From the Chair

P. David Adelson, MD, FACS

As this is my last newsletter and meeting as chair of the AANS/CNS Section on Neurotrauma and Critical Care, I want to thank the Trauma Section members for this honor and for entrusting me to represent the section over the past two years. It has been an active time for the section. I have had the pleasure of direct contact with many of you, both in and out of neurosurgery, regarding your local, national, and international concerns, and have hopefully responded to all of your comments and suggestions on how the Trauma Section can continue to help you in your practice and your continuing education.

The Trauma Section has been faced with a number of issues over the past several years. The role of neurosurgeons in emergency services, and particularly neurotrauma, has been debated within neurosurgery and nationally as the discussion of “right thing to do”/duty versus financial and legal pressures has become more heated. These discussions have occurred not only among our colleagues and government, legal system and third-party payers, but also among different specialties of medicine, both established and proposed. The debate is often rancorous, with each specialty offering an approach to managing a growing and overwhelming crisis.

The Trauma Section needs to remain a leadership voice on this and other relevant issues, whether they be emergency coverage, EMTALA, HIPAA, research, reimbursement, medical liability, regionalization, or acute care surgery, to name but a few. The section must remain an advocate for neurotrauma and critical care, highlighting the need for neurosurgeons’ involvement in the care of neurological/neurosurgical emergencies, especially since most are not traumatic in nature (for example, aneurysmal subarachnoid hemorrhage, ventriculoperitoneal shunt malfunction, and spinal metastases with neurologic decline). In all of these situations, the neurosurgeon, properly covering, remains the optimal person to deliver care to patients. It is incumbent that we as a specialty continue to speak out for the “right thing to do,” or others will define our...
roles—likely against our better judgment. We need to be advocates not for “neurosurgery’s turf” but rather for the unique, highly expert, and expansive approach to patient care that we provide and that cannot easily be replaced with certificate courses.

Neurosurgery has been unique in defining the knowledge base and practice management guidelines for neurotrauma, with the first formal guidelines of any neurosurgical specialty published collaboratively by the Trauma Section, the Brain Trauma Foundation and the AANS in 1995. Since that time, two editions of the guidelines have been published, and many other documents have defined the appropriate management for pre-hospital, pediatric, and spine trauma. These evidence-based documents must be a part of our educational mission. We must continue to educate and update practicing neurosurgeons as to cutting-edge diagnosis and management of patients with neural injury and emergencies, and provide recommendations based on the latest literature and algorithms of treatment and patient care. The educational and scientific programs of the Trauma Section have been truly noteworthy. Whether through the spring and fall annual meetings, with standing-room-only practical courses and luncheon seminars, to our popular resident courses offered two to three times per year, the section has been highly successful in bringing to the membership up-to-date knowledge and approaches in neurotrauma and critical care. And you have responded with your attendance, involvement, and questions during these sessions. We need to continue to ensure that these educational opportunities are available to provide practical, “implement it now” tools.

As part of this initiative, one new educational opportunity that I am particularly proud is the development of the first joint symposium of the National Neurotrauma Society (NNS) and the Trauma Section, to be held at the Hilton Walt Disney World in Orlando, Fla. on July 26 to 30, 2008. The section had for years considered a separate, stand-alone meeting focused on neurotrauma and critical care similar to the format of the resident courses in neurotrauma that we have developed over the past few years. A joint symposium is an opportunity for clinicians and basic scientists to meet together in sessions that cover the gamut of basic laboratory science, through translational and clinical sessions on TBI, spine and spinal cord injury, and intensive care, and to offer all a better understanding of the state-of-the-art management of neurotrauma and critical care, present and future. With both didactic and hands-on sessions (spinal column trauma reconstruction, multimodality monitoring, and surgical management for brain trauma), the joint symposium hopes to create a better dialogue and collaboration between the clinicians and scientists that might translate into improved patient care in the future. We hope that this symposium will attract a variety of disciplines including basic neuroscientists interested in neurotrauma and critical care but also neurosurgery, emergency medicine and critical care, neurorehabilitation and others. This is an exciting opportunity to further define our subspecialty and better educate others as to the unique, global perspective neurosurgeons have for such patients. We hope you will consider attending this exciting symposium. Go to http://www.neurotrauma.org/2008/index.htm for more information on the program, venue and activities.
In closing, I would like to thank the officers and the rest of the Trauma Section Executive Committee who have helped me over the past two years. Past President Alex Valadka, MD has been on ongoing strength for the section with his incredible leadership at the American College of Surgeons Committee on Trauma and many other venues, and as a strong voice for neurosurgery, highlighting the importance of neurosurgeons in neurotrauma and critical care. He is now a full member of the Washington Committee and will continue to bring his expertise to the issues affecting all of us. The new chair, Michael Fehlings, MD, PhD, will be an able successor, bringing a different perspective from north of the border. I would also like to thank Secretary-Treasurer Shelly Timmons, MD, PhD, who worked hard as the editor of this newsletter and in supporting the ongoing work of the Trauma Section. As the new Chair-Elect, she will bring her insight from the Council of State Neurosurgical Societies (CSNS), American College of Surgeons (ACS), and practice in a busy trauma center to the section. I would also like to thank Synthes, Codman Johnson and Johnson; Integra; and DePuy Acromed for their support of our educational programs and research fellowship. Lastly, to all the energetic Executive Committee members who served the section well over the past two years, I thank you for your service.
Neurotrauma News Announcement

**Announcement: Neurotrauma News Is Now Online Only!**

*Neurotrauma News* is now online only! This Spring 2008 issue and subsequent issues of the newsletter will be provided in electronic format only. Section members can access the newsletter via a directly e-mailed link and at [http://www.neurosurgery.org/sections/section.aspx?Section=TR&Page=newsletter.asp](http://www.neurosurgery.org/sections/section.aspx?Section=TR&Page=newsletter.asp). The decision to move from combined paper and online PDF format to an online-only format has been carefully considered by the Executive Committee over the past year. The change in format will help us provide more content and more frequent updates.
## Mission Possible: Integrating Disciplines, Practice Protocols, Collaboration, and a Culture of Caring to Improve Outcomes in the SICU

Mary Kay Bader, RN, MSN, CCNS, CNRN, CCRN,  
Margie Whittaker, RN, MSN, CCRN, CNRN, and  
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"Teamwork is the ability to work together toward a common vision... the ability to direct individual accomplishments toward organizational objectives...It is the fuel that allows common people to attain uncommon results."
—Andrew Carnegie

Surgical Neuro-Intensive Care Units, or SICUs, in hospitals provide highly specialized care to critically ill patients with neurological illness or injury. Achieving optimal outcomes for this neuro population is challenging due to the complex nature of their illness or injury. Caring for these patients are individuals from multiple disciplines, each with his or her own scope of practice built on education and evidence-based literature and unique skills and competence. Successfully integrating these individual practitioners into a cohesive team fosters collaboration and mutual respect among the disciplines. From this foundation, an integrated culture of caring can be created where the patient and family unit benefit from the synergy of the team. When all of these characteristics are combined and the team directs their attention toward achieving synergistic caring practices, common practice morphs naturally into optimal outcomes.

The 16-bed SICU at Mission Hospital, a 325-bed community hospital and level II trauma center located in Orange County, Calif., was created in 1992 following a split from the cardiac ICU. Trauma and postoperative surgical/neurosurgical patients comprised the patient population for the first five years. In 1997, the SICU concentrated its efforts on building an integrated neurotrauma ICU. The trauma medical director, neurosurgery chief, neuro/SICU clinical nurse specialist, SICU nurse manager and trauma program manager met to assess current practices, identify opportunities for improvement and construct an integrated model of care focusing on evidence-based literature. The team commenced its evaluation by focusing on traumatic brain injury.
The leadership team discovered that the current practices in managing severe TBI patients were not in line with the 1995 Brain Trauma Foundation guidelines. Mission Hospital’s practice patterns focused care on hyperventilation, dehydration and intracranial pressure. In addition, there was a lack of consistent approach in managing the patients dependent on the specific physician practitioner. With seven trauma surgeons, five neurosurgeons and five intensivists, each with his or her own management styles, variability in patient management was common. The six-month outcomes for severe TBI (Glasgow Coma Scale scores of 3 to 8) from 1994–1997 were 43 percent mortality rate, 30 percent severe disability/persistent vegetative state, and 27 percent good outcome/moderate disability. The team reviewed the evidence-based literature and discovered an opportunity to change practice and impact outcomes. The acknowledgement of the disparity of practice patterns and the literature was the catalyst for change in the SICU. Integrating the 1995 guidelines required building practice protocols where all disciplines work together. The group brought together key physician, nursing and ancillary personnel who created an integrated severe TBI protocol that became the basis for patient management. Implementing the protocol required developing a model of ICU care built upon uniform clinical practice, culture of caring, and collaboration (Figure 1).

Clinical practice comprises all of the team members caring for the neuro population. Each discipline must utilize its specialized skills/knowledge to build integrated care practices with the goal to move the patient from illness to health. A group of 52 nurses delivers care in the SICU. The group’s competence was built through providing advanced neuro-education, integrating multimodality technologies, mentoring at the bedside by the clinical nurse specialist and acquiring critical thinking skills (Table 1).

One way to measure knowledge competence is through professional certification. The CCRN (certified critical care nurse) and CNRN (certified neuroscience nurse) certifications are offered by national nursing specialty organizations. In the SICU, comprehensive educational programs provide the basis for knowledge while the clinical experiences at the bedside build competence. Many of the SICU nurses possess professional certification validating their knowledge. The mentoring of the clinical nurse specialist at the bedside expands the nurses’ skills by providing real-time learning. Critical decisions at the bedside are fostered by applying critical thinking principles and standardizing the care provided by the nurses.
The complex nature of the neurological illness/injury requires that the nurse at the bedside be able to assess patients, integrate the evidence-based guidelines, interpret monitoring data and select appropriate interventions. The TBI protocol is the focal point of practice. Physicians in the SICU entrust the nurses with clinical decision making by providing uniform protocols and physician orders required for these protocols. The protocols are supported by 24/7 open lines of communication among the bedside nurses, the clinical nurse specialist and physicians. In addition to the protocols, invasive and noninvasive multimodality monitoring technologies are integrated into care practices, including ICP monitoring, brain oxygen monitoring, blood flow monitoring, pupillary monitoring, EEG derived monitoring and temperature regulating equipment (Figure 2). These elements of clinical practice foster a culture of mutual respect among physicians and nurses, as well as create a culture of caring for the patient and patient's family.

Healthy relationships and communication among the disciplines are paramount. To achieve integrated multidisciplinary care, there must be a culture of respect for each specialty's knowledge. Trust in each other's knowledge and skills creates synergy and enhances care. The SICU leadership team works to ensure the family's participation at the bedside and to provide opportunities for physicians and nurses to share information daily during rounds. Caring is central to building a relationship among patient, family and team. Involving the family by allowing their presence at all times in the SICU, providing accurate information and listening to their concerns creates an environment of caring. This fosters collaboration between the care team and the patient/family.

Collaboration among the disciplines in the SICU is the end result of integrating the various elements of clinical practice and a culture of caring. The group must plan the care of their patients and practice together as colleagues. Group members working interdependently within the boundaries of their respective scopes of practice fosters collaborative practice. The integration of these core elements created a radical change in the outcome of Mission Hospital's critically ill neuro population.

Keeping track of the outcomes in this patient population allows the team to get the
"big picture" as well as discover areas that still need work. In the past 10 years, the outcomes of the neuro patient populations have dramatically improved. In 2007, the severe TBI patient population outcomes reveal a drop in mortality from 43 percent to 13 percent, with a concurrent drop in severe disability/persistent vegetative state from 30 percent to 14.5 percent. Good outcome/moderate disability increased from 27 percent to 72.5 for the same period.

The application of these principles to other neuro subpopulations has led to decreases in mortality, that is, from 33 percent to 22 percent for the primary intracerebral hemorrhage patient population and 5.9 percent to 2.5 percent mortality in the ischemic stroke patient population. The impact of Mission’s integrated model of care has had positive impact on the retention of experienced ICU nurses at the bedside, led to improved patient/family/staff relationships, and been acknowledged by national organizations through awards.

Retaining nurses is integral to providing continued competence. Nurses at Mission’s SICU have an average of 15 years in practice. The SICU’s turnover rate is 4 percent, and its vacancy rate of 8 percent is much lower than the state vacancy rate of 14 percent. The SICU nurses are engaged in the team practice and in the governance of the unit. They contribute to the decisions regarding operations of the SICU through leadership, education, and clinical practice councils.

The integrated care model has had many positive effects on Mission Hospital. The involvement of family members in the care of their loved ones has led to family members’ participation in committees that design patient/family care practices. Monetary contributions totaling $8.5 million to the neuro program have been an unanticipated outcome of the team’s positive and ongoing relationships.

Lastly, the team’s work has brought recognition from national organizations such as the Joint Commission and the American Association of Critical Care Nurses. Mission Hospital received the 2000 Joint Commission Ernest A. Codman Award for excellence in performance improvement related to the care of severe TBI. The SICU has received 14 individual and team Circle of Excellence awards from AACN and has been designated a Beacon Unit, an award that recognizes excellence in the critical care environment. As of March 2007, only 78 units in the United States have been recognized with this award.

Engaging practitioners into an integrated care model has led to a cohesive team and has provided the environment to work together toward a common goal—improved patient outcomes in neuro populations.
The Indispensability of Specially Trained Neurosurgical Nurses in Neurosurgical Intensive Care

Shelly D. Timmons, MD, PhD, FACS, Sharon Rivas, MD, and Denise Blackford, RN, BSN

Specialty intensive care units have been in existence for the past several decades. The rise of neurosurgical intensive care units, NICUs, in the 1970s and 1980s coincided with developments in neurophysiology and advances in neuroanesthesia, neurosurgical techniques and emergency management that resulted in increased survival rates and improved outcomes for patients with complex injuries and central nervous system diseases, and for those undergoing increasingly intricate microneurosurgical intracranial procedures. NICUs provide specialized care in neurosurgical diseases and injuries. The focus of such units includes specialty nursing expertise in neurological assessment and neurophysiology, and competencies with various established and emerging neuromonitoring techniques.

The field of neurocritical care and neuroscience nursing has been enhanced by the development of professional societies for nurses, such as the American Association of Neuroscience Nursing, AANN, and the American Board of Neuroscience Nursing, ABNN, which provides the Certified Neuroscience Registered Nurse examination and certification. Nearly 3,000 nurses in the United States, Canada, and certain U.S. territories have attained this certification since its inception in 1978. Academic achievements in the field are highlighted in the AANN-sponsored Journal of Neuroscience Nursing, the readership of which includes neurotrauma nurses.

Enhancing Patient Care
There is no doubt that the quality of care for neurological patients is better in units with specially trained neurosurgical nurses due to the complex nature of the neurological examination and monitoring, nurses’ intuition developed with experience, and the critical nature of detecting subtle clinical changes early. Undetected changes or mismanagement of sometimes multiple simultaneous interventions can have disastrous consequences in neurotrauma and neurosurgical patients, who can deteriorate and die, or suffer severe functional deficits, quite rapidly.
Neuromonitoring techniques are developing rapidly, requiring an even greater knowledge of central nervous system physiology on the part of nursing staff, who are the minute-to-minute guardians and caretakers of the patient. Knowledge of intracranial pressure dynamics, cerebral perfusion pressure, cerebral blood flow and cerebral oxygenation; brain and body temperature; nutritional, hematological and electrolyte needs and effects; musculoskeletal needs and avoidance of complications; spinal cord injury effects on hemodynamics; effects of central nervous system-acting drugs, osmotic agents and antiepileptic medications; avoidance and immediate recognition and treatment of seizures; and importance of timing and appropriate use of radiographic imaging are but a few clinical parameters with which the neurotrauma or neurosurgical specialty nurse must be immediately conversant. Treatments for some of these problems often involve multiple simultaneous interventions, including positioning, ventilator changes and assessment of respiratory function, administration of multiple drugs, treatment of hyperglycemia or hyperthermia, set-up for ventriculostomy placement or other procedures, and traveling to CT, all in conjunction with repeated reassessments of hemodynamic parameters and the neurological examination, and necessary laboratory studies (ABG, CBC, CMP, coagulation studies, glucose, and others).

Knowledge of set-up and maintenance of ventriculostomy, lumbar drains, intracranial pressure monitors, and central lines and Swann-Ganz catheters (standard management and troubleshooting) is requisite for the NICU nurse. In some settings, the NICU nurse also must be conversant with tissue oxygenation monitors, cerebral blood flow monitors, jugular venous saturation monitors, central cooling devices and multimodality monitoring devices. Implementation and common usage of a variety of grading scales specific to neurological trauma and diseases enhances the nurse’s communication with physicians and understanding of disease processes and treatment. Familiarity with these can only come with routine exposure to these types of patients.

NICU patients must travel frequently. Frequent CT scanning is a mainstay of the monitoring and treatment of NICU patients, particularly for patients admitted after trauma. MRI is most often utilized to assess a patient’s central nervous system in the hospital setting; therefore, NICU patients frequently travel to MRI for brain and spinal MRI scanning. X-rays are commonly employed in the trauma setting for spinal column injuries, and adequate films often cannot be obtained via portable mechanisms. Emergency operations and procedures are commonplace in the NICU patient population, necessitating travel to the operating theatre. Finally, specialized tests are often required on NICU patients, including arteriography, nuclear brain scans, barium swallows, and occasionally myelograms and ultrasound.

It is not uncommon for NICU patients to travel daily for the first several days of their ICU stay. Most NICU patients are on mechanical ventilation and have multiple indwelling catheters (including arterial lines), central venous catheters, pulmonary artery catheters, ventriculostomy catheters, intraparenchymal monitors and lumbar drains. Many have postsurgical drains inserted in their wounds and have multiple IV drips requiring automated pumps. In order for these patients to leave the ICU room for diagnostic and therapeutic procedures, all of the lines,
drips, and catheters must be packed up and protected. The patients must have bag ventilation and be reconnected to a ventilator at the destination. They often must maintain head of bed elevation. Indwelling ventricular or lumbar catheters must be clamped during travel and transfer, and lengthy clamping can be dangerous to the patient. Risk for inadvertent removal of the catheters during travel is high. When catheters must be replaced, patients are subjected to an increased risk of central nervous system infection and hemorrhage, which can result in devastating consequences including death. Nurses familiar with these modalities and the signs and symptoms of neurological problems can often avert disaster by preventing secondary cerebral insults.

Hospital falls constitute a major safety problem, particularly for the neurologically impaired. Patients with traumatic brain injury in particular are susceptible to falls due to ongoing confusion and agitation. Nurses without experience with this patient population often overestimate the patients’ abilities to understand and remember instructions. Patients may be mistakenly thought to understand activity and safety instructions because they are "oriented," while no thought is given to their ability to form continuous memory and therefore comply with what they have been told. Behavior of patients with frontal injuries is easily misinterpreted by nurses who are not familiar with this specific neurological presentation as being related to their pre-morbid personalities. Cursing, lack of impulse control, sexual and other forms of disinhibition, and aggressive behavior can be off-putting to those who do not understand that these behaviors are caused by the injury and may be temporary. This may cause care providers to exhibit less patience, provide less care due to patient avoidance, and over-rely on sedation for the patient. Nurses who are not accustomed to the TBI population also tend to be more reluctant to comply with sedation weaning protocols, potentially contributing to longer ventilator usage, higher incidence of decubitus ulcers, and prolonged ICU lengths of stay. Better care also results when nurses are familiar with seizure activity and its emergency treatment, sleep patterns and needs in neurological patients, and declaration of brain death.

Due to the uncertainty of the prognosis surrounding neurological injuries and diseases, a bedside nurse’s special knowledge of the nervous system and effects of injury or disease is extremely beneficial. Such knowledge helps the nurse deal with patients’ families and leads to higher patient and family satisfaction with care.

**Hospital Efficiency, Productivity and Financial Benefit**

Quality of care in the unit must be aggressively tracked and monitored with established evidence-based medicine treatment protocols and an aggressive performance improvement program, including infection control, as central nervous system infections are particularly devastating. Fall reduction in cognitively impaired patients and prevention of decubitus ulcers in patients with prolonged immobilization are two initiatives that can be easily undertaken when developing a new NICU.

Among other cost-saving benefits to having specialty neuroscience nurses is the avoidance of unnecessary tests. For example, nurses who are conversant with the neurological examination, who can proficiently communicate with the
physician staff regarding complex and ever-changing physiological parameters and who can institute established evidence-based protocols can help avoid unnecessary patient trips to the CT scanner for changes that might otherwise be perceived to represent potential structural lesions. When the nurse is a fully integrated partner with the physician in the management of minute-to-minute changes in intracranial pressure, cerebral perfusion pressure and cerebral blood flow, such trips are avoided, reducing the overall cost of care and risk to the patient.

In terms of human resource management, establishment of a stable specialty unit is the goal. Job satisfaction for those working in this type of unit tends to be high. A retention plan should be implemented to encourage nurses who are performing satisfactorily to remain in their positions. When nurses are utilized outside their area of expertise or training (such as placing a cardiac ICU nurse in a neurosurgical ICU), their anxiety over inadequate preparation or performance can result in absenteeism and attrition. When ICU nurse turnover is high, the added expenses of recruitment and nurse orientation increase overall costs. The goals of an NICU should therefore include the provision of rewards for longevity and seniority, for example, by providing experienced nurses with more scheduling choices. Additionally, the nurse manager and medical director should work to promote the professional development of the nursing staff through ongoing educational activities, establishment of a local chapter of the American Association of Neuroscience Nursing, and the fostering of participation in professional and academic activities for those who are interested. CCRN certification should be supported by the hospital, as well as other advanced practice certifications such as Traumatic Brain Injury Clinical Care Specialist Certification.

In smaller hospitals caring for neurosurgical patients where it might be impractical to have a designated physical NICU, a "virtual" ICU with a cadre of specially trained nurses can be developed to care for post-operative and other neurosurgically managed patients.

In summary, with improvements in quality of care, complications are reduced. With fewer complications, decreases in ICU length of stay and fewer hospital and ICU readmissions are expected, thereby improving the hospital’s efficiency, productivity, reputation and financial bottom line.

**Educational and Research Advantages of a Specialty NICU**

For hospitals affiliated with academic centers, the ongoing education of resident physicians; medical and nursing students; physical, occupational, and speech therapy students; and pharmacy and respiratory therapy students can be enhanced in a specialty unit in which patients with similar disease processes and injuries are treated. For those hospitals not academically affiliated, much is still to be gained by concentrating the efforts of all of these required ancillary personnel into one unit with similar patients.

Clinical research is becoming increasingly difficult to conduct in complex medical and regulatory environments. Complex systems of care increase clinical
variability, which can dilute the results of investigational interventions. Standardized approaches to therapy in consistently staffed units can reduce this variability, enhancing the possibility that therapeutic effects of investigational interventions will be detected.

**Conclusion**
Neurosurgeon involvement in the administrative processes surrounding provision of intensive care to our patients enhances outcomes. Partnering with our nursing colleagues is paramount in the development of high-quality NICUs and the furtherance of the field of neurosurgical intensive care.

**About the Authors**
Dr. Timmons is medical director of the Neurosurgery/Neurotrauma Intensive Care Unit and chief of neurosurgery at the Regional Medical Center at Memphis, Tenn.

Dr. Rivas is a resident in the Penn State Neurosurgery program and is completing her residency and Neurotrauma and Neurocritical Care fellowship with Dr. Timmons this year; she plans to practice in Columbia, S.C.

Ms. Blackford is the nurse manager of the Neurosurgery/Neurotrauma Intensive Care Unit at the Regional Medical Center at Memphis and has more than 15 years’ experience in neurosurgical and neurotrauma nursing, as a staff nurse, as a nurse educator, and in management.

**Suggested Guidelines for NICU Medical Directors**
The neurosurgical intensive care unit (NICU) medical director role is intended to provide leadership to help optimize patient safety, provide clinical direction for performance improvement, assist with development of policies that further quality of care and maximize cost effectiveness, advance collaborative relationships among health care professionals, and promote an environment conducive to scholarly activity.

The NICU medical director should establish:

- Patient safety initiatives
- Technology assessment policies
- Procedural competencies for nursing personnel
- Nursing standards of care (in collaboration with nursing)
- Specific performance improvement criteria
- Written NICU admission criteria
- Policy on admissions and transfers
A multidisciplinary team that meets regularly and participates in patient care
Guidelines for the environment of care
Visitation policies

The NICU medical director should also:
Serve on the intensive care unit (ICU) committee, if one exists, attending 50 percent or more of the scheduled meetings
Provide direction and supervision for the nurse manager
Make recommendations to the hospital administration and the medical staff executive committee about patient care or organizational initiatives
Coordinate resident physician educational activities (for academic units)
Be familiar with all clinical research protocols being conducted
Encourage scholarly activity
Promote collaboration among medical specialties and across disciplines to enhance medical care and patient well-being

All of the above should be specific to the NICU, although input from other ICU medical directors will be necessary in some instances, for example, in situations in which patients with certain disease complexes are treated in multiple units. In such instances, patient safety and quality improvement initiatives may cross unit boundaries, as discussed in the ICU committee or upon agreement of the involved directors.

Neurosurgery/Neurotrauma ICU Admission Criteria at the Regional Medical Center at Memphis

Priority admission to NICU is given to patients meeting the following criteria, in order of importance:

I. Class I (Must Have All)
Admitted to the Neurosurgery service
Central Nervous System Injury or Pathological Process Requiring*
   Invasive Neuromonitoring OR
   Implanted Central Nervous System Drainage Devices OR
   Hourly Neurological Examinations
*Patients requiring all three are given top priority
II. Class II**

Admitted to Neurosurgery Service OR Trauma Service with Neurosurgical Consultation/Management of Neurological Injury AND one of the following:

- Moderate or Severe Traumatic Brain Injury (GCS 3-12)
- Ruptured Intracranial Aneurysm
- Post-Craniotomy (Traumatic or Non-Traumatic)
- Intracranial Hematoma(s) > 15 cc Total Volume
- Non-Aneurysmal Spontaneous Subarachnoid Hemorrhage with Hunt Hess Grade > II OR Fisher Grade > II
- Acute Cervical or Thoracic Spinal Cord Injury with Neurogenic Shock OR Unstable Injury
- Blunt Carotid Artery Injury
- Blunt Vertebral Artery Injury Without Occlusion with Anticoagulation Therapy OR Potential for Evolving Infarction
- Cerebral Infarction In Evolution with Carotid or Vertebral Occlusive Disease
- Other Neurosurgical Emergency Condition
- Hydrocephalus
- Acute Shunt Malfunction
- Intracranial or Spinal Abscess
- Spinal Cord Compressive Lesion
- Brain Tumor
- Status Epilepticus
- Spinal Cord Tumor
- Other

**If no patients meeting Class I and II Criteria are awaiting bed placement, consideration may be given to Class III patients for assignment. If possible, Class III patients will be transferred to the next level of care or to another unit if Class II patients arrive subsequently.

III. Class III

- Post-Surgical Spinal Stabilization > 3 Levels
Other Intracranial Hemorrhage

Complicated Mild Traumatic Brain Injury

Spontaneous SAH with Hunt Hess Grade I and Fisher Grade I

Intracranial Hematoma(s) < 15 cc Total Volume

Acute Cervical or Thoracic Spinal Cord Injury without Neurogenic Shock or Instability (e.g., Central Cord Syndrome)

Acute Lumbar SCI (Conus Lesion) or Cauda Equina Syndrome

Post-Neurosurgical Other Procedure

Patients are given priority if they require a neurosurgical physician, neurocritical care nursing, and ancillary expertise in neurological assessment, post-neurosurgical wound and patient care, intracranial pressure dynamics, cerebral blood flow, cerebral metabolism, cerebral ischemia, seizure management, fluid and electrolyte balance, spinal cord physiology, spinal stabilization, hydrocephalus, coma, paralysis, and other neurosurgical problems, as well as the following neurocritical care needs specific to neurosurgical patients: respiratory issues, infections, nutritional requirements, deep vein thrombosis prophylaxis, hemodynamic management, sedation, mobilization, sleep dynamics, swallowing, anticoagulation therapy, temperature dynamics, etc.

References


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Neurotrauma and Critical Care Highlights at the 2008 AANS Annual Meeting

The 2008 AANS Annual Meeting will take place April 26–May 1 in Chicago, Ill. Neurotrauma and critical care highlights of the meeting include the following presentations. Complete meeting details are available at [www.aans.org/annual/2008/default.asp](http://www.aans.org/annual/2008/default.asp).

**Sunday, April 27, 2008**

**Full-Day Course**  
8:00 AM—5:00 PM  
026 Head Trauma: Current Treatments and Controversies with Hands-On Practical Session in Brain Monitoring and Techniques  
Co-Directors: Shelly D. Timmons MD, PhD, FACS and Geoffrey T. Manley, MD, PhD  
Faculty: William M. Coplin, MD; Domenic P. Esposito, MD, FACS; Michael G. Fehlings MD, PhD; Jonathan Jagid, MD; Anthony Marmarou, PhD; Raj K. Narayan, MD, Sharon Rivas, MD

**Monday, April 28, 2008**

**Breakfast Seminar** 7:30–9:30 AM  
103 Cerebral Neuromonitoring  
Moderator: R. Loch Macdonald, MD, PhD  
Panelists: Odette A. Harris, MD, MPH; Michael O. Kelleher, MD, FRCS; Gary K. Steinberg, MD, PhD

**Breakfast Seminar**  
7:30–9:30 AM  
108 Pediatric Head Injury  
Moderator: Thomas Luerssen, MD  
Panelists: Ann-Christine Duhaime, MD; Hugh J. L. Garton, MD, MHSc; John Ragheb, MD, FACS

Plenary Session I Lecture
600 A Prospective, Multicenter Trial to Evaluate the Role and Timing of Decompression in Patients with Cervical Spinal Cord Injury: Initial One-Year Results of the STASCIS Study
Michael G. Fehlings, MD, PhD, FRC; Alexander Vaccaro, MD; Bizhan Aarabi, MD; Christopher Shaffrey, MD; James Harrop, MD; Marcel Dvorak, MD, FRCSC; Charles G. Fisher, MD, FRCSC; Y. Raja Rampersaud, MD, FRCSC; Eric M. Massicotte, MD, FRCSC; Stephen Lewis, MD, FRCSC

Scientific Session VI—Neurotrauma
2:45–5:15 PM
Moderator: P. David Adelson, MD, FACS

645 Results of a Prospective, Multicenter Phase I/IIa Clinical Trial to Evaluate Safety and Preliminary Efficacy of a Recombinant Rho Inhibitor (Cethrin) in Severe Acute Spinal Cord Injury
Michael G. Fehlings, MD, PhD, FRC; Gilles Maurais, MD, FRCSC; Nicholas Theodore, MD; James Harrop, MD; Charles Kuntz, MD; Brian Kwon, MD, PhD, FRC; Jens Chapman, MD; Albert Yee, MD, FRCSC

646 Temporal Relationship Between ICP and PbtO2 in Acute Brain Pathology; The Role of Real-Time Analysis Using Symbolic Regression
John F. Morrison, MD; Michael D. Schmidt, MSE; Matthew C. Ringgenberg, BS; Narendra Nathoo, MD, PhD; Pradeep K. Narotam, MD, FACS

647 Endovascular Treatment of Traumatic Intracranial Aneurysms
Ricardo Segal, MD; Jose E. Cohen, MD; John M. Gomori, MD; Alex Spivak, MD; Emil Margolin, MD; Gil Sviri, MD; Gustavo Rajz, MD; Sergey Spektor, MD

Invited Speaker*
Neurotrauma at the Crossroads: A View of Our Subspecialty in 2018
M. Sean Grady, MD

648 The Effects of Intrathecal Hypotension on Tissue Perfusion and Pathophysiological Outcome Following Acute Spinal Cord Injury
Eric M. Horn, MD, PhD; Nicholas Theodore, MD; Rachid Assina, BS; Robert Spetzler, MD; Volker Sonntag, MD; Mark Preul, MD

Synthes Resident Craniofacial Award*
649 Management Strategies and Outcomes for Pediatric Patients with Severe TBI and Refractory ICP
Jayant Jagannathan, MD; David O. Okonkwo, MD, PhD; Kwang H. Yeoh, BSC; Dwight Saulle, BA; Aaron S. Dumont, MD; Rod J. Oskouian, MD; Charles A. Sansur, MD; John A. Jane Sr., MD; John A. Jane Jr., MD

650 The Value of Postoperative Computed Tomography in Cranial Cases
Ahmad Khaldi, MD; Vikram C. Prabhu, MD, FACS; Douglas E. Anderson, MD; T. C. Origitano, MD, PhD
651 Transverse Process Fractures Do Not Warrant Neurosurgical Consultation or Involvement
Wayne C. Paullus, MD; Lucas H. Bradley; Norman S. Litofsky, MD, FACS; James R. Howe, MD

652 Diminution in Pain in Acute Spinal Cord Injury Treated with Oscillating Field Stimulation
Scott Shapiro, MD; Richard B. Borgens, PhD; Richard B. Rodgers, MD; Jamie Bradbury, MD

Tuesday, April 29, 2008

Breakfast Seminar
7:30—9:30 AM
214 Management of Spinal Axis Trauma
Moderator: Gregory R. Trost, MD
Panelists: Michael S. Muhlbauer, MD; Nicholas Theodore, MD; Michael Y. Wang, MD

Breakfast Seminar
7:30—9:30 AM
224 Management of Acute Spinal Cord Injury
Moderator: Michael G. Fehlings, MD, PhD
Panelists: James D. Guest, MD, PhD; Charles Kuntz, IV, MD; Michael Patrick Steinmetz, MD; Andrea Strayer, MSN, CNRN; Michael Y. Wang, MD

AANS/CNS Section on Neurotrauma Scientific Session
2:45—5:30 PM
Moderators: Odette Althea Harris, MD, MPH; Roland A. Torres, MD

Codman 2006 Award Presentation*
2:45–3:00 PM
Gregory Hawryluk, MD

Codman 2007 Award Presentation*
3:01–3:15 PM
TBA

731 Magnetic Resonance Imaging Findings in Vegetative State After Acute Head Injury
Raimund P. Firsching, DR; Birgitt Stiller, MD; Imre Bondar, PhD, MD; Martin Skalej, PhD, MD

Synthes Resident Spine Award*
732 Cortical Control and Characterization of a Spinal Nerve Bridge to Bypass Spinal Cord Injury
Raqeeb M. Haque, MD; Samit Chakabarty, PhD; Lucas Campos, MD, PhD; Deepa Danan, BS; Christopher Winfree, MD; John Martin, PhD

733 Early Detection of Cerebral Edema Through an Implanted Optical Probe
Christopher M. Owen, MD; Amandip S. Gill, BS; Devin K. Binder, MD, PhD

734 The Use of Selective NMDA Modulators in Traumatic Brain Injury
Jennifer Jennings, MD

Spinal Trauma Case Studies: Discussion with the Experts
4:15–5:30 PM

- **Cervical Trauma**
  J. Patrick Johnson

- **Thoracolumbar Trauma**
  Rudolf Beisse

- **Lumbar/Lumbosacral Trauma**
  Michael Wang

**Wednesday, April 30, 2008**

**Breakfast Seminar**
319 Cerebral Trauma State-of-the-Art Treatment
*Moderator: Alex B. Valadka, MD*
*Panelists: Austin R. Colohan, MD, FACS; Geoffrey T. Manley, MD, PhD; David O. Okonkwo, MD, PhD; Jamie S. Ullman, MD*

**Breakfast Seminar**
322 Management of Subacute and Chronic Treatment of Traumatic Spinal Cord Injury
*Moderator: Michael G. Fehlings, MD, PhD*
*Panelists: Barth A. Green, MD, FACS; Geoffrey T. Manley, MD, PhD; Daniel K. Resnick, MD; Scott A. Shapiro, MD*

**Plenary Session III: Rhoton Family Lecture***
11:15–11:50 AM
*Introduction: Jon H. Robertson, MD*
*Speaker: Mrs. Lee Woodruff*
The 26th Annual National Neurotrauma Symposium

July 27–30, 2008
Orlando, Fla

The National Neurotrauma Society, including the AANS/CNS Section on Neurotrauma and Critical Care and the Virginia Commonwealth University School of Medicine, invites you to attend the 26th Annual National Neurotrauma Symposium at the Hilton Walt Disney World Resort in Orlando, Fla.

This three-day scientific symposium, which draws expertise from medical and scientific communities, is especially designed for scientists, physicians, postdoctoral fellows, residents and graduate students. The scientific program will span the gamut of clinical pathophysiology, treatment strategies, basic research models and molecular approaches involved in CNS neurotrauma.

For additional information, go to http://neurotrauma.org/2008/index.htm

Letter From the NNS President
Letter From the Chair of the AANS/CNS Section on Neurotrauma and Critical Care
Special Workshop Session 4B—Monday, July 28

Dear Colleague:

It is a great pleasure for me as the president of the National Neurotrauma Society to invite members of the society and other basic scientists and clinicians who are interested in neurotrauma research and clinical management of spinal cord, brain and peripheral nervous system injury to attend the 26th Annual National Neurotrauma Symposium, which will be held at the Hilton Walt Disney World Resort in Orlando (Lake Buena Vista), Fla. from July 27–30, 2008.
The National Neurotrauma Symposium is the premier annual meeting of the neurotrauma community and provides the opportunity for basic scientists, clinicians, and allied health workers to meet and discuss timely topics related to pathophysiology and mechanisms of recovery from and treatment of spinal cord and traumatic brain injury. This annual meeting facilitates the translation of basic science laboratory findings into clinical treatment strategies for patients. The development of effective new therapies for neurotrauma requires the combined efforts of researchers from a variety of disciplines including physiology, biochemistry, molecular biology, pharmacology, neurosurgery, emergency medicine and critical care, neurorehabilitation and others. While many of these research areas are represented by professional societies that convene their own annual meetings, the National Neurotrauma Symposium is unique in that the sole emphasis is on spinal cord and traumatic brain injury. It is a focused meeting during which the latest in neurotrauma basic and clinical science can be presented and discussed with like-minded colleagues.

This year the NNS, for the first time, is partnering with the AANS/CNS Section on Neurotrauma and Critical Care of the American Association of Neurological Surgeons and the Congress of Neurological Surgeons in the organization of the meeting. Accordingly, our program will include four breakout sessions devoted to clinical aspects associated with management of spinal cord and traumatic brain injury. This will greatly enhance the translational nature of the meeting and gives it educational value to both basic and clinical neurotraumatologists.

So, please plan to join me for The 26th Annual National Neurotrauma Symposium including the AANS/CNS Section on Neurotrauma and Critical Care this summer. It promises to be a great scientific meeting in a location that boasts many exciting attractions for neurotrauma scientists, clinicians and their families. I hope to see you in Orlando!

Sincerely,

Edward D. Hall, PhD
President, National Neurotrauma Society
Neurotrauma Symposium at the Hilton Walt Disney World Resort in Orlando (Lake Buena Vista), Fla. from July 27 to 30, 2008.

This is the first joint symposium for the National Neurotrauma Society and the AANS/CNS Section on Neurotrauma and Critical Care. Over the years, the NNS and the Trauma Section have been very involved in neurotrauma and critical care science, though the groups remain for the most part separate. While the NNS has traditionally been about the laboratory science, through a joint effort with the Trauma Section, the scientific program committee has created specific clinical sessions for the practicing physician and neurotrauma nurse, as well as the basic scientist, to better understand the state-of-the-art management of neurotrauma and critical care. Both didactic sessions (management of TBI, spinal cord injury, and intensive care) and hands-on sessions (spinal column trauma reconstruction, multimodality monitoring, and surgical management for brain trauma) will be offered. The goal of this joint symposium is to create a better dialogue and collaboration between the clinicians and scientists that might translate into improved patient care in the future through the combined efforts of researchers from a variety of disciplines including physiology, biochemistry, molecular biology, pharmacology, neurosurgery, emergency medicine and critical care, neurorehabilitation and others. This first joint symposium is a wonderful opportunity to hear the most up-to-date clinical and basic science in neurotrauma and critical care in a relaxed and rich, collaborative environment.

I look forward to your joining me in Orlando for the symposium. It will give attendees an excellent opportunity to learn what is new in neurotrauma with plenty of trauma-specific continuing medical education. With spectacular, convenient accommodations, the symposium is a wonderful meeting opportunity as well as a wonderful family getaway. We look forward to seeing you there!

Sincerely,

David Adelson, MD
Chair, AANS/CNS Section on Neurotrauma and Critical Care

NNS 2008 Program Committee

David Adelson, MD, Children’s Hospital of Pittsburgh
Helen Bramlett, PhD, University of Miami
Maria Crowe, PhD, VA Medical Center
Michael Fehlings, PhD, University of California, Los Angeles
Gary Fiskum, PhD, University of Maryland School of Medicine
Patrick Kochanek, MD, University of Pittsburgh
Johnathan Lifshitz, PhD, University of Kentucky
Geoffrey Manley, MD, PhD, University of San Francisco
Special Workshop Session 4B—Monday, July 28
Hands-On Spinal Stabilization Following Trauma

The National Neurotrauma Society and the AANS/CNS Section on Neurotrauma and Critical Care are pleased to offer this hands-on spinal instrumentation workshop during the meeting. This session will feature expert neurosurgeons providing instruction on the indications, operative approaches and surgical techniques in spine trauma.

Laboratory stations (sawbones) will give attendees hands-on practice and technical instruction in state-of-the-art spinal instrumentation for treatment of cervical and thoracolumbar trauma.

The session is limited to 40 participants, and registration is accepted on a first-come, first-served basis. To reserve your space, please send an e-mail request to NNSworkshop@tlceventsgroup.com