

# Neurotrauma & Critical Care NEWS



Fall 2015

## AANS/CNS Section on Neurotrauma & Critical Care

Editor: Martina Stippler, MD, FAANS

### Trauma Sessions

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for the Neuro-ICU

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Message from ThinkFirst  
Liaison

#### Monday, September 28, 2015

Room: 343

SECTION ON NEUROTRAUMA AND CRITICAL CARE

##### Contentious Issues in Neurotrauma

Moderators: Daniel J. Hob, MD, FAANS; Parham Yashar, MD

Speakers: Randall Matthew Chesnut, MD; Ramon Diaz-Arrastia, MD; R. John Hurlbert, MD, PhD; Geoffrey T. Manley, MD, PhD, FAANS; Raj K. Narayan, MD, FAANS; Jamie S. Ullman, MD, FAANS

7:00–7:25 a.m.

##### Controversy: Methylprednisolone in Incomplete Spinal Cord Injury: Contraindicated or Helpful?

7:00–7:10 a.m.

Contraindicated, R. John Hurlbert, MD

7:10–7:20 a.m.

Helpful, Michael G. Fehlings, MD, PhD, FAANS

7:20–7:25 a.m.

Discussion

7:25–7:50 a.m.

##### Controversy: Multimodality Monitoring for Severe Traumatic Brain Injury: New Standard or Passing Fad

7:25–7:35 a.m.

Pro, Ramon Diaz-Arrastia, MD

7:35–7:45 a.m.

Con, Randall Matthew Chesnut, MD

7:45–7:50 a.m.

Discussion

7:50–7:55 a.m.

##### Introduction of the Marmorou Lecturer

Jamie S. Ullman, MD, FAANS

7:55–8:25 a.m.

##### Marmorou Lecture: Traumatic Brain Injury – Where Next?

Raj K. Narayan, MD, FAANS

8:25–8:30 a.m.

##### Questions

#### Tuesday, September 29, 2015

Room: 343

SECTION ON NEUROTRAUMA AND CRITICAL CARE

##### Oral Presentations

Moderators: Gregory J. Murad, MD, FAANS; Craig H. Rabb, MD, FAANS

##### DEPUY SYNTHES AWARD FOR RESIDENT RESEARCH ON BRAIN AND CRANIOFACIAL INJURY

7:00–7:09 a.m.

##### 174 Descriptive Epidemiology, Mechanisms and Symptom Resolution of Concussion Sustained by National Collegiate Athletic Association Student-Athletes, 2009/10-2013/14 Academic Years

Scott L. Zuckerman, MD; Erin Wasserman; Aaron M. Yengo-Kahn; Gary Solomon, PhD; Zack Kerr

##### DEPUY SYNTHES AWARD FOR RESIDENT RESEARCH ON SPINAL CORD AND SPINAL CORD INJURY

7:09–7:18 a.m.

##### 175 Surgical Versus Non-operative Management of Type II Odontoid Process Fractures in Octogenarians

Christopher Salvatore Graffeo, MD; Avital Perry, MD; Ross Puffer, MD; Lucas Carlstrom; Grant William Mallory, MD; Michelle J. Clarke, MD, FAANS (L)

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7:18–7:27 a.m.

**176 The Levels of GFAP and UCH-L1 During the First Week After A Traumatic Brain Injury – Correlations with Clinical and Imaging Findings and Outcome**

Jussi Posti; Riikka Takala; Hilkka Runtti, Virginia Newcombe; Joanne Outtrim; Ari Katila; Janek Frantzén, MD; Henna Ala-Seppälä; Jonathan Coles; Ifiakher Hossain, MD; Anna Kyllönen; Henna-Riikka Maanpää; Jussi Tallus; Peter J. Hutchinson, MD; David K. Menon; Mark van Gils; Olli Tenovuo, MD, PhD

7:27–7:36 a.m.

**177 Monitoring Intraspinal and Spinal Cord Perfusion Pressure in Acute Spinal Cord Injury**

Marios Papadopoulos, MD

7:36–7:45 a.m.

**178 COMT Val158Met is Associated with Domain-specific Cognitive Impairment Following Mild Traumatic Brain Injury**

John K. Yue; Ethan A. Winkler, MD, PhD; Thomas W. McAllister; Nancy Temkin, PhD; Adam Ferguson; Hester F. Lingsma; Esther Yuh, MD, PhD; Phiroz E. Tarapore, MD; Saurabh Sharma; Ava Puccio; Kevin Wang, PhD; Pratik Mukherjee, MD; Alex B. Valadka, MD, FAANS; David O. Okonkwo, MD, PhD, FAANS; Ramon Diaz-Arrastia, MD; Geoffrey T. Manley, MD, PhD, FAANS

7:45–7:54 a.m.

**179 Brain Tissue Oxygen Tension and Its Response to Physiological Manipulations is Dependent on Distance from Injury Site in a Swine Model of Traumatic Brain Injury**

Gregory W.J. Hawryluk, MD, FAANS; Nicolas Phan, MD; Adam Ferguson; Diane Morabito; Nikita Derugin; Campbell Stewart; Margaret Knudson, Geoffrey T. Manley, MD, PhD, FAANS; Guy Rosenthal, MD

7:54–8:03 a.m.

**180 Comprehensive Study of Post-Traumatic Cerebral Energy Metabolism: Alterations in Oxygen, Glucose & Lactate Metabolism and Their Time Course In 74 Patients Compared to Normal Controls**

Joshua Robert Dusick, MD; Thomas C. Glenn, PhD; Paul M. Vespa, MD; Neil A. Martin, MD

8:03–8:12 a.m.

**181 Computed Tomography Parameters for Atlanto-occipital Dislocation in Adult Patients: The Occipital Condyle-C1 Interval**

Eduardo Martinez del Campo; Samuel Kalb, MD; Hector Soriano Baron; Jay D. Turner, MD, PhD; Matthew Neal, MD; Timothy David Uschold, MD; Nicholas Theodore, MD, FAANS

8:12–8:21 a.m.

**182 Acute Putrescine Supplementation with Schwann Cell Transplantation Improves Sensory and Serotonergic Axon Growth and Functional Recovery in Spinal Cord Injury**

Bryan Iorgulescu; Samik Patel; Jack Louro; Christian Andrade; Andre Sanchez; Damien Pearse

8:21–8:30 a.m.

**183 MEG Identification of Reduced Functional Connectivity Following Concussion**

Ahmad Alhourani; Sudbir K. Pathak; Michael J. Randazzo; Tom Wozny; Efstathios Kondylis; Shawn Walls; Michael Ward; Stephen Foldes; Donald Krieger; David O. Okonkwo, MD, PhD, FAANS, R. Mark Richardson, MD, PhD, FAANS; Ajay Niranjana, MD

**Saturday, September 26, 2015**

12:30–4:00 p.m.

Room: 333/334

**PC12: Neurocritical Care and Neurosurgical Emergencies Update**

Course Directors: Jack Jallo, MD, PhD, FAANS; Christopher J. Madden, MD, FAANS

Faculty: Kamran Athar; Antonio Belli, MD; Ali Metin Kafadar, MD; Ian E. McCutcheon, MD, FAANS; John K. Ratliff, MD, FAANS

**Sunday, September 27, 2015**

12:30–4:00 p.m.

Room: 342

**PC27: Trauma Update: Traumatic Brain Injury**

Course Directors: Nancy Carney, PhD; Shelly D. Timmons, MD, PhD, FAANS

Faculty: Rocco Armonda; Asim Mahmood, MD, FAANS; Gregory J. Murad, MD, FAANS; David O. Okonkwo, MD, PhD, FAANS; Roland A. Torres, MD, FAANS; Tanju Ucar, MD; Jamie S. Ullman, MD, FAANS

**Monday, September 28, 2015**

Time?

Room: 215/216

**M02: Athletic Head Injuries: Return to Play**

This Lunch Seminar is utilizing a “Flipped-Classroom” format. Attendees are encouraged to attend the online webinar of the faculty presentations prior to coming to the session, thus permitting more time for interactive discussion with the faculty and attendees during the in-person session.

Moderator: Richard G. Ellenbogen, MD, FAANS

Faculty: Julian E. Bailes, MD, FAANS; Tanvir Choudhri,

MD; James M. Johnston, MD, FAANS; Russell R. Lonser, MD, FAANS

**Tuesday, September 29, 2015**

Time?

Room: 231/232

**T17: Guidelines for Neurocritical Care Management**

Moderator: Shelly D. Timmons, MD, PhD, FAANS Faculty: Gokhan Akdemir; Leon Levi, MD; Joshua E. Medow, MD, FAANS; Patricia B. Raksin, MD, FAANS; Jamie S. Ullman, MD, FAANS



of 50 years ago, let alone 2,000 years ago.

Our Western values have also changed with time. The Enlightenment of the 16th and 17th centuries brought to the fore the notion of individual freedom or autonomy. The respect for individual rights was one of the founding principles of the United States. Rights, however, must be balanced with responsibility and other values, including duty, honor and religion.

When confronted with a complex ethical question, it is reasonable to consider a formal ethical analysis, which is not the same as obtaining a legal opinion. A legal opinion discusses whether or not an act violates given code or hospital regulation, whereas an ethical analysis seeks a deeper answer to the question of what is the right thing to do.

In carrying out the ethical analysis, one should be mindful of the major ethical principles: Non-maleficence, beneficence, respect for autonomy and justice.

Non-maleficence means that at the very least one should not inflict harm. It is clearly stated in the original Hippocratic Oath: First, do no harm (“primum non nocere”). Some moral traditions hold that some acts have intrinsic evil and therefore are never justifiable. For example, the Catholic teaching regarding abortion.

The second major principle is beneficence, or the notion that one ought to remove or prevent harm and promote or do good. It is never a simple question to decide what is good. For whom should the individual physician be responsible, the individual patient, the health-care system or society as a whole? “Cui bono?” (Who benefits?) When a physician places his or her notion of what is good over that of the patient or the patient’s family, this can be considered paternalism.

The third major ethical principle is respect for autonomy. This principle stems from the belief that individuals have inalienable rights. One must respect the individual’s right to self-determination in so far as that individual is capable of making such determination. Obtaining informed consent when carrying out surgical treatment and consulting with the patient’s family regarding substituted judgment are acts that demonstrate respect for patient autonomy. The trend recently is that autonomy seems to trump everything in the ICU, e.g. “It’s my life; I can do what I want with it.”

The fourth major ethical principle is justice or balance. There are many balances to be struck in ethical analysis, e.g. the balance between burdens versus benefits of intensive care; the balance between resource allocation on single patient versus a population of patients and the balance between a beneficent paternalism and the notion that autonomy trumps everything.

If one is practicing in a Catholic hospital, an ethical analysis also must take into consideration the religious directives for Catholic health-care institutions. One of the interesting moral analyses addressed here is the principle of double effect. Catholics teach that a moral act may have two effects, a good intended effect and an evil effect, which is permitted. Such an act may be justified if the following conditions exist:

1. The act is not intrinsically evil. It may be morally neutral or good.
2. The intention is only good.

3. The good is not achieved by means of the evil.
4. The good must outweigh the bad, bringing in the concept of proportionality.

Neurosurgeons will continue to be confronted with complex moral decisions. We may look to our own religious or humanistic values for guidance in dealing with these complex questions. A strong ethics committee at your institution can be a valuable resource. As part of the neurointensive care team, we should never be afraid to seek consultation from those whom I have found to be both knowledgeable and people of goodwill.

### Useful References

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### International Committee Update

The section will be collaborating in several activities at the international level. Raj Narayan, MD, FAANS; and Shekar Kurpad, MD, PhD, FAANS, are working with academic groups from India in order to improve the neurotrauma care system. Section members will be participating in educational activities organized by the Neurotrauma Society of India and the Neurotrauma Committee of the Asian Australasian Society of Neurological Surgeons. In Latin America, two academic activities, hosted by the Colombian Association of Neurosurgery and the Mexican Association of Neurological Surgeons, will have official, integrated activities with the American Association of Neurological Surgeons. Andrés Rubiano, MD; P David Adelson, MD, FAANS; and Shelly Timmons, MD, PhD, FAANS, will be participating in these events.



Members of the section are encouraged to participate and bring ideas into global health initiatives focused on capacity-building for neurotrauma education and research, especially in low- and middle-income countries. Some projects are already in discussion, including neurotrauma registries and clinical practice guidelines development. In order to participate, contact the committee chair, Dr. Rubiano (rubianoam@upmc.edu).



# Fall Prevention in the Elderly

Martina Stippler M.D

Traumatic Brain Injury (TBI) in the elderly is a major public health problem. The young and the elderly are most at risk. The elderly are especially vulnerable and suffer worse consequences after TBI. Domestic accidents account for most of the TBI in this population. Moreover elderly TBI victims also have co-morbidities and are susceptible to complications. Although those aged 65 years and over account for only 10 percent of TBI patients, they account for 50 percent of TBI-related deaths.

Hospitalization rates and fatality rates in the elderly in combination with an aging population make it clear that TBI in the elderly is becoming a major health care concern in the medical and neurosurgical community. Here are the facts: Hospitalization rates more than doubles in the 65-74 age groups compared to the 75-85 age and doubles again in patients older than 85 years of age. Fatality rates in TBI patients over 65 years of age increases by 114 percent from 18 per 100,000 population to 44 per 100,000 population compared to younger patients with TBI. Additionally it is estimated the population of individuals over the age of 65 will be 35 million by the end of this decade, and 86 million by the year 2050. As the world population ages one can expect an escalation of TBI-related admissions and fatalities. This will make TBI in the elderly a considerable medical and social problem in the very near future.

This discussion begs the questions: What is old age? TBI in the elderly has been surprisingly neglected in the research arena. Only 1.05 percent of all abstracts presented at the National Neurotrauma Symposia in one specific year addressed the effects of age on TBI. Of these 41 studies, 24 were animal and 17 clinical research. All studies investigating the aging and TBI correlation described the adverse effects of age on outcome after TBI. Biologically, aging begins at twenty years of age. However, no one would consider a 20-year-old individual "old." So when does age become an independently negative predictive factor for outcome after TBI? Using a database of 2,664 TBI patients, Mass et al. calculated the threshold age for increasing mortality to be 39 years of age, using univariate analysis, and 66 years of age, using multivariate analysis. For every 10 years beyond the threshold age, mortality after TBI

## Three Questions to Ask Your Elderly Patients

When you see patients 65 and older, make these three questions a routine part of your exam:

1. Have you fallen in the past year?

2. Do you feel unsteady when standing or walking?

3. Do you worry about falling?

If your patient answers "yes" to any of these key screening questions, they are considered at increased risk of falling. Further assessment is recommended.

increases by 10 percent.

Others identified an age group on the "edge" with more potential for recovery after TBI than older poor-prognosis patients. The edge age group, patients between 65 and 74 years of age, appear to have an improved outcome and a significantly lower mortality than those 75 years and older. Even with maximal medical and surgical care those above 75 years of age did poorly.

Domestic accidents, especially falls, account for the majority of TBI in the elderly. The propensity to falls in this age group is increased because of certain co-morbidities associated with advanced age, such as poor eyesight, impaired balance, postural hypotension and cerebrovascular accidents. Contradicting literature exists on whether or not co-morbidities play a role in outcome; some studies report a direct correlation between outcome and comorbidities, others did not.

Iatrogenic coagulopathy with aspirin, plavix or coumadin increases the likelihood of death by 14.7 times when compared with those who are not on anticoagulation therapy.

The negative impact of depression on the recovery process is an important fact to consider in any TBI patient, but especially in the elderly. Depression is more frequent in the elderly after TBI and can significantly interfere with their rehabilitation potential. Prevalence of depression in the elderly after TBI can range from 21-37 percent compared to 1.8-8.9 percent in elderly without TBI.

Although the outcome after TBI has improved in the last 50 years with the advent of an organized trauma system and critical care, the outcome for elderly patients remains poor. In fact, over the last 10 years there has been an overall increase in TBI mortality attributed to the increasingly elderly population. Both operative and non-operative outcome for elderly patients after head trauma cannot ameliorate poor outcomes. TBI care in the elderly can be intensive with questionable benefits and often results in increased emotional burden to the families. The decision to treat or not to treat involves consideration of many ethical questions.

The best approach for TBI is prevention and it might not be as difficult as one thinks. As falls are one of the most common reasons for the elderly to sustain a TBI, fall prevention can make a difference. The first step in this direction would be to start screening



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patients older than 65 years to assess their fall risk. The Centers for Disease Control offers an easily implemented evidence-based fall prevention and screening program: STEADI which stands for Stopping Elderly Accidents, Deaths and Injuries. STEADI is comprised of tools and educational materials for health care providers that are based on an algorithm adapted from the American and British Geriatric Societies' Clinical Practice Guidelines<sup>24</sup>. Using STEADI one can identify patients with a high fall risk, modify risk factors and offer effective interventions.

According to Kannus et al., fall prevention in elderly people consists of regular strength and balance training, vitamin D and calcium supplementation, reduction of the number and doses of psychotropic medication, cataract surgery, and professional home-hazard assessment. The CDC postulates if an evidence-based fall prevention program, like STEADI would be adopted by 5,000 healthcare providers, 1.4 million falls could be prevented and \$3.6 million in medical costs could be saved. If you are interested, you can find algorithm and screening tools and patient information on the CDC website, <http://www.cdc.gov/homeandrecreationalafety/Falls/steady/index.html>

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# Message from ThinkFirst Liaison

Rocco Armonda, MD, FAANS

As the new AANS/CNS Section on Neurotrauma & Critical Care liaison to ThinkFirst, my introduction came with a bang! Out of nowhere, there was a loud clash of metal-on-metal, glass breaking and my bike hitting the ground; I was in the middle of a car versus bike collision. It was mid-day, clear skies and dry conditions on a usually quiet neighborhood street with frequent cars and cyclists. The oncoming car flew through a red light after our light had turned green and a second car in our lane was crossing the intersection. Caught between a car coming from my left and the crossing car on my right, I was incredibly lucky to have missed the point of impact in the collision. My helmet was intact — I had no headache, dizziness or neck pain; no clavicle fracture; my bike was fine. More importantly, the two ladies in the car that was struck were also without serious injuries. I commended the driver behind us, a former Army combat medic, for taking control of the entire scene, contacting the police and clearing the intersection. Fortunately for all of us, no one was seriously injured.

Not everyone is so lucky. As the weather warms up, crashes like this happen far too often in our communities. It is what brings us into the crossroads of a patient with emergent cranial-spinal injuries and polytrauma — knowing most of these injuries could have been prevented. Distracted driving, driving over the speed limit and not observing traffic signals all lead to life-threatening collisions. What saved my life was a combination of my wearing a helmet (at all times on a bike) and a split-second of time.

The ThinkFirst National Injury Prevention Foundation is approaching its 30th year anniversary this coming year and will hold its national conference in Chicago during the 2016 AANS Annual Scientific Meeting. The group recently held its 2015 conference in Washington, D.C., May 1-4, 2015, in conjunction with the AANS Annual Scientific Meeting. Highlights of the meeting included National Highway Traffic Safety Administration (NHTSA) Administrator Mark Rosekind, PhD, a renowned expert on human fatigue and drowsy driving, and Sandy Sinclair, NHTSA, who spoke on distracted driving. Driver fatigue and distraction, along with speeding and driving under the influence of alcohol, drugs and even prescription drugs, make our roadways hazardous for everyone. Inexperienced teen drivers are in more crashes than other age groups, but long commutes and driving while sleep-deprived make a deadly combination of which we as neurosurgeons, parents, friends and colleagues need to be aware. Summer's increase in bicyclists and pedestrians sharing the road with vehicles also increases the risk for crashes.

ThinkFirst chapters, based in hospitals, medical universities and physician practices, are focused on helping people learn to reduce their risk for injury, especially our children and teens. Consistent theory-based programs that explain the importance of our brain and spinal cord, how injuries affect our body and how we can take simple steps to protect ourselves and others are provided free of charge to schools and at community events throughout the U.S., Canada and many other countries. The focus is on the leading

causes of injury: vehicle safety, sports, falls and violence. ThinkFirst For Kids, ThinkFirst For Youth and ThinkFirst For Teens provide programs for specific age groups and are complete with videos, presentations materials, curricula and evaluation tools. ThinkFirst About Concussion is the latest program to help youth and teens recognize and react appropriately when a concussion is suspected.

While nurses, therapists and physicians present the facts, ThinkFirst Voices for Injury Prevention (VIP) speakers share their personal experiences during youth and teen presentations. There are currently 240 VIP speakers who speak with ThinkFirst chapters in the U.S., explaining what led to their brain or spinal cord injury, how it affected their lives and how it could have been prevented. Student evaluations have shown that hearing from someone who was injured motivates attendees to start making safer choices.

How often have we walked through our ICU thinking how much better it is to prevent injuries than to treat the life-altering sequelae of a traumatic brain or spinal cord injury? Is there a ThinkFirst chapter in your hospital or in the vicinity, conducting these evidence-based prevention programs? While ThinkFirst provides more than 6,000 presentations each year in the United States, there are many areas in each state without a nearby chapter. Currently, there are 154 U.S. chapters and 36 international chapters. While several states have developed chapters strategically, such as Michigan, which has 20 chapters, seven U.S. states (Maine, Utah, North and South Dakota, Vermont, Iowa and Alaska) have no chapters. Most states fall somewhere in the middle, with one or more chapters providing programs to a hospital's surrounding communities. For a full list, see the chapter directory at [www.thinkfirst.org](http://www.thinkfirst.org).

As neurosurgeons we have an obligation to serve our community, not just as physicians, but also as citizens. How better to serve our communities than by engaging our hospitals in supporting a ThinkFirst chapter? Level I and II trauma centers are required to have a designated injury prevention coordinator providing injury prevention education, and ThinkFirst provides the training and program materials for trauma centers or any health organization to use. Each chapter is required to also have a sponsoring physician who serves as an advocate and medical advisor.

Visit the ThinkFirst website to see what chapters are available in your area. Ask how you can start supporting ThinkFirst locally with a chapter and nationally with an annual donation to assure ThinkFirst provides programs for our use for another 30 years. Stay safe while enjoying the outdoors this summer and make it a point to become involved with ThinkFirst.



## AANS/CNS Section on Neurotrauma and Critical Care Committee 2014-2016

### Current Officers

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**Members-At-Large:** Sharon Webb, MD, FAANS; and Rocco Armonda, MD, FAANS (2014-16)

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**Annual Meetings Subcommittee:** Craig Rabb, MD, FAANS

**CNS Education Division Liaisons Subcommittee (including CNSU Editorial Board):** Odette Harris, MD, FAANS

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**Nominating Committee:** Geoffrey Manley, MD, PhD, FAANS

### Liaisons (2014-16)

**CNS EC:** Jamie Ullman, MD, FAANS

**AANS BOD:** Jamie Ullman, MD, FAANS

**Joint WC:** Shelly Timmons, MD, PhD, FAANS

**QIW:** Shelly Timmons, MD, PhD, FAANS; Ben Rodgers, MD, FAANS; Chris Zacko, MD, FAANS

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**National Neurotrauma Society:** Geoff Manley, MD, PhD, FAANS

**Spine Section:** Paul Arnold, MD, FAANS

**Neurocritical Care Society:** Chris Zacko, MD, FAANS

**YNS Committee:** Maya Babu, MD, MBA

**Pediatric Section:** Pending

**CV Section:** Sharon Webb, MD, FAANS

**Physician Extenders:** Pending

**SNS:** James Ecklund, MD, FAANS (2012-14)

**CSNS:** J. Adair Prall, MD, FAANS

**ThinkFirst:** Rocco Armonda, MD, FAANS

**Brain Trauma Foundation:** Gregory Hawryluk, MD, FAANS