number, type and location of trauma patients who are now being managed by non-trauma facilities.
- ❑ This analysis should guide the number and location of additional Level II and Level III facilities to complete a statewide system of appropriately located trauma hospitals.

Information Systems

- ❑ Acquire UB-92 data to provide a “denominator for trauma” and to assess the distribution of severe trauma patients treated within non-designated hospitals.
- ❑ Assess the possibility for collaboration between the ISSAC and NCHES databases in an effort to remove redundancy and combine resources.
- ❑ Provide additional system administration and data analysis support within the OEMS as needed to link and maintain the multiple new databases that are soon to become available.

Trauma System Evaluation

- ❑ Develop a statewide and regional trauma system PI plan.
- ❑ Legislate the new system-wide quality improvement process with clearly defined authoritative roles within the lead agency (OEMS) and facilitative roles within the RACs.
- ❑ Seek state funding to support PI-related RAC activities to augment other grant support and the in-kind contributions provided to RACs by trauma centers.

Research

- ❑ Develop an overall plan for the statewide coordination of trauma-related research. Incorporate this research component into the State Trauma Plan.

- ❑ Develop a statewide trauma research consortium, linked to the activities of the STAC, for purposes of promoting research throughout the continuum of trauma care.
- ❑ Link trauma research & surveillance to the process for developing public policy and changes to existing injury-related regulations and statutes.

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 State EMS and trauma systems have flourished under the expert and consistent leadership of dedicated individuals who have committed themselves to the improvement of trauma care and EMS in North Carolina (NC). The stability of the leadership over long spans of time has permitted continued progress towards goals that have resulted in NC becoming a leader in the nation in trauma care. One of the strengths of the OEMS is its ability to identify and collaborate with a multitude of stakeholders for trauma and EMS. It is impossible to list each of these collaborators in this document for fear of missing important contributors. However, these

agencies and organizations include professional medical associations, hospital associations, prehospital provider organizations, and numerous governmental and non-governmental entities.

The North Carolina Office of Emergency Medical Services (OEMS), established in 1973, has served as the lead agency for trauma since the early 1980's. The Trauma Systems Act of 1993 formalized this authority. General Statutes delineate this authority: Regulation of Emergency Medical Services, Statewide Trauma System Act of 1993, and the Emergency Medical Services Act of 1973 (Updated in 2001, 2002, and 2003).

The OEMS is an agency within the Division of Facility Services (DFS). DFS is the state regulatory entity responsible for the licensing of hospitals and nursing homes, for the approval of Certificates of Need, etc. DFS is a division within the Department of Health and Human Services (DHHS).

A State EMS advisory council is authorized in statute. The council meets quarterly and has existed since OEMS' inception in the early 70's. It currently has two major committees: Compliance and Injury. The Injury Committee makes recommendations to the State EMS Advisory Council on all OEMS recommendations with respect to changes to the state's trauma criteria and designation processes, as well as initial and renewal of trauma center designations.

A Trauma Registry Task Force, originated in 1987, and has evolved into the State Trauma Advisory Committee (STAC) in January 2003. Its mission is to provide a public forum to facilitate trauma system development and coordination of trauma activities between the state's various trauma interest groups. The major trauma stakeholder groups such as the North Carolina Division of the American Trauma Society (NCATS), North Carolina Committee on Trauma (NCCOT), Regional Advisory Councils (RACs), trauma nurse program managers and registrars meet individually on the same day as the quarterly STAC meeting and remain to present reports and participate in the STAC meeting.

At the regional level, Regional Advisory Committees (RAC) have been formed around Level I or Level II trauma centers. All hospitals in the state must establish an affiliation with a RAC. Each RAC has received initial funding from the Duke Endowment. The RACs' compositions, in terms of acute care facilities, are defined primarily by clinical referral patterns within the region to the central Level I or II facility. Generally, participation in the RAC by hospital stakeholders is significant (although variable) and activities include performance improvement and educational offerings. The level of participation from the prehospital EMS system seems less than representative of the provider group. In some RACs, the administrative level of the hospital representatives, (i.e. staff rather than leadership), may be insufficient to support some added functions and responsibilities of the RAC particularly since 9-11-01.

Presently, the role and missions of the RACs and STAC are not uniformly defined throughout the state. Of necessity, the RACs have absorbed disaster preparedness responsibilities in reaction to the urgent needs of the system resulting from 9/11 and continued threats. Post 9/11 RAC responsibilities have related primarily to bioterrorism response and, in the last year, the emergency preparedness responsibilities addressed the capacity and capability of the state to care

for increased numbers of trauma and burn patients. The RACs are integral to the state bioterrorism plan, as defined in the state's strategic plan approved by the Governor. However, these additional responsibilities have created concern that the RACs may not be appropriately structured (nor have the governance capacity) to manage the workloads effectively and accomplish integration with other health care entities within the regions. Strategic planning regarding the revisions to the RAC structure and their core functions has not yet occurred.

The Medical Director for OEMS serves as the overall Medical Director for EMS, trauma, bioterrorism, pediatrics and all other specialties, reflecting the integration of the trauma program into EMS. The North Carolina EMS Medical Director is a position contracted by OEMS and is integrated into all functions related to OEMS. The position is considered essential as articulated in the Statute which states that the Secretary of the DHHS shall "establish and maintain a means of medical direction and control for the Statewide EMS System." The state rules also mandate that the trauma system administrator and EMS Medical Director serve on each site team that surveys a hospital for initial or renewal trauma center designation. The current EMS Medical Director is an emergency physician at University North Carolina-Chapel Hill (a Level I trauma center) and has served in this position since 1998. Although the position that he occupies is funded at only 60%, 100% of his time is devoted to EMS. The workload of this position appears to have grown significantly over time.

The OEMS Hospital and Trauma Specialist, has served as a full-time employee (by virtue of a state funded position) in this capacity since 1978. She has provided stability and leadership to the system and has been key to the progress that has been made over the years. She brings to this position a background in hospital administration as well as nationally recognized expertise in trauma care. If and when this individual retires or otherwise leaves this position a critical void will exist. Preparations for transition for all key personnel should be ongoing.

OEMS, through its own operating budget, has contracted with the University of North Carolina, Chapel Hill since the late 80's for a research director who assists the trauma system administrator on various trauma-related projects. This researcher prepares data for trauma center site visits, develops and maintains the state trauma registry, and registry research and assists in preparing yearly trauma reports.

RECOMMENDATIONS

- Reconcile the divergence of opinion among trauma system leaders concerning the expectations, administration and operations of the trauma system in terms of accountability and responsibility. Review the general issue of an enabling vs. enforcing approach and of centralized governance vs. a decentralized, volunteer mechanism to trauma system development.
- Organize the expert trauma clinical leadership into a unified team to champion the direction of the system using the state trauma plan. Include definition of a Major Trauma patient; refine triage criteria, destination protocols, utilization of air ambulances, etc.

- As the system develops, consider a part time trauma physician position in the OEMS to provide trauma related medical advice, assist with the work of the trauma system and report to the EMS Medical Director. Consider models adopted by other states such as Delaware and Maryland and tie to the integration of the NCCOT in a similar fashion as the NCCEP.
- Define roles and responsibilities for the County EMS Medical Directors related to trauma triage, treatment and transport and assure that they are formally included in the system performance improvement processes reporting their PI issues to the regional and state EMS staff for resolution.
- Plan for succession of key personnel who are “one deep” in the lead agency. For instance, there needs to be ongoing training for successors in key positions such as the Trauma System Manager, EMS Director, EMS Medical Director and so on to prepare for issues such as retirement, promotion or career changes.

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

The current North Carolina “trauma system” is designed around specifically designated and verified trauma centers and constitutes an exclusive system not uncommon for states developing trauma systems in the 80’s. North Carolina’s exclusive system has led to areas in the state where trauma care in trauma centers is robust, and centers of excellence exist. However, there are other geographic areas without designated trauma centers that rely on undesignated acute care facilities for the provision of trauma care. The current data systems have not yet been fully implemented to provide information on all injured patients-either from prehospital patient records, or from all hospital emergency departments. Consequently the scope of this issue is not well known. Anecdotal information suggests that, in some areas, there are not clear written guidelines (enforceable) for prehospital and hospital personnel for the transport or transfer of seriously injured patients to a designated trauma center. There is also no consensus at the state level that directs local EMS systems at the local level, on how patients should be sent directly from the field to the trauma center versus the local community hospital in places where no trauma center is readily available.

Although much of the current legislation maintains a focus on trauma centers rather than a trauma system, the Office of Rural Health has recently indicated a willingness to assist with rural trauma system development and address trauma care access for the ~ 50% of the population that is located in rural areas of the state.

The OEMS has functioned as a lead agency for the NC trauma system using an encouraging and enabling approach rather than centralized control and regulatory enforcement. OEMS works to identify task force members with appropriate diversity with respect to geography, culture, medical professional certification, etc. State statutes and rules dictate oversight by the Medical Care Commission and a rules review process that requires evidence of specific feedback obtained from constituents at required public meetings.

Previously, OEMS' state plans, a National Highway Traffic Safety Administration (NHTSA) Assessment, a Trauma Task Force and the 2002 Trauma Stakeholder Meeting have focused on components within the trauma system. All have included broad EMS, hospital and community input. The current trauma system is multi-layered with overall direction from the state and input from and implementation at the regional and local levels. A trauma state plan is in final draft (not read by the review group) that is to be completed following the COT consultation so that applicable recommendations can be incorporated.

Several reports, assessments and reviews have been completed that support current and future system development. A three-day Trauma Stakeholder's Meeting in January 2002 reviewed each trauma system component from the *1992 HRSA Model Trauma Care System Plan* and identified the trauma system's basic strengths, weaknesses, opportunities and threats. Trauma was also included in a Bioterrorism funded hospital needs assessment completed by each of the 122 hospitals in the state in 2003. The state is currently completing, under the 2nd year of the *Bioterrorism Hospital Preparedness Grant*, a needs assessment of each county's EMS services. These assessments of current capability and capacity are to be commended in preparing the state for future acts of terrorism or other threats and emergencies.

The regional trauma programs in North Carolina are structured around seven trauma Regional Advisory Committees (RACs), that were formalized in the late 90's and have been instrumental in developing rapport among stakeholders in the regional trauma areas. RACs were established to encourage hospitals with shared interests to work together to address regional trauma system concerns, to undertake regional trauma planning, and to help establish and maintain a coordinated trauma system. Each of North Carolina's hospitals (as well as 17 of its' 100 counties lacking a hospital) maintains membership in at least one of the seven RACs, with membership largely following traditional transfer patterns. While usually one Level I or II trauma center serves as the lead coordinating entity for each RAC, in two instances, the RAC is coordinated through the combined efforts of two trauma centers. OEMS oversees the RACs and works with the seven RAC coordinators to identify tasks, provide resources and assist with technical support whenever possible. Regional and local system planning has been delegated to the RACs, and the state is beginning to address regional performance improvement through the RACs. The continuous involvement of system stakeholders at the STAC, RAC and State EMS Advisory

Council meetings is helpful in disseminating information and keeping professional groups informed of agency initiatives.

Following 9/11, each RAC expanded its focus to include disaster and terrorism planning. The emphasis to date has been on hospital interface with the trauma center and, to a lesser degree, on the inclusion of prehospital issues related to trauma. The RACs fill an integral role, e.g., each developed multidisciplinary regional disaster committees, etc. are key to medical augmentation plans.

The state has also taken advantage of funding from the Metropolitan Medical Response System (MMRS) in four of its urban areas, and has actively worked with the National Disaster Medical System (NDMS) to improve its EMS and trauma systems. Following 9/11, a state coalition comprised of the Special Operations Response Team (SORT), State EMS, Emergency Management (EM), and Public Health assembled to address emergency response to terrorism. All four agencies developed and approved a new State Medical Response System (SMRS) plan that is included in the State Strategic Plan developed by the Governors' State Emergency Response Commission for the integration of all team communications. Soon after the coalition came to fruition, OEMS, in a strong partnership with public health, received \$16.7 million of HRSA's emergency preparedness funding for Bioterrorism Hospital Preparedness.

As a result of this partnership and funding over the past two years, OEMS greatly expanded the role of the trauma RACs and their Disaster Committees to include bioterrorism hospital preparedness planning. This required much work and time, leading to the perception of some in the trauma community that the grant activities competed with the routine operations and development of the EMS and trauma systems. However, the grant resulted in many system improvements.

OEMS was actively engaged in disaster response at the state level long before 9/11. The integration of the trauma system with mass casualty and disaster response systems increased greatly following that event. North Carolina has often used its response capabilities due to numerous severe hurricanes and regional disasters requiring trauma system response. After each event, lessons learned have been used to improve the system. OEMS, through HRSA funding, provided a new eight hour training course on managing burn injuries through the RACS and the Hospital Association. Over 500 medical professionals (including prehospital) across the state participated in this education for patient care in the first 24-48 hours following injury. This was an example of translating the assessment of a problem following a disaster, where a number of persons were severely burned, into policy development and assurance by developing and implementing the burn training program.

The trauma system is integrated with the EMS system, but this integration does not appear to be complete at all levels of the system. EMS and trauma are supported and regulated through the OEMS. The Medical Director is the same for both systems, with the regulations for EMS systems and the trauma system requiring both systems to address the integration and interface. There is no consistent written local EMS plans or standardized approaches to ensuring the transport of trauma patients to trauma centers in all areas. Local EMS plans do exist to ensure

trauma patients are transported to trauma centers when more than one hospital is located within a county and not all hospitals are designated trauma centers, but these are not implemented statewide. However, if there are no designated trauma centers in the county service area, trauma patients may be transported to the nearest community hospital.

RECOMMENDATIONS

- Convene a work session to define the boundaries, reporting, communications pathways and accountability governance structure for the RAC's to the STAC and OEMS. The reporting and governance issues need to be defined in order for either the current RAC structure to be effective or for a new RAC structure to evolve. A meeting to define the governance issues and design reporting relationships is a first step.
- Develop regional trauma system plans to support the state trauma plan.
- Consider a broader scope of service for the State Trauma Advisory Committee with the inclusion of trauma stakeholders in the organizational structure. Include a subcommittee to address trauma system peer review, performance improvement or clinical issues that require physician medical expertise and confidentiality.
- Strengthen the partnership with the Office of Rural Health; identify the role of the Critical Access Hospitals in the trauma system.
- Identify an organized advocacy mechanism separate from the OEMS to support new legislation and other trauma system and center initiatives requiring elected official actions.
- Integrate the trauma plan with the HP 2010 objectives and the State Health Improvement Plan and use this information to educate the health department leadership about the trauma public health issues. Gain support for the OEMS in injury prevention, statistics and epidemiology and health planning. Utilize the technology tools and skills to translate data into meaningful information such as mapping of statewide injury trends.
- Integrate the county level EMS systems and hospitals that are currently not designated trauma centers with local, regional and state trauma plans, the state health improvement plan and the rural health improvement plan to assure wise use of resources and appropriate targeting of efforts based upon health statistics for specific communities. This could include discussions on the local mechanisms for triaging trauma patients and the use of the helicopter in local transports of trauma patients to the trauma center.

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

In North Carolina, two statutes specifically pertain to emergency medical services and the state trauma system: Regulation of Emergency Medical Services that includes the *Statewide Trauma System Act of 1993*; and the *Emergency Medical Services Act of 1973*. Both statutes underwent revisions in 2003. The related rules developed in conjunction with these statutes also underwent major revisions the same year. The statute highlights the authority of the OEMS for the trauma system:

DHHS is given responsibility for establishing and maintaining a program for the development of a statewide trauma system and has consolidated, as required in Article 7A 131E-162, all state functions relating to trauma systems, both regulatory and developmental, under the auspices of OEMS.

The legislation includes provisions for:

- a. a trauma system plan (not final and awaiting this report)
- b. integration of trauma and EMS systems
- c. prevention programs
- d. establishment or adoption of standards of care
- e. the designation of trauma centers
- f. organization of data collection and system evaluation
- g. confidentiality protection of data collection or quality improvement records/reports
- h. quality management and quality improvement programs

Lack of enforcement and lack of any consequences for non-compliance with statutory requirements in the trauma system was perceived as an obstacle to further system improvement and felt to be a weakness of the current system by the trauma center staff. Lack of involvement in the trauma system or failure to transfer level-of-care patients to designated trauma centers appears to have no consequences for non-participating acute care facilities. The incidence and associated outcomes for major trauma patients treated solely by non-participating hospitals is unknown.

Accountability for system performance at levels below the OEMS (prehospital, trauma centers, RAC) was unclear to participants. Clearly defined roles and responsibilities for the Regional entities and State Advisory committee, along with reporting structures, has not been articulated or implemented.

RECOMMENDATIONS

- Update the EMS and trauma statutes/ rules to define the new Regional advisory committee roles and State Trauma Advisory committee responsibilities.
- Until such time as an ED Reporting system becomes fully functional explore use of the hospital discharges database (UB92) to identify trauma patients treated outside of the designated trauma centers and to provide denominator data. Incorporate a regular review of non-trauma center UB92 data (or other reliable data source on trauma patient admissions to non-trauma centers) into the system-wide PI program. The purpose of this activity is to further evaluate system performance.
- Update the hospital licensing rules to define EMS medical receiving facilities and hospital participation in the trauma system (e.g., the hospital must participate in the trauma system by, at a minimum, signing a memorandum of understanding with

Level I and/or II trauma centers, must participate in the RAC, comply with PI, and support the data submission).

- To ensure an inclusive approach to trauma care in North Carolina, further define trauma center levels (III, IV), processes related to designation and protocols where appropriate in statute and rules.

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 OEMS state-operating budget is approximately \$3 million/year. Combined with external funding, it is approximately \$21 million this year. Trauma is funded as a component within OEMS. External funding sources and amounts for the past year are listed below:

HRSA Bioterrorism Grant	\$13,417,400
HRSA AED Grant	\$ 276,593
HRSA Trauma & EMS Grant	\$ 40,000
HRSA EMSC Partnership Grant	\$ 100,000
DOJ Domestic Preparedness Equipment Program	\$3,812,901
TOTAL	\$17,646,894

The OEMS distributed approximately \$7 million directly to hospitals and \$2 million directly to county EMS systems this year, from the HRSA Bioterrorism Grant for improving hospital preparedness. The Duke Endowment (a private foundation) provided \$434,000 in funding this past year for seven RAC coordinator positions and for a survey conducted by the UNC Injury Prevention Research Center to ascertain the public's knowledge of the trauma system in North Carolina.

HRSA funded a Trauma Outcomes Performance Improvement Course (TOPIC) this year and (for a second year) a percentage of staff time to develop the non-trauma center registry (ISSAC). The Bioterrorism Hospital Preparedness funding funded burn courses, a hospital inventory and bed resource software program for NC hospitals, the COT trauma system consultation, redundancy for the communications system, further integration of databases, etc. This funding is expected to continue.

All North Carolina trauma centers are required to collect hospital charge data, but not cost data, as one of the 200 data points in the state's trauma registry. The trauma centers do not track and measure trauma costs by patient, diagnosis, length-of-stay at locations such as the ICU in a facility, department, physician, and payer and submit this information to the lead agency.

The trauma system does not equate costs to relative value gained (cost of utilizing resources). At this time, the state does not combine and analyze the trauma system from an overall cost and benefit standpoint. Funding needs assessments have not been done nor are systems operations costs tracked to provide historical data to justify new funding.

All trauma centers collect and report payer mix data as participants in the state trauma registry. In addition, a number of other hospitals voluntarily provide this information to the state. The impact of out-of-state Medicaid patients was reported as a significant issue in at least two locations of the state that border South Carolina and Virginia. The current and future impact of the growing number of retirees relocating to North Carolina is unknown.

The financial information from the trauma centers indicates the major categories within the trauma payer mix as follows for the 1994-2002 period: Medicare (22 %); Self-Pay (21%); Commercial (14%); Managed Care (14%); Medicaid (13 %); and Worker's Compensation (6%). For 2002, the figures are similar for each of these categories, with an increase in Managed Care to 19% and a decrease in Commercial to 6%.

As in other areas of health care, there has been an overall reduction in reimbursement to trauma centers for charges. In the past, standby costs and uncompensated care costs could be spread across the patient population. This is no longer possible, creating a concern and reported financial losses for trauma centers within the state. The inability to cost shift was identified as a barrier for hospitals not volunteering to become Level III trauma centers in NC.

Funding is not earmarked specifically for trauma. However, the North Carolina General Assembly, through legislation, allocates funding for the trauma system through its funding to OEMS for trauma system oversight. For many years, funding has been allocated to support the salary of OEMS' trauma system administrator, support staff, parts of the trauma registry and a small portion of the OEMS Medical Director's salary.

RECOMMENDATIONS

- Conduct a financial assessment of trauma system funding needs and distribute the report widely. (See *Financial Analysis of Florida's Trauma System, 2002*)
- Identify the impact of continued population changes on the trauma centers and the trauma system, to include the prehospital EMS resources, so that funding can be planned to support the anticipated increase.
- Address over-triage of trauma patients from a system cost perspective to determine the impact on over triage on the utilization of system resources. As system data begins to produce more reliable information study the impact triage has on local and regional system operations.
- Use data to support financial considerations and include the cost of data collection/analysis into trauma systems funding.
- Incorporate into trauma planning and implementation the following initiatives:
 - Include an analysis of the financing of the trauma system in the state and regional trauma system development plans.

- Include provisions for funding a new governance structure for regional trauma support (redesigned RAC structure and operation) into the Health Department/OEMS budget in the next budget cycle.
- Include provisions for funding system evaluation and reporting, including epidemiological support,
- Include financial planning that anticipates the end of the grant funding that has supported the system to date.
- Seek inclusion in the distribution of federal preventative block grant funding.
- Include provisions for technology that will increase productivity, e.g., distributive education needs, teleconferencing, teleconsultation (especially for the Level IIIs and all other acute care facilities).

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 OEMS has no system-wide program to address injury prevention and control except through the EMS for Children program. However, within the North Carolina Division of Public Health there is an Injury and Violence Prevention Office. Funding for injury control and prevention similarly does not come from OEMS but rather from the Office of Injury and Violence prevention within the NC Division of Public Health. While engaged in prevention efforts, this office appears to be somewhat disconnected from the trauma system and acute injury care providers. The EMS Advisory Committee has a subcommittee on injury prevention. EMSC also has a workgroup that specifically addresses the needs of children. Many, if not all, of the RACs have subcommittees to address injury control and prevention activities within their own service areas. Some of the RACs have begun injury and violence prevention programs working through their own constituency groups. Some of these are integrated with fire prevention at the local level but there appears to be little sharing of programs, slide shows and videotapes across the RACs, across the EMS system or as a statewide effort. Child safety seats, teenage drinking and driving programs were common themes-usually based on national programs. Although some attempts at measurement of the effectiveness of these prevention programs have been made, these analyses have not been universally applied or formally reported.

Prevention programs are a requirement for trauma center designation and re-verification and, as such, examples were given of prevention programs supported by the trauma centers. Representatives spoke of several statewide initiatives involved in injury prevention. One such program is the North Carolina “SafeKids” program with 50 chapters actively involved in implementing program objectives. North Carolina has been a national leader in many areas of injury prevention and control within their traffic safety programs (Click it or Ticket; Booze it and Loose it), reduction of State DWI, and in seat belt usage. The state has identified motor vehicle crashes (number 1 killer from traumatic injury in North Carolina); falls (number 3); and burns (number 5) as priorities for injury prevention.

North Carolina has nationally recognized centers involved in injury prevention and control, some of which participated in this consultation visit. Such centers for injury prevention and control include the UNC Injury Prevention Research Center, the East Carolina Injury Prevention Program and the UNC Highway Safety Research Center, amongst others. Many of these centers were interested in trauma patient data and actively involved in clinical research projects involving traumatic injury and prevention. Not all of these centers were closely linked with the acute care providers. In addition, it did not appear that the activities of these centers are

integrated with the State Public Health Epidemiology Division, the RACs (except in their own service areas) or with statewide initiatives other than those that were grant funded at each of the centers.

RECOMMENDATIONS

- Conduct a survey assessment of all injury prevention and control activities throughout the state through the Office of Injury Control and Prevention (or another office within the NC Department of Public Health). Include information such as websites, contact numbers, email addresses, program objectives and widely distribute the findings of the survey to all stakeholders.
- Host a “Traumatic Injury Prevention and Control Day.” Such a forum should provide a mechanism for all stakeholders to meet and develop a statewide plan for traumatic injury prevention and control for North Carolina. This should include a strategy to develop effectiveness measures of different interventions and potential philanthropic and political support to maintain forward momentum.
- Seek input from the centers of excellence in injury and select program/programs for academic study and evaluation within the state trauma system. The selected program(s) should be one that has the potential to have local, state and national impact on morbidity and mortality from traumatic injury.
- Complete, as part of the statewide trauma plan, an annual report stressing the cost-effectiveness of proven injury control programs already functioning within North Carolina. The report should be published and disseminated to the Legislature and the media.
- Initiate media advocacy efforts at the local and regional level to highlight injury prevention initiatives and trauma center successes.
- Conduct early analysis of NCHES and PreMIS data, together with the existing trauma registry data set, to develop and further refine targets for injury prevention and control efforts specific to North Carolinians.
- Establish regular communication between the Public Health Epidemiology Division and the other Trauma Stakeholders including the RACS and injury centers.

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 work force 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

Statewide human resources assessment efforts have included a three-day trauma system stakeholder's meeting (2002) that identified strengths, weaknesses, opportunities, and threats to the state's trauma system and its components, and a *Hospital Needs Assessment for the HRSA Hospital Preparedness Initiative* completed in 2003. An outgrowth of the Hospital Needs Assessment was the identification of staffing and bed shortages throughout the state. In response to this identified need, OEMS along with emergency management personnel began disaster planning for hospital staff relocation from unaffected to affected areas including pre-credentialing of professional staff. Small-scale uses of the plan have revealed additional areas of need and those are being addressed.

The *Task Force on the North Carolina Nursing Workforce Report* (North Carolina Institute of Medicine) was released in May 2004, and concluded that, while the nursing shortages in North Carolina are not as extreme as those being experienced by some other states, attention and intervention must occur in order to prevent severe nursing shortages in North Carolina within the next ten years.

However, hospitals currently perceive significant nursing shortage issues. Trauma centers have developed problem solving approaches including use of traveling nurses, new graduates, and international nurses, and offering bridge nursing education programs. With these programs they have recognized an increased need for strong orientation and monitoring of quality of care. Staff retention and maintenance, including improved morale, are ongoing issues.

Potential effects of nursing shortages may include hospitals' inability to staff licensed beds, causing admitted patients to wait in emergency departments. This leads to increased diversion of incoming emergency ambulance patients. There is no information on whether there has been an increase in the number of diversion hours in North Carolina, either state or region-wide. Trauma centers generally do not divert prehospital trauma patients and try to help each other if an overload occurs. Inter-facility transfers are diverted at times due to lack of ICU beds, particularly pediatric ICU beds. A new state Hospital Status System providing bed and service availability information is being developed through the Hospital Bioterrorism Preparedness program, as is surge capacity planning.

Physician staffing changes are also having an impact on the trauma system. Mandatory decreases in house staff work hours have led to an increased utilization of mid-level providers to care for trauma patients as a means to counter the effect of losing this physician staffing. Primary physician issues in smaller hospitals include: an interest in a lifestyle that does not include taking trauma call, fear of drastic increases in unreimbursed trauma patients, and spotty depth of coverage for surgical specialties. Physician specialists demanding stipends for providing trauma call is a growing issue for trauma centers. Neurosurgical and pediatric surgical specialists are the most difficult to recruit and retain. Some smaller hospitals do not have the interest or ability to perform stabilizing emergency procedures prior to patient transfer. Some have shifts without any

general or orthopedic surgeons available at all. To assist with recruitment and retention, the Office of Rural Health has begun including general surgeons in their formal recruitment efforts.

Prehospital human resource concerns relate to burnout rates, decreased volunteerism, and difficulties with staff retention. Bridge programs for EMT-P's to RN are helpful to the individuals but can further deplete prehospital paramedic resources. Critical incident stress management programs, breaking up shift work, offering educational scholarship and retirement programs and opportunities for paramedics to perform other agency functions in times of personal need are options being utilized by some EMS agencies in other states to address retention problems.

RAC staffing, in the form of a coordinator, is provided to all RAC's through a Duke Endowment grant, which ends this year. Because of the large increase in workload brought to the RAC's by delegation of bioterrorism grant requirements, a bioterrorism planner will be provided to each RAC utilizing bioterrorism funding. The trauma program managers meet regularly, as do the trauma registrars. The Registrars have a website offering information on educational opportunities, among other topics. Many of the non-trauma centers seem to lack an internal trauma advocate to help gain support for participation. There is limited trauma staff within OEMS to handle the oversight and monitoring function of the trauma system and improve and enhance the role that RACs play in system coordination and enforcement.

RECOMMENDATIONS

- Continue enhancing the care provided by the prehospital care system. Increase access to the highest level of prehospital care achievable for the state's entire population and visitors.
- Increase County EMS Medical Director standardization and accountability as related to trauma triage, treatment and transportation. Require the regular submission of standardized reports of agency and medical direction activities to the State EMS Medical Director.
- Develop job expectations, roles and responsibilities for the County EMS Medical Directors.
- Use the planned Hospital Status System to track hospital capabilities in personnel and resources during both surge and normal volume periods. Get the information and updates to the prehospital providers on the streets. Include overall hospital diversion status that updates frequently and regularly.
- Develop and offer a staff-sharing program for non-trauma center staff to rotate using a buddy system to trauma centers in order to increase understanding of and interest in trauma centers and care.

- Increase OEMS FTE's at the state and local levels to fulfill the new oversight and reporting requirements for the statewide trauma system.
- Investigate funding available to address nursing shortages through the Bureau of Health Professions' Division of Nursing (www.hrsa.gov).
- Investigate ongoing availability and interest of public health students to fulfill an internship role in the OEMS and regions.

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

Prehospital Education

DOT National Standard Curricula are utilized for EMT-B and EMT-P education. EMT-I education is based on a modification of the National Standard Curriculum. National Registry certification is not required for NC prehospital providers. It was estimated that fewer than 10% of prehospital providers in the state are Nationally Registered. Standard certification courses such as BTLS and PHTLS are available and encouraged but not required. A large annual conference, Emergency Medicine Today, has been provided by the OEMS for 30 years. However this conference is not tied to learning objectives determined from the prehospital PI programs within the state.

The NC College of Emergency Physicians has provided guidelines for the minimum requirements for prehospital protocols, as well as skills, equipment, medical oversight, and performance improvement. Each jurisdiction establishes its own set of standards for prehospital personnel based on the NCCEP guidelines. However, there is limited statewide monitoring to ensure that the right patient is getting to the correct facility to meet his/her needs in a timely manner. Discussions provided during the open forum pointed to an inconsistent application of triage, treatment and transport protocols across the state, not necessarily tied to patient needs.

Comments made in the open forum indicated that the increase in the number of education hours required for initial and continuing education following the national curricula has been a contributor to the decline volunteerism seen in recent years.

The OEMS Education Credentialing Specialist uses a Certification/ Inventory System database to track initial and continuing education records for prehospital providers. Recertification is required every four years and includes credentialing, written examinations and practical skill stations.

Quality management is a requirement for all EMS Services and its use is encouraged to drive continuing education programs. This has been implemented over the past 12 months, and has not yet been evaluated.

Nursing Education

There are many opportunities to pursue nursing education in the state, including Associates Degree, Bachelor's Degree, Master's Degree, and Licensed Practical Nurse programs. There are also RN to BSN, and EMT-P to RN programs available.

Trauma center continuing education standards are in place for Levels I, II, and III trauma centers. This includes requirements for RN's and LPN's caring for trauma patients in transport programs, ED's, ICU's, and medical-surgical floors as well as mid-level providers who routinely care for trauma patients, trauma nurse coordinators, and trauma registrars. Compliance is monitored through the state designation process.

RAC's provide Outreach educational components for the hospitals in their regions. Various national certification programs such as ATLS, TNCC, ACLS, and PALS are also available.

HRSA grant funds were used to bring the Society for Trauma Nurses' TOPIC (Trauma Outcome Performance Improvement Course) to NC.

The Bioterrorism Hospital Needs Assessment identified a lack of adequate numbers of burn center beds for a large burn injury event. A burn care course was developed to teach hospital/Trauma Center staff burn care for the first 24 to 48 hours post-burn. There is 500 staff members that have attended this course, which has been provided through the RAC's and other hospital associations. Other educational needs related to preparedness have been addressed as they have been identified, many are web-based.

Physician Education

NC has four medical schools and nine Area Health Education Centers.

Trauma center standards for clinical qualifications and trauma continuing education exist for trauma and ED directors, general surgeons, orthopedic surgeons, neurosurgeons and emergency department physicians.

A medical director's course is mandatory for all EMS Agency Medical Directors.

Telemedicine, including CME opportunities, is available to some extent in the state. Some of the RAC's tape their education sessions for the hospitals unable to send attendees to the meetings.

Other

The Division of Public Health has a computer-based Workforce Development System that includes 40 Public Health competencies. Education gaps are identified for each user, remedies offered, and completion of educational efforts tracked.

The COT Rural Trauma Team Development Course is being considered as a pilot program for education of physicians, nurses, and mid-level providers in smaller acute care facilities and a disaster planning course for school nurses has been provided.

RECOMMENDATIONS

- Use data trending to plan statewide system and RAC performance improvement and educational programs.
- Assure provision of the highest achievable and sustainable level of EMT prehospital care throughout the state.
- Require at least PHTLS or BTLS course for all prehospital providers as part of their initial training and continue to provide these courses as part of ongoing continuing education.
- Develop and provide a trauma triage course for all prehospital providers to teach them their role in the North Carolina Trauma System.
- Encourage individual prehospital providers to achieve National Registry certification (NREMT). Consider provision of some recognition for doing so (newsletter, pin etc) or inclusion of a percentage of Nationally Registered providers as a standard in the Model EMS Agency document.
- Encourage and enable trauma providers to utilize distance-learning opportunities to enhance their practice.
- Tie continuing education to the results of performance improvement monitoring so that system enhancements can be tracked and shared system wide. Translate systemic errors in triage, treatment, transportation and clinical practice into training programs.
- Continue to pursue implementation of the *COT Rural Trauma Team Development Course* in concert with the Rural Health Office.

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

NC G.S. 143-508 designates DHHS as the state department responsible for "establishing and maintaining a program for the improvement and upgrading of emergency medical services" throughout the state of NC. To that end, direct responsibility falls upon the OEMS to regulate EMS functions in NC. Each county has been delegated the authority for reviewing and approving EMS agencies and personnel within county, and for providing oversight of the county's EMS activities.

The state EMS Medical Director is a board-certified emergency physician with extensive experience in emergency medicine, EMS and trauma, and data management systems. Currently the Medical Director's position is at 0.6 FTE. Recently, responsibilities have also expanded to include domestic preparedness, potentially detracting from the trauma component of the position. There is currently no specific regional physician medical director oversight (e.g. Regional OEMS EMS Medical Director) provided at the regional level either within the RACs.

Under a three-year grant from the Duke Endowment Foundation, OEMS is developing an EMS PI Resource Center to improve performance improvement activities at the local level. As part of this project, OEMS is developing toolkits for use by local EMS providers to address issues of local and state EMS service design and performance and specific EMS issues such as trauma, cardiac arrest, pediatrics, airway management, cardiac care and stroke care.

Medical direction at the local level is typically provided by the county EMS Agency Medical Director, although some individual provider services may also have a medical director. It is estimated that there are approximately 120 medical directors or assistant medical directors in the state. Requirements for medical directors (initial qualifications, continuing education requirements), roles and responsibilities are outlined in NCCEP documents adopted through rule by OEMS. Local medical directors are responsible for credentialing personnel, protocol development and quality improvement activities. It appears that the involvement of county EMS system medical directors is variable throughout the state. Primary responsibility for QI activities rests at the local level through a system EMS peer review committee. Information provided during the site visit suggested that the level of quality improvement activities being conducted around the state is highly variable. Although recent rules changes provide much better protection for peer-review activities there appears to be persistent confusion among hospital and prehospital personnel about that protection. This currently seems to impede quality improvement programs at all levels of EMS and trauma.

The majority (84 counties) of the state's prehospital system provide EMT-P level care, six counties have EMT-B as the highest prehospital level of care, and ten counties provide EMT-I as the highest level of care. The need to re-evaluate the level of prehospital care in some of the eastern areas of the state was expressed in the open forum. Each county has its own medical director.

Staffing in OEMS includes personnel in the state and regional offices. County EMS agencies are staffed as necessary to accomplish the activities of the agency with varying levels of personnel. Generally, the county agency is part of county or local government with a specific administrative person responsible for coordinating county activities.

Trauma protocols are included as part of the state minimum protocols generated by the NCCEP and reference in rule by NCOEMS. These are based on the North Carolina EMS Skill and Medication Formulary maintained by the North Carolina Medical Board for the appropriate level of EMS personnel as incorporated into initial training programs. With the exception of the EMT-Intermediate level of personnel, these follow the DOT curriculums. Outside of the local system continuing educational program, there are opportunities for trauma-related CE for EMS personnel during Emergency Medicine Today, an annual conference typically attended by over 1,000 prehospital and hospital personnel. In addition, BTLS and PHTLS courses are offered throughout the state for EMS personnel. Documentation of compliance with CE requirements occurs at the time of personnel re-licensure and is randomly audited.

Off-line medical direction is provided by the county (system's) EMS medical director. A few EMS providers also have an individual medical director. EMS medical directors are required to complete the state medical director-training program developed by NCCEP within a year of appointment. EMS medical directors are also required to complete a certain number of trauma / EMS related CME hours during their licensure period. Compliance is also attested to at time of re-licensure and randomly audited. On-line medical oversight is provided by physicians, generally in the ED of the receiving facility. They are also required to complete a training program established by the state. County EMS agencies are tasked with audit of on-line medical direction activities, as part of their QI program.

County EMS agencies are responsible for the development, implementation and review of triage and destination protocols for their system. Those protocols are reviewed by the OEMS Medical Director with the opportunity for OEMS to require modification if the system protocols are not felt to be appropriate. There is no specific state model protocol or requirement regarding destination protocols.

In many areas of the state, there is only one receiving facility in the county and protocols outline transport of the major trauma patients either directly to the local hospital for subsequent transfer to a trauma center (if necessary) or directly from the scene to the trauma center via air ambulance. In those systems with more than one potential local receiving facility, destination direction is provided by system protocols. One system's destination protocol that was reviewed by the team allows for transport of a major trauma patient to a non-trauma center, if requested by the patient. Quality improvement activities regarding protocol compliance, including destination protocols, resides with the county EMS agency. Specific issues of concern, or complaints, are forwarded to OEMS for review.

RECOMMENDATIONS

- Ensure participation of the NCOEMS Leadership, including the state EMS Medical Director or State Trauma Medical Director (as mentioned in previous sections) in state level trauma related meetings.
- Include OEMS participation in appropriate components of NCCOT meetings or other appropriate state trauma meetings to ensure interaction with trauma program medical directors.
- Ensure reporting of local QI activities to OEMS on regular basis, potentially through the regional structure.
- Identify a method for NCCOT to have more consistent input and interaction with OEMS during trauma related protocol development and QI activities.
- Continue implementation of the Performance Improvement tool kits through the development of the PI Resource Center.
- Evaluate the appropriateness of medical oversight at the regional level with consideration given to identifying Regional EMS /trauma medical directors.

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

North Carolina licenses over 800 providers throughout its 100 counties. EMS personnel are licensed by OEMS and credentialed by the local EMS agency. Rules require minimum staffing requirements for ground ambulance consisting of a least a medical responder and an EMT-Basic (required for patient care). 97% of the state is covered by ALS level providers. There are staffing exceptions allowed for specialty transport vehicles. All levels of EMS personnel are required to have off-line medical direction through the county EMS Agency Medical Director and approved protocols. Communications capabilities for on-line direction are required for all transporting and non-transporting vehicles. Equipment standards for transporting vehicles are established by NCCEP and adopted by OEMS. Review and update of those requirements occurs as needed. OEMS is responsible for inspecting and licensing all transport (ground and air medical) and all non-transporting vehicles in the state. Vehicle inspection occurs at the time of licensing and randomly as needed.

Each county EMS agency is responsible for developing the county EMS plan which outlines how EMS services are provided at the local level, how patients are to be transported, destination designation and how non-transporting and air medical programs interface with the county system. Discussions indicate that the depth and complexity of county EMS plans is quite variable around the state. It is an assumption by the site visit team that an EMS system plan would include specific issues of trauma care. Because of geographic, demographic and resource availability of each EMS system, OEMS has not established minimally accepted guidelines for vehicle resource placement or for minimum response times. All transport destination decisions

are determined by criteria developed under local protocols by the county EMS agency based on geographic, demographic and resource availability.

Although not required, most EMS systems have mutual aid agreements with surrounding counties. There is no requirement for formal agreements between ambulance services and non-transporting services or with other public safety agencies.

RECOMMENDATIONS

- Conduct a formal review of distribution of EMS provider agencies throughout the state, including review of overall response time issues to ensure prompt response of EMS resources regardless of the geographic location of the victim.
- Ensure that each county EMS system has a performance-based, integrated and fully functional EMS and trauma system plan.
- Conduct a more formal review of the county EMS plan to ensure compliance with statewide trauma objectives (e.g. getting the right patient to the right facility in the right time frame).
- Establish triage criteria and destination decision protocols to ensure transport of trauma patients to the most appropriate receiving facility within the inclusive trauma system.

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, post dispatch 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 systems 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 post dispatch instruction protocols should be in place.*
- *A quality improvement program should be in place.*

CURRENT STATUS

North Carolina is fortunate to have 100% of the population covered with 9-1-1 availability; 83% of those are E9-1-1 services. 9-1-1 calls are received by a county public safety answering point (PSAP), which is also responsible for dispatching the needed public safety agencies, including EMS. Sixty-one of those PSAPs are also able to provide emergency medical dispatch (EMD) services, including post-dispatch instructions. The county EMS plan addresses appropriate dispatch of necessary resources as well as on-line medical direction requirements. All licensed EMS vehicles are required to have communications equipment appropriate to allow for communications with dispatch and operational EMS resources as well as medical direction resources. Although 100% of the state is covered to allow for on-line medical direction, testimony indicated that there are frequent instances of that communication with hospital not occurring. State communications personnel indicated that may be due to lack of communications system understanding by some personnel.

Local EMS systems are responsible for QI activities of on-line medical oversight issues.

Recent initiatives regarding domestic preparedness planning activities call for development of additional communications redundancy. As well, there will be increased communications capabilities among public safety agencies, EMS and public health.

RECOMMENDATIONS

- Ensure education of prehospital and hospital personnel regarding the technical use of on-line medical direction communications equipment.
- Expand EMD programs to include all counties in the state.
- Continue expansion of interoperable communications resources for redundancy and increased communications among disciplines.
- Evaluate new communications technologies as developed for inclusion in the state EMS/trauma communications system.
- Continue development of the E9-1-1 system to include all areas of the state.

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 state has a long history of interaction with EMS agencies, OEMS and the emergency management community in disaster planning activities. This cooperative interaction has only increased with the recent domestic preparedness (bioterrorism) planning activities. Although the Division of Public Health is the grantee for federal funds provided to North Carolina, the OEMS has been functionally designated as the lead agency for HRSA Hospital Bioterrorism Planning activities. Regional responsibilities for planning have been delegated to the Regional Advisory Councils, causing them to assume activities not originally planned or budgeted for the RACs. The RACs have created disaster planning groups within their regions, composed of EMS, trauma, law enforcement, public health, fire/rescue, emergency management and other disciplines, to ensure a broad-based approach to planning issues. This has served as a mechanism to ensure inclusion of trauma issues as part of the planning process. Additional personnel will be added to RAC staff in the coming year to help address the DP planning activities. The OEMS and Division of Public Health are working cooperatively to assure that the CDC and HRSA deliverables are developed in an organized manner.

Local EMS agencies are responsible for planning activities at the local level. Conversations with a State Emergency Management official indicate that those planning and response activities have been well incorporated into the local emergency management programs. This has been demonstrated a number of times as the state has had to respond to multiple natural and man-made events (e.g. hurricanes, floods, ice storms, manufacturing facility explosions).

In addition to local resources, the state has a number of resources available to support disaster response needs. There are three Metropolitan Medical Response System (MMRS) programs in the state in Charlotte, Greensboro and Wake County. The Special Operations Response Team (SORT) is also designated as a federal Disaster Medical Assistance Team (DMAT NC-1) and is available as a federal and state asset. Regional and local resources include three levels of State Medical Assistance Teams (SMAT) to provide varying levels of medical triage, treatment and decontamination as needed. Although these resources help address the surge capacity needs of the state, other facility and personnel surge issues are being investigated. These planning

activities will help the state respond to events of domestic or international terrorism as well as other potential needs for medical augmentation (e.g. SARS or pandemic flu outbreaks).

As noted under communications discussion, the state is developing additional communications redundancy mechanisms that will enhance both daily and disaster operational communications. There is also a web-based Hospital Status System that is expected to be operational this month. This mechanism will permit hospitals to quickly communicate and update hospital resource information throughout the state.

Exercise of disaster plans has occurred regularly in the past, both with actual event responses and in periodic exercises. This is expected to continue as required by the DP Planning activities.

RECOMMENDATIONS

- Continue the activities of the multi-disciplinary planning consortia for domestic preparedness response issues.
- Finalize redundant communications system planning.
- Finalize development and distribution of the SMAT programs throughout the regions.

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

The OEMS has the statutory authority to develop and implement trauma center standards for Level I, Level II and Level III centers. The basis for the North Carolina facilities document is the American College of Surgeons *Resources for the Optimal Care of the Injured Patient*. As modifications to this document are published by the College the criteria for the state of North Carolina are modified as appropriate to meet state needs and updated accordingly. This process has served the state well and many trauma centers have undergone several reviews to maintain their standing within the EMS system. Currently there are five Level I trauma centers, four Level IIs and two Level III centers.

Recently, two Level I facilities have undergone review by the American College of Surgeons verification team in conjunction with the state site visit team. All hospitals that desire trauma center status enter into the designation process on a voluntary basis. There is no specific process for the designation of pediatric trauma or burn facilities but consideration of designating specialty referral centers is underway. Processes have been put in place for review of clinical performance of the designated trauma centers, along with re-designation and de-designation should this be required.

During the consultation visit, participants expressed their opinions regarding the number and location of trauma centers throughout the state. These stakeholders felt there was an appropriate number and geographical location of Level I trauma facilities. There was a sentiment that the Level II centers were also located appropriately but there was a need for an additional Level II center in the south central area of the state. Lastly, there was an expressed need for several Level III centers throughout the state. No supporting trauma outcome or EMS data were presented at the time of the review to support this contention, but examination of the population density and the emergency department volume and size of the hospitals in this area would support adding Level II or level III centers in the south central corridor. No data were available at the time of the consultation visit to provide information as to the optimal number, or location, of such proposed Level III centers within the state. However, in moving from an exclusive system to one that is more inclusive it would be appropriate to consider adding Level III or IV trauma centers in areas where there are long distances to currently designated Level I or II trauma centers.

Additional trauma centers are not subject to a Certification of Need (CON) process. Rather, the hospital volunteers to be reviewed by the state for compliance with the state criteria. As a component of this application, an analysis of the impact on adjacent trauma centers is performed and, if there is a significant impact on existing trauma centers, then the application for designation can be denied. The trauma center service areas are defined by the trauma centers themselves and many have developed hospital-based helicopter programs to expand their service

areas; these helicopter programs act collaboratively within the North Carolina Air Alliance. The RAC's have developed around inter-facility transfer patterns to the designated trauma facilities and serve both as an educational and informational exchange forum between trauma centers and the prehospital personnel. More recently the RACs have begun some performance improvement initiatives within their defined service area.

Data provided by the state indicate there were 45,491 trauma admissions in 2002 and 48,455 in 2003. Spinal cord injury-related hospitalizations were 318 in 2002 and 364 for 2003. There is a separate database for head injury hospitalizations. Within North Carolina there were 15,998 deaths from trauma in the years 1999-2002 with motor vehicle crashes being the most frequent cause at 6,256; with firearms and falls following at 4,344 and 1,733, respectively. Flames and burns were the 5th cause of death within the same time period at 556 deaths. These data are consistent with other national public health data showing trauma as a leading cause of morbidity and mortality among the population.

The state has data on the number of general surgeons, neurosurgeons and orthopedic surgeons and maps for the distribution of these specialists were provided for the review team. No data were available as to how active these specialists were (full-time active clinically; part-time or retired) or whether these specialists provided care to the acutely injured patient.

The state maintains documentation of the available resources within all acute care facilities. This list is updated on an annual basis. This capability is being updated as a component of the effort to provide care in the event of multiple casualties following a terrorist attack. There was concern raised during the site review about the nursing shortage. North Carolina has been a national leader in analysis of this crisis and has just completed an in-depth study of the problem together with suggestions for solutions within the state. Nursing shortages in Intensive Care Units (ICU's) were cited as a contributing problem to emergency department diversion issue facing the state. Trauma centers universally expressed that they were committed to the management of the trauma patient and continued to receive trauma patients despite very high occupancy rates.

There is no requirement for all acute care facilities to provide data on trauma patients. The eleven trauma centers and five non-designated hospitals provide data to the state (about 200 data points) on a quarterly basis. This has been in place for several years and North Carolina is nationally recognized for its State Trauma Data Registry. A pilot project Information System for the State Trauma Advisory Committee (ISSAC) is underway to collect trauma data from non-trauma facilities. This is on a voluntary basis and incorporates 34 data points on every trauma patient who is admitted; transferred to another hospital or dies within the emergency department. It is hoped that this data system will be implemented at all non-trauma hospitals. Hospitals provide UB92 discharge data on all admissions by state statute. UB92 discharge data are available to the State Center for Health Statistics. However, patient identifiers are removed and hospital identity is coded before the state receives the data. The overall timeliness and availability of the data for linkage and other purposes needs to be improved so that OEMS can utilize the data for trauma system development and performance improvement.

There is no statewide definition of what constitutes a major trauma patient. There is no definition of who might most appropriately be treated at a Level I, II, or III trauma center facility. Many of the RAC's have developed and disseminated guidelines for the transfer of patients to the trauma center, but these guidelines vary and are not universally accepted or followed. There was some indication that some trauma patients were not being transferred into designated facilities and some transfers were occurring later than optimally indicated. It was indicated that, although guidelines from the RACs were helpful, there was no mandate or enforcement policies if health care providers did not abide by these guidelines in the management of an acutely injured patient.

There is a performance improvement (PI) process already in place within the state. Recent updating of the PI process has occurred with considerable input from trauma surgeons and trauma nurse managers. Confidentiality statutes are in place to conduct these PI activities both at the state and regional level. These legislative changes have been relatively recent and have not yet been upheld by case law. A widely distributed formal legal interpretation of the law and its relevance in conducting peer review by the RACs is probably warranted.

Concerns were expressed that current support for the RAC's is with grant funding from the Duke Endowment and that the funding is scheduled to end within the next year. Continued funding for the RACs in their current role is not guaranteed. There was also concern expressed that the hospitals might be perceived as having a conflict of interest in providing the PI process for the regional trauma system and that the trauma centers would not be seen as independent evaluators. There was concern that the evaluation of care offered to either a referring hospital or EMS by the trauma center may impact future referral patterns.

Managed care does not appear to have high penetration within the state and was not considered to be an obstacle to trauma system development at this time.

RECOMMENDATIONS (see end of section)

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*
- *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

Guidelines for the definition of which patients are deemed appropriate for transfer to a Level I or Level II trauma center have been developed at the local level but, as noted above, there is no statewide consistency as to which trauma patients should ultimately end up in the designated trauma facilities. In RAC's that have Level III facilities there appeared to be an excellent working relationship between the Level III facility and the trauma destination hospital. Mention was made by several trauma directors that there had been inappropriate transfer of patients with relatively minor injuries. The reason for some of these inappropriate transfers could not be pinpointed to any one factor but seemed to be perceived to be a combination of; availability of on call specialist 24/7 at the community facility, financial status of the patient (indigent), or because the community specialist was inexperienced in trauma patient management. Guidelines for determination of which patients were appropriate for transfer to the trauma center direct from the scene appear to have been developed but not universally applied throughout the state. Triage of patients to the trauma center appears to be a local decision. In areas where there is a trauma center close by, the patient generally gets transported to the trauma center. In other areas the patient most likely will end up in the community hospital. Citations were given of inappropriate identification of trauma patients, for example mention was made of a pediatric patient with a 1% burn injury who was transferred by helicopter from the scene to a trauma center. Mention was also made of delay in transfer of critical patients from outlying hospitals. The theme presented by those present during the survey was that uniformity of triage and transfer has yet to be realized within the North Carolina trauma system. Identified cases where triage and transfer may be improved are managed on a case-by-case basis by the receiving center and are sometimes used as educational cases at RAC meetings. There is no enforcement activity around triage of major trauma patients from the scene or the transfer of major trauma patients to the nearest trauma center for rapid definitive care.

The helicopter programs have highly trained and effective personnel and are licensed by the state. Repatriation of patients back to the referring hospitals was identified as an on-going issue.

Several trauma centers have begun evaluating this problem to determine root causes and solutions so that patients can be returned to their community hospital when appropriate.

Many of the trauma centers manage pediatric trauma cases and there are two recognized burn centers within the state. Transfer agreements are in place as these are required by the State trauma designation process.

RECOMMENDATIONS (see end of section)

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:*
 - *New injury admissions per year of SCI, TBI, and dual-diagnosis patients to each rehabilitation center*
 - *Indicators of patient severity, including complications (for example, ASIA classification system for SCI, Glasgow coma scale for TBI)*
 - *Time between acute care and initiation of rehabilitation*
 - *Acute care length of stay*
 - *Length of stay at rehabilitation center*
 - *Functional independence measure (FIM) score*
 - *Facility or location to which patient was discharged*
 - *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

Some of the trauma centers have in-house rehabilitation centers and have excellent relationships with psychiatry staff. Mention was made of the paucity of pediatric rehabilitation beds and the difficulty of transferring trauma patients from acute care to rehabilitation centers. Specific mention was made of attempting to place an indigent trauma patient who promised to have a prolonged length of rehabilitation stay, i.e. an indigent patient with a head injury. Two of the trauma centers indicated that they have transferred indigent illegal immigrants, after initial acute care, at their own expense, to the patient's country of origin.

Rehabilitation centers do not appear to be closely linked to the state trauma system. The state has taken action to recruit a psychiatrist to provide input to the STAC and improve collaboration between the separate disciplines. The review team was informed that the occupancy of the state rehabilitation beds was 63% but the reasons for this low occupancy were unclear. The review team also heard of concerns of the measurement of rehabilitation outcome data. The accuracy and completeness of such data by rehabilitation centers was questioned by those in attendance.

RECOMMENDATIONS

- Develop a statewide forum including representatives from trauma, hospitals, EMS and other stakeholders for consensus as to which trauma patients should be

- transferred to a Level I and II, and which patients should be transferred to other levels of trauma and acute care facilities. Following the development of consensus, adopt and promulgate statewide guidelines for on-scene triage and transfer direct to trauma center, on-scene transfer by helicopter and inter-facility transfer of major trauma patients.
- Analyze existing UB92 hospital data from the most recent years along with regional ambulance data to determine the number, type and location of trauma patients who are now being managed by non-trauma facilities. This analysis should guide the number and location of additional Level II and Level III and future Level IV facilities as needed to complete a statewide system of appropriately located trauma hospitals. The Level III and IV centers should receive support and consultation from the Level I and Level II centers in this process.
 - Evaluate the need for a separate process for the designation of burn and pediatric trauma facilities.
 - Move from an exclusive trauma center system to an inclusive trauma system where every hospital that receives trauma patients is considered an important component of the trauma delivery system. A nomenclature recognizing their participation should be developed together with criteria for participation within the system. This should include appropriate collection of data from all facilities and such data collection should be designed to be relatively easy for the local community hospital.
 - Develop and implement transfer agreements to ensure rapid transfer of severely injured trauma patients from the local level to the closest appropriate trauma center.
 - Explore, through a united effort of the trauma centers, improved linkages to acute rehabilitation for the injured patient. Analysis should include determination of appropriate remedial strategies to ensure timely rehabilitation for all appropriate injured patients.

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*

CURRENT STATUS

The state of North Carolina maintains a long-standing trauma registry (NCTR) requiring participation by all hospitals designated as trauma centers (n=11). Hospitals not designated as

trauma centers (100+) are not required to submit data to the NCTR. This registry is one of the largest in the U.S., containing more than 200 data points for approximately 170,000 trauma patients collected since 1987. The registry is maintained by OEMS, through the Department of Surgery at UNC-CH and is supported by the state budget process. Authority to initiate and maintain the registry is contained in North Carolina General Statutes (10A N.C.A.C. 13P .0901-.0903) with appropriate confidentiality and discoverability protections (G.S. 143-158(a)). For over 15 years, the registry was administered based upon recommendations from a Trauma Registry Task Force, but is now overseen by the State Trauma Advisory Committee. This governing board established the trauma patient inclusion criteria and insisted on the universal use of the NTRACS program for data collection since the early beginnings of the registry. Designated trauma registries are required to submit registry data to the state within 90 days of patient discharge.

Access to the existing NCTR data is facilitated by an electronic data request submission system. Institutional Review Board (IRB) endorsement is sought when necessary by the researcher. Data analyses are primarily conducted in-house with summary and tabulated data made available to the investigator. OEMS staff routinely utilizes NCTR data to augment trauma center re-designation reviews. However, NCTR data could be made more accessible to other non-traditional data users to increase its visibility and function.

Additional data collection systems are in process, either being proposed, developed or implemented for statewide use. The functionality (usefulness, efficiency, effectiveness, redundancy) of these separate systems within North Carolina was not specifically assessed as part of this consultative visit. In sum, different divisions within the North Carolina DHHS are developing different database systems for different purposes, some of which may overlap.

Currently, additional funds secured through a grant from the Trauma-EMS Systems Program within HRSA are being used to expand the scope of the NCTR by collecting a limited data set (34 data elements) from all hospitals within the state of North Carolina (i.e., the ISSAC data collection system), including the additional 100+ hospitals currently not participating in the NCTR. This proposed data collection system relies on administrative and clinical data, is voluntary and would provide daily accumulations of data via an electronic system. Major milestones associated with this project (complete or ongoing) include; a review of HIPAA requirements associated with data collection, development of a prototype of the ISSAC collection system and registry and continued efforts to rally support among non-trauma center hospitals.

Data collected as part of EMS care will also soon (year 2005) be available on a statewide basis through a unique data collection system referred to as the Pre-hospital Medical Information System (PreMIS). All EMS events with a formal 911 activation and resulting in the evaluation of a patient will be characterized using 200+ data elements and submitted electronically within 24 hours of patient contact.

An additional dataset is currently under development within the state. Through funding originally provided by the North Carolina Division of Public Health, North Carolina Hospital

Association and the University of North Carolina-Chapel Hill Department of Emergency Medicine, an ED data collection system is under development that will include all emergency department admissions in the state North Carolina. This data collection system is referred to as the Hospital Emergency Surveillance System (NCHESS). The NCHESS system is primarily designed as a syndromic surveillance system.

During the site visit, it was discovered that different divisions within the Department of Health and Human Services are supervising the development of two of the above mentioned information systems (i.e., ISSAC and NCHESS). There was concern that ISSAC and NCHESS are somewhat redundant and may unduly increase the burden placed upon hospitals, which are expected to participate in both systems on a voluntary basis.

The notable vision held by OEMS is that data from NCTR, ISSAC/NCHESS and PreMIS will be made available and linked through either direct or probabilistic methods to enhance the assessment of trauma system care within the state. The data elements available for linkage within most of these databases are impressive and should ensure the validity and reliability of multiple linkages. However, once PreMIS and ISSAC/NCHESS datasets are available, current levels of system support/administration and statistical support within OEMS may easily be overwhelmed.

Probabilistic data linkage methods are under development in North Carolina, with programming currently underway to “link” law enforcement crash records and medical examiner data to trauma registry information. To date, these efforts have been moderately successful. Additional training using commercially available data linkage software would be most helpful. An additional dataset potentially available for linkage includes vital records. The importance of being able to reliability and accurately link data sources is important to further enhancing the functionality of the current and proposed information systems.

Each of the above mentioned datasets are stored electronically and have appropriate confidentiality precautions in place. However, the NCTR is the only emergency care related dataset currently funded using general funds. All other related datasets are funded using sources with potentially variable funding streams.

Hospital discharge data is not readily available to OEMS. There is currently a strong interest among experienced local investigators to estimate the total burden of injury within the state and assess the admission patterns of patients suffering severe trauma. Access to longitudinal hospital discharge data (from all hospitals in the state) would provide a strong initial assessment of these important questions. This is an area where communication links and, perhaps, policy changes would greatly enhance the ability of diverse (yet cooperative) divisions within NCDHHS to make full use of hospital discharge information for public health assessment, surveillance, assurance and policy development.

RECOMMENDATIONS

- Investigate possible avenues for acquiring multiple years of UB-92 data to provide a “denominator for trauma” and to assess the distribution of severe trauma patients treated within non-designated hospitals. Once these data are obtained, the following steps should be taken to prepare the data for analysis and assure hospital confidentiality:
 - Blind the UB-92 hospital identifier by “dichotomizing” the data field into designated trauma center vs. a non-designated hospital.
 - Construct a “region” variable based upon hospital location.
 - Convert ICD-9-CM coding into Abbreviated Injury Scale (AIS) scores and Injury Severity Scores (ISS) using appropriate conversion software.
 - Identify “index injuries”, based upon ICD-9-CM coding, that represent conditions that should be treated in designated trauma centers.
- Apply to become a CODES state once ED and/or EMS data are available and current. Resources associated with this granting opportunity will enhance the processes necessary to “link” NCTR data with ancillary data sources.
- Begin discussions with the NC Hospital Association to enhance state access to hospital discharge data in its raw and unfiltered format.
- Acquire a commercial probabilistic linkage software package and seek training through the National EMS Data Analysis Resource Center (NEDARC).
- Investigate methods allowing NCTR data to be made available via a password protected website for designated hospitals to dynamically evaluate their data (e.g., OLAP Cube technology).
- Assess the possibility for collaboration between the ISSAC and NCHESS databases in an effort to remove redundancy and combine resources. This collaboration will decrease the data burden placed upon hospitals.
- Provide additional system administration and data analysis support within the OEMS to shore up resources needed to link and maintain the multiple new databases soon to become available.

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*

CURRENT STATUS

Each designated trauma center in the state of North Carolina is responsible for identifying a specific performance improvement program and demonstrating evidence of ongoing review to the OEMS as a requirement of initial and re-designation. Included in the OEMS requirements for trauma center designation are the mandates that each hospital formulate a Trauma Program Performance Committee and hold meetings on a quarterly basis. The purpose of these meetings is to address system and educational issues associated with each specific geographic region and to conduct case reviews regarding patient management and clinical care issues. Guidance

regarding the process of performance review is provided through a document entitled: *Performance Improvement Guidelines for North Carolina Trauma Centers*. This document includes a brief primer describing definitions and other basic constructs of a performance improvement program. Also included in this document are standardized audit filters used to identify cases to receive either a brief or full review. These audit filters are drawn from recommendations provided by the American College of Surgeons and address both in-hospital and prehospital care issues.

In 1999, the state of North Carolina formally recognized seven regions and formulated Regional Advisory Committees (RACs). RAC organizations, at least initially, organized around the designated trauma centers. Each RAC historically included facilities providing inter-facility transfers to the trauma center organizing the RAC. Since 2002, RAC meetings have been held quarterly and are well attended by all hospitals self-associating (or assigned) to a specific RAC. During the site visit, representatives from six of the seven RACs reported that between 60 and 100% of non-designated hospitals routinely attend the RAC meetings.

In the past, authority to conduct a trauma review originated within the existing quality improvement and peer review structure in each hospital. Recently, additional peer review protection for regional trauma review has been provided through state legislation. In addition, recent legislation authorizes RAC organizations to facilitate *system-based* performance improvement and organize regional meetings to address larger system concerns.

There is no formal, systematic mechanism for system quality management oversight at the state level. That is, there is no state administered performance improvement (PI) process. Originally, OEMS envisioned a process whereby aggregated/trended registry data are provided to individual RACs to evaluate and define a local action and follow-up plan with minimal state oversight. However, to date, RAC meetings have been primarily “educational” in nature with little “trauma system case review” and no loop closure. The original OEMS vision has been diluted by the fact that acute care hospitals not designated as trauma centers are not required to participate in RAC initiated system performance improvement programs and area RACs have not tested new formal authority to conduct proper performance improvement.

There are a number of additional concerns associated with the current RAC structure when considering state proposed local performance improvement activities. Initial funding provided by the Duke Endowment for RAC coordinators will end this year, increasing the uncompensated resource allocation provided by trauma centers voluntarily supporting RAC organizations. In addition, “housing” RAC organizations within trauma centers fosters a false identity which instinctively raises concerns regarding competition and makes it awkward for non-designated hospitals to discuss clinical or management issues.

The OEMS trauma manager and medical director monitor individual trauma performance improvement activities within designated facilities and recommend updates to trauma standards as needed. Periodic reviews of all designated facilities are conducted and identified concerns are addressed by the trauma centers as necessary.

RECOMMENDATIONS

- Legislate the development of a system-wide quality improvement process with clearly defined authoritative roles within the lead agency (OEMS) and facilitative roles within the RACs.
- Devise regional trauma system performance improvement plans under the direction of OEMS with input and feedback from regional hospitals and EMS leaders. The plans should include state reporting requirements and conditions under which state action may be required to ensure loop closure.
- Seek state funding to specifically support performance improvement-related RAC activities, augmenting other grant support and the in-kind contributions provided to RACs by trauma centers. Fiscal commitment to the RACs by OEMS will help defuse the notion that RACs are intractably aligned with a specific trauma center.
- Provide area RACs with regional data from the North Carolina Trauma Registry (NCTR) “linked” to PreMIS, ISSAC/NCHESS and vital records data. Data made available to area RACs should identify areas of concern through audit filters, data trending and outlier analysis. Access to the hospital discharge data should also be made available to OEMS so that regional historical trending of injury patterns can occur.
- Under the direction of OEMS, author a regional trauma system performance improvement guide similar to the *Performance Improvement Guidelines for North Carolina Trauma Centers* developed by the North Carolina Committee on Trauma (NCCOT).
- Conduct statewide and region-specific analysis of NCTR data benchmarked against comparable National Trauma Data Bank (NTDB) data to provide an external source of performance monitoring.

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:
 - a. *Cost-effective research*
 - b. *Outcomes research*
 - c. *Epidemiology*
 - d. *Injury control research*
 - e. *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

The state of North Carolina has a rich legacy of trauma systems and injury prevention research with several recognized investigators making significant contributions to the trauma and prevention literature. There are several active research organizations operating within the state. These include:

- UNC Injury Prevention Research Center
- Eastern Carolina Injury Prevention Program
- UNC Highway Safety Research Center
- Injury and Violence Prevention Branch

Many of these programs have national reputations as centers of excellence in injury prevention and research but there is little interaction with the trauma centers, EMS or the trauma system. There is extensive prevention research through the UNC-IPRC with focus areas of occupational injury, violence, child abuse, and sports/recreational injuries.

North Carolina maintains an active trauma registry that is available to qualified investigators for system-based research through a formal data access procedure. There is a strong utilization history of this state trauma database for injury-related research. The state supports injury research through the funding of a state trauma registry director, via a contract with UNC Department of Surgery. Multi-institutional acute care research coordinated through the North

Carolina Chapter of the Committee on Trauma has been initiated, and there is considerable interest in expanding this activity. In January 2004, NC began data collection as part of the National Violent Death Reporting System, although it is too early for meaningful data analysis and reporting at this time.

The preponderance of research appears to be organized and conducted through individual centers or organizations with limited coordination at the state level. Opportunities for inter-organizational systems or prevention research have not been fully explored. The School of Public Health at UNC provides graduate students with opportunities for involvement in regional injury-related research. However, the linkage between the State Trauma System, including its database, and related interests in the School of Public Health appears to be limited.

In regards to traffic crashes, the Highway Safety Research Center has not extensively used North Carolina trauma registry as a resource for crash statistics. The general use of injury-related research to assess public health problems and drive public policy development in the state has been limited.

There has been very little contact between the RACs and the various research centers and, as a result, apparently limited familiarity at the RAC level with epidemiological and prevention research being done in North Carolina by the various research centers. All RACs have injury prevention programs within their service areas. However, there is little or no funding to conduct injury research or to convert these prevention programs into research models to assess the effectiveness of the intervention. There is significant redundancy in injury prevention and research activities occurring in the state, with many independent entities working within the “silo” of the institution funding the effort.

It appears that injury surveillance research is being performed at the injury prevention center and trauma center level, but that this activity is not well coordinated with local or state public health offices. Information from the research centers is not regularly reported back to the state to help guide public health and safety policy or report on the status of injury epidemiology in North Carolina. There is no global plan in place for statewide coordination of trauma and injury research.

RECOMMENDATIONS

- Develop an overall plan for the statewide coordination of epidemiological and prevention research. Incorporate this into overall State Trauma Plan.
- Develop a statewide trauma research consortium, linked to the activities and functions of the trauma and EMS system for purposes of promoting research throughout the continuum of trauma care.

- Integrate injury research into the RAC activities. RACs should be encouraged to structure formal investigations, where possible, with an eye towards expansion into publishable research.
- Link research, surveillance findings to the process for developing public policy and changes to existing injury-related regulations and statutes.
- Incorporate studies of cost-effectiveness into injury-related research.
- Incorporate studies of long-term outcomes measures into overall research plan, and involve rehabilitation facilities and personnel as integral participants in this research. Engage, if possible, any existing programs in occupational and rehabilitation medicine at UNC or other Universities.
- Develop liaisons with university faculty, students in public health and other injury-related disciplines for the purpose of facilitating multidisciplinary trauma-related research using existing databases and other trauma system resources.
- Identify, characterize, and catalogue system-wide injury prevention programs, injury-related research projects, and injury-related databases. Make this information available to the RAC, STAC, and trauma center staff in order to identify student, fellow and resident research opportunities and to facilitate collaboration, reduce redundancy and leverage scarce resources.

Focused Questions

Question Posed

1. What is the proper distribution of Level II trauma centers and what will constitute an adequate number of Level III's in North Carolina? We are particularly concerned about the south central portion of the state.

Surveyor Response

North Carolina currently has 122 hospitals with emergency departments; of these, eleven are trauma centers. The five Level I and the four Level II trauma centers appear to be well placed given the population distribution of the state. However, the population of the south central part of the state is underserved as regards to Level I and Level II trauma care. Cumberland County is the single largest outlier in Level I and II coverage across the state. This trauma center coverage gap may result in increased trauma morbidity and mortality among the population in this part of the state. In the event that there is no hospital capable of achieving Level I or II status in this geographic area, a Level III trauma center would be an appropriate, although less of a desirable solution.

The most evident deficiency in the number and level of trauma centers in North Carolina is the lack of Level III centers as there are currently only two. The current trauma care system is an exclusive system meaning not every acute care hospital participates in the trauma care system. An opportunity exists to make a profound improvement through creation of an inclusive trauma system in which each hospital participates in the trauma care system to the level of their ability and commitment. Designated and verified trauma hospitals take care of trauma patients, and participate in data collection (state trauma registry) and regional trauma care performance improvement (RAC process). By having all acute care facilities be part of an inclusive trauma system the care to all injured patients improves.

As the state and its' hospitals work towards creating the inclusive system, consideration should be given to establishing a number of Level IV trauma centers as has been successfully accomplished in other states. The large proportion of rural counties and population within North Carolina should make the Level IV concept attractive. Designating Level IV facilities will make it possible for all hospitals to feel that they are part of a system. However, the number of hospitals that get designated at a level below their true capability should be kept at a minimum (potential Level II's applying for Level III status and potential Level III's applying for Level IV status). Designating hospitals at their highest possible level will help optimize efficiency of the trauma care system throughout North Carolina. It may be possible to develop a plan whereby a facility comes in at one level and agrees to achieve the next level within a specified time period.

RECOMMENDATIONS

- Develop and implement a plan for trauma center hospital coverage in the South Central part of the state. Should no hospital come forward and agree to participate as a Level II or III facility institute measures to move seriously injured patients to the closest level I or II facility in the most rapid time period. This could include such things as stationing an air medical helicopter in the area for rapid field evacuation.
- Pursue an inclusive trauma system by developing and implementing standards and guidelines for the designation of level III and IV facilities especially in the rural parts of the state. It may be necessary in developing this plan to incorporate a strong role for the Level I and II facilities in outreach, education, training, research, and PI (look to how other states have accomplished this, namely Washington, Oregon).

Question Posed

2. Is the level of state trauma funding adequate and, if not, what are some avenues for improvement?

Surveyor Response

The level of state trauma funding is not currently adequate to the task of supporting the statewide trauma system infrastructure, even as currently constituted. The state trauma program manager and the state trauma registrar are supported by direct state investment. However, these investments appear to be limited to no more than approximately \$200,000, for a per capita outlay of 2.5 cents for North Carolina's population of approximately 8,000,000. State trauma regulations define the statewide trauma system as the collective entity of the regional trauma systems, but state trauma funding in support of regional trauma systems is not included in the current state budget. Rather, the regional [trauma] advisory committees (RACs) are staffed by individual regional trauma program managers whose salaries are paid by the Duke Endowment, funding that is not expected to continue beyond the current fiscal year. Moreover, regional hospital bioterrorism coordinators, who are wisely based within the regional trauma systems and collaborate closely with the RACs, are supported with funding provided by the federal Health Resources and Services Administration (HRSA), which, although it is expected to be continued in the short term, have an uncertain future. By contrast, the per capita outlay in more organized state trauma systems is in the range of 10-15 cents per capita, exclusive of direct subsidies to trauma hospitals and trauma physicians for standby costs. In addition, while the job description of the State EMS Medical Director includes supervision of the state trauma program, non-trauma EMS programs consume nearly all of the State EMS Director's time as his duties are presently constituted, for which he is compensated at the 0.6 FTE level. The site visit team believes that the North Carolina trauma system is large enough, in terms of size, geography, and complexity, to warrant the services of an Associate State EMS Medical Director (reporting to the EMS

Medical Director), charged with oversight of the state trauma system. This added position would require commitment at least the 0.4 FTE level.

Adequate funding for a viable state trauma system infrastructure in North Carolina should include funding for a trauma program manager, a trauma registrar, and clerical support at the state level, and for every RAC, for a total of approximately \$900,000. In addition, support should be provided at the state level for a part time trauma program medical director, and for epidemiological and biostatistical consultation, for a total of approximately \$100,000. Thus, the minimal level of personnel needed to support the state and regional trauma program infrastructure is approximately \$1,000,000, or about 12.5 cents per capita. As stated, this minimal level of support is entirely comparable with the monetary support provided by states with well organized trauma systems, and could be provided through any number of different mechanisms. It is important that the public itself assume the responsibility for the support of the state and regional trauma system infrastructure, to assure a level playing field for all participants, and to guarantee the public's stake in a system that, in the end, exists for its own benefit.

The more difficult problem is providing reimbursement for standby costs as well as uncompensated care. In the short term, such costs might be covered by selective allocation of emergency preparedness funds available either from the federal Centers for Disease Control and Prevention (CDC,) or HRSA. However, no long-term solutions are readily apparent, save for direct or indirect public investment by governmental or third party payers, negotiated on a case-by-case basis with individual trauma centers, according to need. Arguably, the "halo" effect of maintaining readiness for trauma patients increases trauma facilities' availability to care for patients with other serious illnesses on a 24 hour a day, 7 day a week basis, thereby enhancing opportunities for increased revenue. However, no valid estimates of the value added to the health care system of having such services immediately available to the people of North Carolina have been developed. The revenue picture varies from institution to institution dependent upon case mix and volume. Estimates of each center's standby costs could be developed, enabling either public or private insurers to make an assessment of the added costs needed to care for their subscribers, with the understanding that if such costs are not reimbursed in an equitable manner, they might not be available to their subscribers when needed. Alternatively, standby costs could be at least partially offset by dedicating a portion of disproportionate share funding to trauma facilities serving impoverished areas, or with a higher proportion of trauma patients for whom there is no insurance coverage.

RECOMMENDATIONS

- Pursue stable state funding for the trauma system including personnel for the RAC's and part-time Associate Trauma Medical Director.
- Consider the use of funding sources used by other states in support of the trauma system.

Question Posed

3. What tools are we lacking to encourage participation in the trauma system where it currently does not exist?

Surveyor Response

The following response represents a list of suggestions that North Carolina may consider to encourage greater participation by all acute care facilities within the state in the trauma program:

- Hold small group sessions to learn from candidates (non-trauma centers) what the barriers are for them to participate. Alternatively a self-report questionnaire might be utilized to solicit more direct input from key individuals.
- Educate on Level III and Level IV options and requirements.
- Change the tone and requirements for Level III and IV application process in the Standards document to be more encouraging rather than requiring the need to be proven by the hospital.
- Seek Hospital Association concurrence in this endeavor with the hospitals. Ideally the Hospital Association would embrace the larger picture of what is best for the citizens and what the hospitals' obligations are to their communities.
- Ask to have a Trauma System representative attend the Hospital Association meeting with a presentation on an inclusive Trauma System. Expand to include a presentation to the Hospital CEO's at one of their biannual meetings.
- Develop the destination protocols/prehospital triage scheme which will direct trauma patients meeting certain physiologic and other significant mechanism of injury criteria (could be those already in the standards requiring a trauma activation and surgeon evaluation) first and let hospitals decide if they wish to miss the opportunity to care for these patients or if they now have a reason to pursue designation.
- Approach hospitals known to be considering designation attempts or those identified as key (in terms of volume or location) individually and offer assistance / mentoring / guidance. Establish flexibility in meeting rigid requirements until a facility can fully met standards (provisional status, level III moving to a level II).
- Hold trauma center preparatory classes for non-trauma center key personnel (ED nurse managers, administrators, and physicians).
- Offer inclusive trauma system presentations to hospitals wishing their medical staff or boards to learn more about pursuit of designation at a level commensurate with their ability.
- Use peer pressure and media presence to generate the interest in not wanting to be the only NON-participant in an area. Public education and sharing of trauma center status can help with this. Education of key legislators in the area of greatest need can also influence the outcome. If one hospital jumps on, it is easier to get others to follow.
- Funding support for start-up costs or other incentives might also be beneficial.

- Develop formalized MOU's for interfacility transfer agreements of trauma patients to ensure access to appropriate care. Ensure issues of performance improvement, education, and repatriation between the facilities is covered within the agreements.

RECOMMENDATIONS

- Consider the list above and pursue actively the recruitment of another facility to be part of the trauma system in the area of greatest need.
- Use the media if necessary to gain community support.
- In designing a more inclusive trauma system consider added requirements for hospital licensure to participate in the trauma system program (use Wyoming as a model).

Question Posed

4. Would realigning the regionalization of trauma care (from the current RAC structure) along the lines of the public health structure hurt or improve our efficient delivery of trauma care?

Surveyor Response

The question as posed cannot be answered. There are a number of factors to be considered in changing the current regional patterns and the data to support or reject an alternative regional network was not presented. To realign along Public Health regions may or may not gain any efficiency in managing the trauma system. However, there are opportunities that may help strengthen the regional trauma system in a configuration more along the lines of the EMS service areas while not interrupting current trauma center referral patterns.

The evolution of the existing RAC system, while collegial, may not always result in the most efficient delivery of care to the seriously injured patient. Therefore, it is unclear that the realignment of the regional boundaries would have any significant impact on the delivery of trauma care. That being said, it is also unclear that the existing boundaries actually promote the "efficient delivery of trauma care."

In those areas where strong referral patterns exist that are consistent with time and distance criteria the existing system may work well. This is particularly true if there is a strong relationship between the referring hospital and a trauma center. If the realignment of artificial geographic boundaries would result in either substantial political or fiscal capital, without compromising patient care, then every consideration should be given to realignment. Additionally, there may be economies of scale that can be achieved by the consolidation of

existing RACs along the lines of the EMS regions providing an opportunity for staffing, regulatory authority and other health planning and operational management.

There currently exist referral patterns that are driven more strongly by considerations other than the shortest distance or time to an appropriate facility (sister facility, teaching agreements, tradition, marketing). This feature is further exacerbated by the lack of standardized and consistently applied destination protocols and triage criteria for prehospital personnel at the local or regional level.

Many of the activities that regional trauma entities are typically involved in are not dissimilar to those outlined as responsibilities for the existing RAC in Section 10A NCAC 13P.1102 and 1103. There are, however, two significant and RAC regulation flaws in the existing structure. The first of these is that the RAC is, by regulatory definition, trauma center-centric, revolving around a Level I or II trauma center. The second flaw is that the RAC, and by extension, the trauma center, is expected to provide oversight of trauma activities within the region without appropriate authority or resources to do so, placing the lead trauma centers in an untenable position. The current lead centers are to be commended for organizing the existing RACs within the previously described limitations and for promoting the regionalization of trauma care through a wide variety of promotion, cajoling, and encouragement. However, this does not make for a strong regional system when no enforcement or standardization exists among the entities and no neutral third party exists to arbitrate disputes (such as state government).

A neutral structure may be needed to relieve the Level I trauma center's burden of unenforceable regulation and perceptions of conflicts of interest and restraint of trade. This organizational structure could be either quasi-governmental or non-profit in nature. In either case, being representative of all trauma stakeholders within their region and funded at a level commensurate with their responsibilities would be essential. Each regional entity should be responsible to both its constituency and to a higher authority (i.e. state). A redesigned RAC structure could also include the development of a similar entity structured at the state level to represent each of the regional entities and a broader statewide trauma constituency. Or, conversely, it could be a state agency such as the OEMS. In either case, the statewide entity or agency would assume the primary oversight and regulation of the North Carolina Trauma System and, once again, be supported with a level of funding commensurate with its responsibilities.

A close examination of states such as Oregon, Washington, or Texas where regional advisory organizations have been in operation for sometime might be of benefit. In considering redesigning the RAC structure consideration should be given to an organization that is more aligned with the EMS regions rather than Public Health regions. The EMS regional entities, with the right organizational mission and personnel support, could be expanded to serve as the neutral third party in developing regional trauma systems of care that report to OEMS. Realignment along the EMS regional lines may not hurt and may improve the efficient deliver of trauma care services by allowing more standardization and integration with EMS and other health care entities within the regions.

RECOMMENDATIONS

- Define the roles, responsibilities and structure of the “ideal” regional entity, capitalizing on the consensus-based tradition inherent in NC trauma system development.
- Define the roles, responsibilities and structure of the “ideal” statewide oversight entity for the NC trauma system.
- Determine the financial needs of the regional and state entities in the performance of the above responsibilities, expectations and oversight.
- Seek legislative funding and legislate and/or develop new rules and regulations to support the development and maintenance of the regional and statewide entities.
- Consider a new framework that aligns regional services on other than traditional referral or marketing patterns.

Question Posed

5. How can we strengthen our regional and statewide performance improvement activities? How can we utilize our trauma registry and other databases more effectively, with an emphasis on obtaining outcome data?

Surveyor Response

The current statewide and regional performance improvement programs suffer from a variety of limitations, chief among which is the lack of participation of any but Level I and Level II trauma centers in the North Carolina Trauma Registry (NCTR), negating its usefulness as a population based data bank. The Hospital Discharge Database (HDD) does not include hospital or patient specific identifiers, so cannot be linked, either deterministically or probabilistically, to the Prehospital Medical Information System (PreMIS), from which an initial estimate of physiologic stability could be made, thereby precluding direct comparison of trauma care in trauma centers versus other hospitals. While HDD could be used to construct outcome analyses based upon transformation of ICD-9-CM codes to AIS severity indices, thus ISS, the recognized inaccuracies of such analyses are compounded by the fact, as with most administrative databases, that HDD lacks physiologic variables. Unfortunately, the Information System of the State [Trauma] Advisory Committee (ISSAC) also lacks physiologic variables, so cannot be used in lieu of HDD. Additionally, it is unknown at this time whether the North Carolina Hospital Emergency Surveillance System (NCHESS), currently under development, will include vital signs.

In short, it is impossible, under present circumstances, to obtain a true picture of the effects of traumatic injury on the citizens of North Carolina, sharply constraining the development of injury control public health policy. Moreover, even if functional linkages between relevant databases were in place, neither the state trauma advisory committee (STAC), which is not currently described in either statute or regulation, nor the regional [trauma] advisory committees (RACs), conduct system-wide quality improvement. The RACs do have explicit authority to conduct such activities with appropriate protections. However, currently, neither the RACs, nor the Office of Emergency Medical Services (OEMS), have sufficient staff to conduct extensive system-wide quality improvement activities. This problem is further exacerbated by a reluctance on the part of the RACs to conduct QI for fear of disrupting existing referral patterns.

RECOMMENDATIONS

The following key imperatives are necessary to strengthen North Carolina's regional and statewide performance improvement activities:

- Provide specific authority in statute and/or regulation for the Department of Health and Human Services, through its agents and officers, including the State Trauma Advisory Committee (STAC) and the regional [trauma] advisory committees (RACs), to conduct targeted inquiries and develop statewide benchmarks regarding the quality and outcome of trauma care, using event, patient, ambulance, and hospital specific identifiers on a need to know basis only, with such inquiries being protected from discovery under quality assurance law.
- Provide specific authority in statute and/or regulation to the Department of Health and Human Services to link all trauma related state health databases, including but not limited to HDD, NCHES, NCTR, ISSAC, and PreMIS, using unique event specific identifiers, for the purpose of ongoing, comprehensive injury surveillance.
- Require participation by non-trauma centers in both a fully inclusive statewide trauma data bank and the appropriate RAC, in exchange for designation as a Level III or Level IV participant in the North Carolina trauma system
- Require the STAC to develop statewide programs, policies, processes, and procedures for use by itself and the RACs in conducting statewide and regional performance improvement exercises, and require the RACs to implement them.

The following key initiatives are necessary to utilize North Carolina's trauma registry and other databases more effectively, with an emphasis on obtaining outcome data:

- Establish collaborative relationships between the Department of Health and Human Services Division of Facility Services, including the State Trauma Advisory Committee (STAC) and the regional [trauma] advisory committees (RACs); the Department of Health and Human Services Division of Public Health, including its statewide and regional injury control programs; and academic institutions within the state, for the

purpose of conducting fully integrated research programs in injury control, including injury prevention and trauma care.

- Conduct targeted analyses of specific mechanistic causes and anatomic types of injury using fully integrated, event specific data, for the purpose of improving methods of injury prevention and trauma care.
- Develop mechanisms through which non-trauma centers can fully participate in the statewide and appropriate regional trauma systems, including but not limited to RAC membership, data transfer and analysis, and continuing education.
- Provide a trauma program manager and trauma registrar for every RAC, in addition to the full time state trauma program manager, state trauma registrar, and state trauma data analyst currently in place.

Question Posed

6. Are our triage, bypass, transport and destination guidelines appropriate and sufficiently rigorous?

Surveyor Response

No. Guidelines for triage, transport, bypass, and destination are determined at the county level. There is currently no standard statewide protocol or template for the trauma patient in the prehospital setting in North Carolina. The county-specific triage and destination protocols are variable and do not consistently identify which trauma patients should bypass the local community hospital for transport to the designated trauma center (usually Level I or Level II). It would appear that all too frequently trauma patients are taken to the closest hospital, even if there is no physician to receive the patient. Specifically, it has been stated that “in counties where there is not both a trauma center and a community hospital, all patients first go to the community hospital.”

The “golden hour” of trauma care is that variable time period that a trauma patient will survive without definitive care, which is frequently operative. Advanced trauma systems worldwide facilitate timely trauma patient arrival at an appropriate designated facility. The decision to take a trauma patient to an undesignated hospital, especially if there is no physician at patient arrival, wastes the valuable “golden hour” and may have resulted in unnecessary deaths throughout this state (see Flowe, K.M., Cunningham, P.R., & Foil, M.B. (1995) Rural trauma: Systems in evolution. *Surgery Annual* 27: 29-39).

Triage, transport, bypass, and destination guidelines are inadequate in many regions of the state. However, there are specific destination guidelines in some counties (such as Mecklenburg) that

are based on *American College of Surgeons* criteria. These guidelines allow for “patient” choice to dictate “patient” destination rather than severity of injury or facility resources to care for the injured patient. Many counties also have air medical transport criteria for the injured patient. In the case of air transport of the injured patient, the patient will be transported to a designated trauma facility rather than the closest community hospital. Some ground transported trauma patients would similarly benefit from direct transport to a trauma center, even if it means crossing one or more county lines. The creation, validation, and continuous updating of guidelines and protocols for trauma patient triage and transport (including bypass and destination criteria) is an extremely important next step as North Carolina works to mature its trauma care system.

RECOMMENDATIONS

- Working through the regional entities (including all acute care facilities), and seeking input from local providers, create standardized triage, treatment and transport guidelines for prehospital personnel in managing trauma patients. An interface with medical transport and use of a helicopter in ensuring the appropriate destination will be important especially in areas where no local trauma center is available. Artificial county boundaries should not be a compelling factor in making the best transport decision for the severely injured patient. Rather, time and distance to appropriate levels definitive care consistent with the severity of injury should drive the decision-making.
- Re-evaluate local EMS plans to assure that appropriate triage, transport, and bypass of local facilities, is in place to ensure transport to the trauma center when the patient meets a certain threshold of injury, regardless of geographic boundaries.

Appendix A: Site Visit Team – Biographical Sketches

ROBERT C. MACKERSIE, M.D., F.A.C.S.

Dr. Mackersie is the Director of Trauma Services and Acting Chief of Surgery at San Francisco General, a Professor of Surgery at the University of California, and the Chair of the American College of Surgeons Committee on Trauma Systems Consultation. He is an actively practicing trauma and general surgeon with an interest in surgical critical care and post-traumatic inflammatory lung injury.

Dr. Mackersie received his undergraduate degree in Mechanical Engineering from the University of California, Berkeley; his medical degree from Michigan State University, and completed his residency in General surgery at the University of California San Francisco, including a two year NIH sponsored lab fellowship.

He previously served on the faculty of the University of California, San Diego. Dr. Mackersie lectures extensively in the United States as well as internationally in Canada, Australia, Brazil, Argentina. He has had a long involvement in the educational aspects of trauma, and has supervised fellowship programs in trauma, critical care, and violence prevention. He regularly serves as a surveyor for the ACS-COT Trauma Verification & Review Committee and recently assumed chairmanship of the Trauma System Consultation Committee for the American College of Surgeons.

Dr. Mackersie has authored or co-authored over 100 publications, mostly on trauma-related topics. He has had a long involvement in academic and professional aspects of trauma and surgical care, including:

1. Governor, American College of Surgeons
2. Chairman, COT Committee on Education, American College of Surgeons
3. Chairman San Francisco Trauma Systems Audit Committee
4. Chairman, Publications Committee, Western Trauma Association
5. Board of Managers, Western Trauma Association
6. Secretary/Treasurer, HC Naffziger Surgical Society - UCSF
7. Chief of Staff, San Francisco General Hospital
8. President, Northern California Chapter, American College of Surgeons
9. Member, Committee on Trauma Executive Committee, ACS
10. Professional & Academic societies including: American Association for the Surgery of Trauma, Western Trauma Association, Society of Critical Care Medicine, Society of University Surgeons, Pacific Coast Surgical Association, Southwestern Surgical Association, and others.

ALASDAIR K.T. CONN, M.D., F.A.C.S.

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

JON R. KROHMER, M.D., FACEP

Dr. Krohmer is the Medical Director of Kent County EMS in Grand Rapids, MI. He is also an Associate Professor of Emergency Medicine at Michigan State University and Director of EMS of the Emergency Medicine Residency at Spectrum Health Downtown Campus in Grand Rapids. He is a past president of the Michigan College of Emergency Physicians and the National Association of EMS Physicians.

Dr. Krohmer has been involved in EMS activities for over 25 years. He is a graduate of the University of Michigan Medical School and completed an EM residency and an EMS/research fellowship at Wright State University in Dayton.

He has been very active with the American College of Emergency Physicians at the national and state levels and the National Association of EMS Physicians. He is past president of NAEMSP. He was a long member of the ACEP EMS Committee, is the Immediate Past-Chair of that committee and is currently the chair of the Trauma Care and Injury Control Committee. He is the 1998 recipient of the ACEP Outstanding Contribution to EMS Award and the 2003 recipient of the NAEMSP Ronald Stewart Award for contribution to national EMS activities. He is the NAESMP liaison to the ACS COT and is a past president of the Michigan Trauma Coalition and has been very active in trauma systems development in Michigan.

N. CLAY MANN, Ph.D., M.S.

N. Clay Mann, PhD, MS. Dr. Mann is an Associate Professor in the Department of Pediatrics at the University of Utah School of Medicine and Director for Research at the Intermountain Injury Control Research Center. Dr. Mann received his Ph.D. from the University of Texas in Preventive Medicine and has a Masters Degree from the University of Utah in Statistics/Epidemiology. He has published 70 peer-reviewed articles dealing with traumatic injuries to children, trauma system evaluation, cardiac and trauma resuscitation and the role of emergency medical services in health care. Dr. Mann has special expertise in nonparametric statistics and small sample analysis. He has published methodological papers dealing with the specification of risk adjusted log odds using injury data, improving diagnostic accuracy by pooling test findings and design issues associated with multi-site community trials with continual data collection. Mann has served as principal investigator or co-investigator on 45 federal, state, foundation or industry grants. He has conducted several randomized, controlled community trials dealing with cardiac resuscitation, acute coronary disease education and paramedic training. Currently, Dr. Mann serves as a statistical and study design consultant for the PECARN project. Dr. Mann also currently serves on several national committees including the Basic Life Support Subcommittee for the American Heart Association, the Advisory Council for the National Trauma Registry for Children Project and is a member of the Stakeholders Steering Committee for the HRSA Trauma * EMS Program.

MARY SUE JONES, R.N.

MarySue Jones has been Delaware's State Trauma Coordinator since 1996, and was the Associate Trauma System Coordinator for 2 years prior. She was a hospital Trauma Coordinator at a Level 2 Trauma Center in Pennsylvania for 4 years, during the time when the Pennsylvania Trauma System was beginning, 1985-1989. She worked as an RN in the Admitting Area of Maryland's R Adams Cowley Shock Trauma Center for 5 years, and also taught in a paramedic educational program for 3 years. Previous clinical experience included surgical ICU, ED nurse manager, and 3-11 shift supervisor. Her Master's degree is in Human Resources Management, her undergraduate in psychology with emphasis on organizational psychology. She is a diploma nursing graduate of the school of nursing at Lankenau Hospital, Philadelphia PA.

MS. MARGARET TRIMBLE

Ms. Trimble has worked for over 35 years in emergency medical services and trauma systems. These years have encompassed training, clinical care and research in both civilian and military careers. She has presented at conferences nationally and internationally, is an author of EMS related articles and chapters and the recipient of many awards including the prestigious military proficiency designator in trauma nursing for significant achievement and contributions.

With a master's degree in health care administration and doctoral level studies in health policy, Ms. Trimble's work in EMS and trauma system development included specialty populations such as the high-risk neonate and high-risk maternal patients, pediatric emergencies, burn and behavioral emergencies. Her clinical areas of practice included open-heart surgery, hyperbaric medicine, burn and trauma critical care. The span of system involvement ranged from injury prevention to rehabilitation.

As the Director of an Army Medical Training Center from 1991-1997, LTC Trimble, was responsible for training medical units in the most up-to-date doctrine and procedures, supporting application research support for new equipment and exercise testing of interoperability for joint service operations. This center pioneered distance learning medical training for the Army National Guard and developed special expertise in biological and chemical casualty medical care.

Since November 1997, Ms. Trimble has been the Director of the Emergency Medical Services Office, Pennsylvania Department of Health.

GAIL F. COOPER, PUBLIC HEALTH ADMINISTRATOR (RETIRED)

Ms. Cooper retired from the County of San Diego, Health and Human Services Agency in March 2002, and since that time has worked on special projects in EMS, Trauma, and Public Health Preparedness. Prior to retiring from the County of San Diego she served as the Public Health Administrator for the County of San Diego and was responsible for over 500 employees and a budget of over \$71 million. This includes not only the EMS Division but also the Epidemiology Section, Emerging Diseases, Chronic diseases, Communicable Diseases, Disaster Medical Response, Vital Records, Public Health Laboratory, Maternal and Child Health, Tobacco Control, Medical Health Quality, Immunizations, Office of AIDS Coordination, Border Health, Public Health Nursing and Public Health Preparedness.

For over 25 years Ms. Cooper has been assisting in the establishment of Emergency Medical Service Systems, Trauma Systems, Injury Control programs, Disaster medical response/Public Health Preparedness and Public Health policy at the local, state and national level. She has been involved in major trauma legislative agendas in numerous states while assisting states in implementing statewide and regional systems of trauma care. She has also assisted state and local communities in further development and refinement of their respective EMS systems, strengthened data collection and evaluation components of EMS and Trauma systems, and formulated policies allowing for the integration of EMS, Trauma, and Injury programs. As part of the EMS, Trauma and Injury agenda she has implemented programs to assess data/evaluation for injury mechanisms, triage criteria, car crash statistics, bicycle injuries, helmet use, pedestrian safety and bioterrorism.

NELS D. SANDDAL, MS, REMT-B

Mr. Sanddal is currently the president of the Critical Illness and Trauma Foundation, 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. Nels 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.

He 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 currently serves 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.

ARTHUR COOPER, M.D., M.S., F.A.C.S., F.A.A.P., F.C.C.M. (observer)

Doctor Cooper was born in Brooklyn, New York in 1949. He obtained his baccalaureate at Harvard College and his doctorate at the University of Pennsylvania School of Medicine. He was trained in general surgery at the Hospital of the University of Pennsylvania and in pediatric surgery and surgical critical care at the Children's Hospital of Philadelphia – and is certified by the American Board of Surgery in all three specialties. He is currently Professor of Surgery at the Columbia University College of Physicians & Surgeons – from which he also holds a master's degree in human nutrition – and is Director of Pediatric Surgical Services and Director of the Regional Trauma Center at the Harlem Hospital Center. He is a member of numerous professional and academic societies, has edited six books and written more than one hundred sixty scientific articles, textbook chapters, and policy statements, serves on a variety of national and regional expert and advisory committees, and is a recognized authority in the fields of pediatric surgical nutrition, critical care, trauma, and emergency medical services for children – particularly prehospital emergency care and trauma systems development – as well as physical child abuse, and the surgical care of children with the human immunodeficiency virus.

CHRISTOPH R. KAUFMANN, M.D., M.P.H., F.A.C.S. (observer)

Dr. Kaufmann is Associate Medical Director, Trauma Services at Legacy Emanuel Hospital in Portland, Oregon. He attended medical school at the Uniformed Services University of the Health Sciences (USUHS) in Bethesda and completed his general surgery residency at Tripler Army Medical Center, Honolulu, Hawaii. He then completed the Trauma/Critical Care Fellowship at Harborview Medical Center in Seattle. He is board certified in general surgery and surgical critical care.

In 1990, while on the teaching faculty of Madigan Army Medical Center in Tacoma, Dr. Kaufmann was deployed with the 47th Combat Support Hospital to Saudi Arabia and Iraq. In 1993, Dr. Kaufmann was assigned to the USUHS Department of Surgery with responsibility as trauma consultant to the U.S. Public Health Service. He served as Director, Division of Trauma and Emergency Medical Systems, Health Resources and Services Administration, where he administered the federal grant program to develop trauma care systems across the United States. He also participated as an author of the Model Trauma Care System Plan. In 1996, he returned to the Department of Surgery at USUHS as Principal Investigator of the Demonstration Project for Telepresence Surgery. He served as Chief, Division of Trauma and Combat Surgery, and Region Chief, American College of Surgeons Military Committee on Trauma. Dr. Kaufmann was the Surgical Director of the National Capital Area Medical Simulation Center and Professor of Surgery at USUHS at the time of his retirement from the U.S. Army in 2002. He is now Chair of the Advanced Trauma Life Support (ATLS) Subcommittee for the ACS Committee on Trauma.

Dr. Kaufmann is author or co-author of over 50 manuscripts or chapters and is an author of the current revision of the Model Trauma Care System Plan. He has given over 100 presentations in 16 different countries. He has been a member of numerous local, state, national and international committees, both military and civilian, relating to trauma systems and trauma care, including:

Member, Trauma Systems Consultation Committee, ACS Committee on Trauma

Associate Examiner, American Board of Surgery
Chair, U.S. Public Health Service Committee on Trauma
Executive Committee, American College of Surgeons Committee on Trauma
Site Surveyor, ACS Trauma Center Verification & Review Committee
Trauma Center Site Surveyor, Virginia, Pennsylvania, and Illinois
Member, Committee on a Vision for Space Medicine Beyond Earth Orbit, Institute of Medicine
Editorial Board, NATO Emergency War Surgery Handbook, 3rd U.S. Revision
President, Ambroise Paré Military Surgical Forum of ISS-SIC
Examiner, Society of Apothecaries of London, Diploma in the Medical Care of Catastrophes

Appendix B: List of NC ACS Participants

<u>Name</u>	<u>Title</u>
Cheryl Anderson	National Trauma EMS System Program Director
<u>Organization</u>	<u>Date of Attendance</u>
HRSA, DHHS	August 1-4, 2004
<u>Name</u>	<u>Title</u>
William Atkinson	President & CEO
<u>Organization</u>	<u>Date of Attendance</u>
WakeMed Health & Hospitals	August 2, 2004
<u>Name</u>	<u>Title</u>
Bob Bailey	NC EMS Advisory Council Member
<u>Organization</u>	<u>Date of Attendance</u>
NC EMS Advisory Council	August 1-4, 2004
<u>Name</u>	<u>Title</u>
Todd Baker	Central Regional Manager
<u>Organization</u>	<u>Date of Attendance</u>
NC Office of EMS	August 1-4, 2004
<u>Name</u>	<u>Title</u>
Sue Ballato	Admin. Director, Trauma Services
<u>Organization</u>	<u>Date of Attendance</u>
New Hanover Regional Medical Center	August 1-3, 2004
<u>Name</u>	<u>Title</u>
Michael Barringer	Trauma Director
<u>Organization</u>	<u>Date of Attendance</u>
Cleveland Regional Medical Center	August 1-3, 2004
<u>Name</u>	<u>Title</u>
Ed Browning	Assistant Chief
<u>Organization</u>	<u>Date of Attendance</u>
NC Office of EMS	August 1-4, 2004

<u>Name</u>	<u>Title</u>
Michael Chang	Director, Trauma/Burn Services
<u>Organization</u>	<u>Date of Attendance</u>
WFU Baptist Medical Center	August 2 & 4, 2004
<u>Name</u>	<u>Title</u>
Thomas Clancy	Medical Director, Trauma Services
<u>Organization</u>	<u>Date of Attendance</u>
New Hanover Regional Medical Center	August 1-3, 2004
<u>Name</u>	<u>Title</u>
Kim Cole	Compliance Specialist
<u>Organization</u>	<u>Date of Attendance</u>
NC Office of EMS	August 1, 3, & 4, 2004
<u>Name</u>	<u>Title</u>
Patti Corbett	UNC Air Medical Affiliation
<u>Organization</u>	<u>Date of Attendance</u>
Air Medical Alliance	August 1-3, 2004
<u>Name</u>	<u>Title</u>
Phyllis Daw	Chief Operating Officer
<u>Organization</u>	<u>Date of Attendance</u>
Division of Facility Svcs.	August 2 & 4, 2004
<u>Name</u>	<u>Title</u>
Leah Devlin	State Health Director
<u>Organization</u>	<u>Date of Attendance</u>
Division of Public Health	August 2, 2004
<u>Name</u>	<u>Title</u>
Serge Dihoff	Director, NC Primary Care Organization
<u>Organization</u>	<u>Date of Attendance</u>
NC Office of Research, Demo., & Rural Health Dev.	August 1-3, 2004

<u>Name</u>	<u>Title</u>
Kathy Dutton	Admin., Trauma & Surgical Svcs.
<u>Organization</u>	<u>Date of Attendance</u>
Pitt Co. Memorial Hospital	August 1-3, 2004
<u>Name</u>	<u>Title</u>
Sandra Farmer	President
<u>Organization</u>	<u>Date of Attendance</u>
Brain Injury Association of North Carolina	August 2, 2004
<u>Name</u>	<u>Title</u>
Bob Fitzgerald	Director
<u>Organization</u>	<u>Date of Attendance</u>
Division of Facility Services	August 3-4, 2004
<u>Name</u>	<u>Title</u>
Greg Fleming	M-TAC Coordinator
<u>Organization</u>	<u>Date of Attendance</u>
Metrolina Trauma Advisory Comm., Carolinas Medical Center	August 1-3, 2004
<u>Name</u>	<u>Title</u>
Kent Greene	
<u>Organization</u>	<u>Date of Attendance</u>
NC Association of EMS Administrators	August 2-3, 2004
<u>Name</u>	<u>Title</u>
Danny Harbinson	Regional Manager
<u>Organization</u>	<u>Date of Attendance</u>
NC Office of EMS	August 1-4, 2004
<u>Name</u>	<u>Title</u>
Keith Harris	Regional Manager
<u>Organization</u>	<u>Date of Attendance</u>
NC Office of EMS	August 2-3, 2004

<u>Name</u>	<u>Title</u>
Todd Hatley	Associate Director of Clinical Research
<u>Organization</u>	<u>Date of Attendance</u>
UNC School of Medicine – PreMIS	August 1-3, 2004
<u>Name</u>	<u>Title</u>
Kathy Heilig	Vice President, Clinical Services
<u>Organization</u>	<u>Date of Attendance</u>
NC Hospital Association	August 1-4, 2004
<u>Name</u>	<u>Title</u>
Dale Hill	Education & Credentialing Specialist
<u>Organization</u>	<u>Date of Attendance</u>
NC Office of EMS	August 1-4, 2004
<u>Name</u>	<u>Title</u>
Holli Hoffman	Hospital Bioterrorism Preparedness Coord.
<u>Organization</u>	<u>Date of Attendance</u>
NC Office of EMS	August 1-4, 2004
<u>Name</u>	<u>Title</u>
Darlene Johnson	Emergency Services Coordinator
<u>Organization</u>	<u>Date of Attendance</u>
NC Emergency Management	August 2-4, 2004
<u>Name</u>	<u>Title</u>
Jim Jones	Public Affairs Specialist
<u>Organization</u>	<u>Date of Attendance</u>
NC Dept. of Health & Human Svcs.	August 4, 2004
<u>Name</u>	<u>Title</u>
Jim Kirkpatrick	NC Bioterrorism Coordinator
<u>Organization</u>	<u>Date of Attendance</u>
Office of Public Health Preparedness & Response	August 2-3, 2004

<u>Name</u>	<u>Title</u>
Gail Kluttz	Chair
<u>Organization</u>	<u>Date of Attendance</u>
Regional Advisory Committees	August 1-4, 2004
<u>Name</u>	<u>Title</u>
Steven Landau	NC EMS Advisory Council Member
<u>Organization</u>	<u>Date of Attendance</u>
NC EMS Advisory Council	August 2-3, 2004
<u>Name</u>	<u>Title</u>
Tracy Lawry	NC EMS Advisory Council Member
<u>Organization</u>	<u>Date of Attendance</u>
NC Advisory Council	August 2-3, 2004
<u>Name</u>	<u>Title</u>
Chad Lohmeier	Data Specialist
<u>Organization</u>	<u>Date of Attendance</u>
NC Office of EMS	August 1-4, 2004
<u>Name</u>	<u>Title</u>
Keith Lovin	NC EMS Advisory Council Member
<u>Organization</u>	<u>Date of Attendance</u>
NC EMS Advisory Council	August 2, 2004
<u>Name</u>	<u>Title</u>
Claudia McCormick	Trauma Program Manager
<u>Organization</u>	<u>Date of Attendance</u>
Duke University Hospital	August 1-4, 2004
<u>Name</u>	<u>Title</u>
Kathy McCurdy	Outreach Coordinator
<u>Organization</u>	<u>Date of Attendance</u>
Pitt Co. Memorial Hospital	August 1-3, 2004

<u>Name</u>	<u>Title</u>
Greg Mears	Medical Director
<u>Organization</u>	<u>Date of Attendance</u>
NC Office of EMS	August 1-4, 2004
<u>Name</u>	<u>Title</u>
Wayne Meredith	Chair, Div. Of Surgical Sciences
<u>Organization</u>	<u>Date of Attendance</u>
WFU Baptist Medical Center	August 1-4, 2004

<u>Name</u>	<u>Title</u>
Terry Mullins	Manager
<u>Organization</u>	<u>Date of Attendance</u>
Trauma-EMS Technical Assistance Center	August 1-4, 2004

<u>Name</u>	<u>Title</u>
Patrick O'Brien	Physiatrist
<u>Organization</u>	<u>Date of Attendance</u>
WakeMed	August 1-2, 2004

<u>Name</u>	<u>Title</u>
Drexdal Pratt	Chief
<u>Organization</u>	<u>Date of Attendance</u>
NC Office of EMS	August 1-4, 2004

<u>Name</u>	<u>Title</u>
Kelly Ransdell	Acting Deputy Director, NC Dept. of Insurance
<u>Organization</u>	<u>Date of Attendance</u>
Office of State Fire Marshal, NC SAFE KIDS	August 1, 2, & 4, 2004

<u>Name</u>	<u>Title</u>
Sharon Rhyne	Hospital & Trauma Specialist
<u>Organization</u>	<u>Date of Attendance</u>
NC Office of EMS	August 1-4, 2004

<u>Name</u>	<u>Title</u>
Michael Rotondo	Chief, Trauma & Surgical Critical Care
<u>Organization</u>	<u>Date of Attendance</u>
Pitt Co. Memorial Hospital	August 1-4, 2004
<u>Name</u>	<u>Title</u>
Carol Runyan	Director
<u>Organization</u>	<u>Date of Attendance</u>
UNC Injury Prevention Research Center	August 2, 2004
<u>Name</u>	<u>Title</u>
Edmund Rutherford	Chief, Surgical & Critical Care
<u>Organization</u>	<u>Date of Attendance</u>
UNC Hospitals	August 1-2, 2004
<u>Name</u>	<u>Title</u>
Kay Sanford	Head, Epidemiology
<u>Organization</u>	<u>Date of Attendance</u>
Injury & Violence Prevention, NC Div. Of Public Health	August 2-4, 2004
<u>Name</u>	<u>Title</u>
Jennifer Sarafin	Trauma Program Manager
<u>Organization</u>	<u>Date of Attendance</u>
Carolinas Medical Center	August 1-3, 2004
<u>Name</u>	<u>Title</u>
Robert Schafermeyer	Carolinas Medical Center
<u>Organization</u>	<u>Date of Attendance</u>
STAC Member	August 1-2, 2004
<u>Name</u>	<u>Title</u>
Sharon Schiro	Director
<u>Organization</u>	<u>Date of Attendance</u>
NC Trauma Registry	August 1-4, 2004

<u>Name</u>	<u>Title</u>
Sylvia Scholl	Trauma Program Manager
<u>Organization</u>	<u>Date of Attendance</u>
WakeMed	August 1-4, 2004
<u>Name</u>	<u>Title</u>
John Shelton	Director of Emergency Services
<u>Organization</u>	<u>Date of Attendance</u>
Surry Co. EMS	August 1-2, 2004
<u>Name</u>	<u>Title</u>
Donnie Sides	Operations Manager
<u>Organization</u>	<u>Date of Attendance</u>
NC Office of EMS	August 1-4, 2004
<u>Name</u>	<u>Title</u>
Mary Beth Skarote	President
<u>Organization</u>	<u>Date of Attendance</u>
NC Association of Paramedics	August 1-4, 2004
<u>Name</u>	<u>Title</u>
Donnie Snyder	Supervision CISS Operations
<u>Organization</u>	<u>Date of Attendance</u>
PCMH	August 2-4, 2004
<u>Name</u>	<u>Title</u>
Kevin Sowers	Chief Operating Officer
<u>Organization</u>	<u>Date of Attendance</u>
Duke University Hospital	August 1-2, 2004
<u>Name</u>	<u>Title</u>
Linda Spallone	Trauma Registry Coordinator
<u>Organization</u>	<u>Date of Attendance</u>
Carolinas Medical Center	August 1-3, 2004

<u>Name</u>	<u>Title</u>
Christy Spivey	SERAC Manager
<u>Organization</u>	<u>Date of Attendance</u>
New Hanover Regional Medical Center	August 1-3, 2004
<u>Name</u>	<u>Title</u>
Thomas Taaffe	
<u>Organization</u>	<u>Date of Attendance</u>
Medical Care Commission Member	August 2, 2004
<u>Name</u>	<u>Title</u>
Dennis Taylor	President
<u>Organization</u>	<u>Date of Attendance</u>
NC Div. Of the American Trauma Society	August 1-4, 2004
<u>Name</u>	<u>Title</u>
Betsy Tesseneer	Trauma Coordinator
<u>Organization</u>	<u>Date of Attendance</u>
Cleveland Regional Medical Center	August 1-3, 2004
<u>Name</u>	<u>Title</u>
Michael Thomason	Trauma Director
<u>Organization</u>	<u>Date of Attendance</u>
Carolinas Medical Center	August 1-2, 2004
<u>Name</u>	<u>Title</u>
Burke Thompson	Assistant Medical Director
<u>Organization</u>	<u>Date of Attendance</u>
Moses Cone Health System	August 1, 2004
<u>Name</u>	<u>Title</u>
Nick Tise	EMS for Children Specialist
<u>Organization</u>	<u>Date of Attendance</u>
NC Office of EMS	August 1-4, 2004

<u>Name</u>	<u>Title</u>
Jessica Trembly	Processing Assistant
<u>Organization</u>	<u>Date of Attendance</u>
NC Office of EMS	August 1-4, 2004
<u>Name</u>	<u>Title</u>
Pascal Udekwu	Director of Trauma
<u>Organization</u>	<u>Date of Attendance</u>
WakeMed	August 1-4, 2004
<u>Name</u>	<u>Title</u>
Carl VanCott	Communications Specialist
<u>Organization</u>	<u>Date of Attendance</u>
NC Office of EMS	August 1-4, 2004
<u>Name</u>	<u>Title</u>
Steven Vaslef	Director, Trauma Services
<u>Organization</u>	<u>Date of Attendance</u>
Duke University Medical Center	August 1-3, 2004
<u>Name</u>	<u>Title</u>
Jamie Walker	Trauma Manager
<u>Organization</u>	<u>Date of Attendance</u>
Pitt County Memorial Hospital	August 1-4, 2004
<u>Name</u>	<u>Title</u>
Dianne Wheaton	Trauma Service Line Coordinator
<u>Organization</u>	<u>Date of Attendance</u>
Wake Forest University Medical Center	August 1, 2, & 4, 2004
<u>Name</u>	<u>Title</u>
Gary Whitman	Vice Commander
<u>Organization</u>	<u>Date of Attendance</u>
NC Association of Rescue & EMS	August 2, 2004

<u>Name</u>	<u>Title</u>
Ginger Wilkins	Duke RAC Coordinator
<u>Organization</u>	<u>Date of Attendance</u>
Duke University Medical Center	August 1-3, 2004
<u>Name</u>	<u>Title</u>
Julie Williams	Administrative Secretary
<u>Organization</u>	<u>Date of Attendance</u>
NC Office of EMS	August 1-4, 2004
<u>Name</u>	<u>Title</u>
Nevada Wolfe	Epidemiologist
<u>Organization</u>	<u>Date of Attendance</u>
Injury & Violence Prevention, Div. Of Public Health	August 1-3, 2004
<u>Name</u>	<u>Title</u>
Cheryl Workman	Trauma Program Manager
<u>Organization</u>	<u>Date of Attendance</u>
Moses Cone Health System	August 1-3, 2004
<u>Name</u>	<u>Title</u>
Susan Chilton	Training Supervisor
<u>Organization</u>	<u>Date of Attendance</u>
Guilford County EMS	August 2-3, 2004
<u>Name</u>	<u>Title</u>
Cat Colvin	Trauma Registrar Data Coord.
<u>Organization</u>	<u>Date of Attendance</u>
UMCH	August 3-4, 2004
<u>Name</u>	<u>Title</u>
Mark Miller	D.V. CFO
<u>Organization</u>	<u>Date of Attendance</u>
Duke Hospital	August 2, 2004

<u>Name</u>	<u>Title</u>
Debra Petrarca	Trauma Registrar
<u>Organization</u>	<u>Date of Attendance</u>
WakeMed	August 4, 2004
<u>Name</u>	<u>Title</u>
Don Dalton	NCHA Public Relation
<u>Organization</u>	<u>Date of Attendance</u>
NCHA	August 4, 2004
<u>Name</u>	<u>Title</u>
Jim Shamp	Science/Health Reporter
<u>Organization</u>	<u>Date of Attendance</u>
The Durham Herald-Sun	August 4, 2004
<u>Name</u>	<u>Title</u>
Cindy Rowe	Assistant to the Trauma Medical Director
<u>Organization</u>	<u>Date of Attendance</u>
Pitt County Memorial Hospital	August 4, 2004

Appendix C: Newspaper Article Regarding Site Visit

Review finds gaps, but potential leadership in N.C.'s trauma care

Associated Press

DURHAM, N.C. - North Carolina has the potential to guide the nation in methods of providing trauma care despite a few significant gaps in emergency services in some areas, according to a group of national experts.

The assessment was delivered Wednesday in a preliminary report by the Committee on Trauma of the American College of Surgeons, which gave the evaluation at the request of the state Office of Emergency Medical Services.

The 11-member panel collected data for months, then spent four days brainstorming before presenting its findings to hospital and emergency medical officials who met in Research Triangle Park.

A final, more detailed report should be finished within six weeks, according to team leader Robert Mackersie, a professor of surgery at the University of California at San Francisco. He said the finished report is likely to support steps already being taken by state medical leaders to maximize public safety.

North Carolina is among only a handful of states that have undertaken this kind of review, Mackersie said. He suggested that minor improvements to be spelled out in the report might establish the state as a national model for handling natural disasters or terrorist attacks.

The committee found that high-level trauma care is conspicuously absent in the Fayetteville area, as well as in some parts of western and northeastern North Carolina, forcing people who need emergency services to travel unnecessarily long distances.

For example, civilians can't get emergency treatment at Fort Bragg's Womack Army Hospital and people with severe injuries can't get the care they need at Cape Fear Valley Medical Center, the report found. Instead, they must be sent to emergency departments as far away as Durham, Chapel Hill or Wilmington.

The panel noted several areas for improvement other than filling gaps in geographic coverage, ranging from increased funding of trauma services to improved communication among emergency medical officials and hospital trustees, state agencies and lawmakers, physicians, patients and the media.

Because of the state's swift and continuing growth, trauma care is "a major public health problem" that requires diligence from state officials, Mackersie said.

State health statistics show that motor vehicle accidents are the leading cause of death for North Carolinians from infancy through age 44. In 2002, the last year for which statistics were

reported, 1,637 people were killed in wrecks, while other unintentional injuries killed 1,992 North Carolinians.

The state's emergency response system is well designed, and more trauma victims could be helped with minor streamlining, Mackersie said.

"We have to beef up our trauma system so we're ready for everything and everyone," said Sharon Rhyne, hospital and trauma specialist with the Office of Emergency Medical Services.

But she said that doesn't mean every community needs a Level 1 trauma center. Data analysis may show that certain kinds of injuries can be best handled through helicopter transport to specialized sites, such as the N.C. Jaycee Burn Center at UNC Hospitals in Chapel Hill.

The evaluation was financed through a federal terrorism preparedness grant obtained by Rhyne's office. "But terrorism is just one of many causes of trauma injury," she said. She said she asked for the survey to help clarify what the state needs to do to effectively get minor injuries handled in community clinics and serious injuries handled quickly.

WRAL.com

Review Finds Gaps, But Potential Leadership In N.C.'s Trauma Care

POSTED: 3:40 PM EDT August 5, 2004

DURHAM, N.C. -- Some national experts in trauma care say North Carolina can be a national leader in the field, but it has some gaps to fill first.

A committee from the American College of Surgeons released a report sought by state emergency medical officials. Only a handful of states have received a similar review. Robert Mackersie led the North Carolina review. He says high-level trauma care is absent in Fayetteville and some parts of western and northeastern North Carolina. That forces people to travel long distances for such care.

The panel says more money is needed for trauma services, as well as improved communication among emergency medical officials and hospital trustees, state lawmakers and the media. Mackersie says the state's surging population means trauma care is a major public health problem. Still, he says North Carolina can be a leader in the field if some improvements are made.

A final report should be completed within six weeks.

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