EDITOR’S NOTE

The Congress of Neurological Surgeons CNSQ staff wishes to welcome Christopher C. Getch, MD, as our incoming CNS president. We are excited about his upcoming year as president and appreciate the foreword that he has provided for this issue. We anticipate another great year of growth and prosperity for this organization under his guidance. In addition, we would like to thank Gerald E. Rodts, Jr., MD, the Past-President, as well as past Past-President, P. David Adelson, MD, FACS, FAAP, for their leadership and further advancement of our society.

In this issue of the CNSQ, we reflect on “crises” and how neurosurgeons as individuals and organizations have responded to these situations. Unfortunately, recently there have been numerous natural disasters around the world, including the earthquake in Haiti. This issue focuses on the Haiti relief response due to the numerous members of our society that were involved with this project. Specifically, Allan Levi writes on “The Early Response”. Nicholas Boulis further describes his personal encounters both in the early and later stages of this natural disaster. Suresh N. Magge, a pediatric neurosurgeon comments on his experience of this crisis and how it affected the most vulnerable population, children. However, there was not only an individual neurosurgical response but also a large group response. The US Navy and other armed services responded in a coordinated effort aboard the USNS Comfort. Samuel Critides and Dennis J. Rivet, who were aboard the ship, discuss this and the unique experience of providing care on a “floating hospital.” Lastly, the Haiti disaster provided a unique experience for newer technology. Michael Wang illustrates the potential advantages of a minimally invasive surgical (MIS) approach in these less sanitized environments, such as it may decrease wound complications.

In a different reflection on neurosurgical responses, Rocco A. Armonda illustrates the military’s management of mass casualties from a neurosurgical perspective. Several additional articles are featured and review different aspects of neurosurgeons responding to “crises.” Edward Benzel, Volker Sonntag, Arnold Menezes, and David Kelly write about Neurosurgery’s response to the spine subspecialty’s conflict with orthopedic surgeons in terms of directing management in treatment of these disorders. Jason Schwalb discusses the MOC process and Charles Rosen, et al. review the crisis of dealing with the numerous electronic medical imaging technologies. Lastly, Ralph Dacey, Kim Burchiel, Nicholas Barbaro and Nathan Selden review the “crisis” of teaching medical residents in the era of duty hour restrictions.

In this issue, James Ausman provides his views on neurosurgical and management of your “practice.” While Costas Hadjipanayis discusses the use of fluorescence-guided resection of malignant gliomas, a newer technology in surgical approach utilized by tumor surgeons.

Lastly, the Inside the CNS section contains articles from the Secretary, Nathan R. Selden, and Resident/Medical Student Committee Chair, Catherine A. Mazzola. As always, we hope you enjoy this issue. We truly appreciate any feedback or comments.

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Images in Neurosurgery
The concept of “answering the call” or committing one’s time and effort to activities above and beyond our basic clinical practice and not simply limiting our passion and efforts to the confines of the operating room is not unique to neurosurgeons. It is this “answering the call” that has very much defined our small specialty throughout its history—from Victor Horsley who gave up his life after he volunteered for field surgery duty in Mesopotamia to Harvey Cushing setting up field hospitals during World War I, and even the men and women in combat in Iraq and Afghanistan today as Colonel Rocco A. Armonda discussed during the 60th CNS Annual Meeting.

In 1896, Woodrow Wilson delivered an oration at Princeton University’s Sesquicentennial celebration titled, “Princeton in the Nation’s Service”. In his speech he stated “It is indispensable; it seems to me, if [a college] is to do its right service, that the air of affairs should be admitted to all its classrooms. I do not mean the air of party politics, but the air of the world’s transactions, the consciousness of the solidarity of the race, the sense of the duty of man toward man, of the presence of men in every problem, of the significance of truth for guidance as well as for knowledge.” These words are as applicable to the field of Neurosurgery to do “its right service” as they were to this venerable University. While military volunteerism and heroism are easy examples, there are many others who “answer the call” for neurosurgery.

When you look around our small yet influential specialty, there is no shortage of examples of our members giving up personal time, including time away from their families, to give more of themselves to their patients, their colleagues, or their specialty. It takes on many forms: developing and delivering an educational program for a scientific meeting, serving on a hospital committee, participating in a state neurological society, or serving the specialty’s interests in Washington, DC. It may involve taking on larger leadership roles with long-term implications, for example the fight to preserve the ACGME as the regulating body for resident work hours or service on the NFL Head, Neck, Spine Committee, a committee whose work has future implications for countless young athletes. It may involve self-sacrifice for others in resource poor environments by travelling internationally to provide care to underserved populations. Or it could mean bringing new knowledge and experience of the field to others in less accessible areas, by setting up a residency program in Africa or responding to a natural disaster such as the Haitian earthquake, as is wonderfully illustrated in this issue of CNSQ. Given the nature of the specialty and the constitution of the individuals who have chosen neurosurgery as a career, getting involved in these types of activities and often playing a leading role is not surprising. The question is whether this sacrifice for others is sustainable in the future given the multitude of barriers and changes that have occurred in health-care over the past decade and whether neurosurgery will continue to take leadership roles going forward.

We are fortunate as a small specialty to have such a significant number of outstanding models and mentors who have “answered the
call”. The question is of the future. Will the next generation of young neurosurgeons “answer the call?” Will the duty hour restrictions morph our specialty from one of “doing whatever it takes to get the job done and then some” to one of shift-work where the “work” – whether patient care or leadership in medicine or health care – is left to the next person? Anyone who is involved in the review of resident applications and the selection of the next class of young neurosurgeons should be reminded of our past and encourage the need for involvement in the future of the specialty. The young men and women applying are still the best and brightest in the field of medicine, scientifically inquisitive and clinically adept. They undoubtedly will continue to receive excellent clinical and scientific training in their residency programs, but in the current and likely future economic environment, will there be financial pressure that drives clinical productivity alone with little willingness to go above and beyond? Only we, as a specialty, can influence this next generation. It is up to all of us to mentor these future surgeons to be involved in more than just the clinical practice of neurosurgery but to give back to the specialty in a broader sense. They not only have to hear the call but must be willing and able to answer it. Neurosurgeons have a long and distinguished history of being involved and it is something we all can be proud of but needs to be ensured of in the future.

> THE QUESTION IS WHETHER THIS SACRIFICE FOR OTHERS IS SUSTAINABLE IN THE FUTURE GIVEN THE MULTITUDE OF BARRIERS AND CHANGES THAT HAVE OCCURRED IN HEALTHCARE OVER THE PAST DECADE AND WHETHER NEUROSURGERY WILL CONTINUE TO TAKE LEADERSHIP ROLES GOING FORWARD."
On Tuesday, January 12, 2010 shortly before 5:00 PM, a 7.0 earthquake struck the nation of Haiti, leaving an estimated 300,000 people dead, more than a million displaced and tens of thousands of individuals with fractured limbs or other life-threatening injuries (Figure 1). Dr. Barth Green, Chairman of Neurosurgery at the University of Miami, was literally one of the first missionaries on the ground, soon to be leading a giant team of followers. Dr. Green is no stranger to Haiti and the nation’s desperate need for medical care as he started the MediShare volunteer program over 16 years ago. Tapping generous supporters, he was able to arrange several corporate jets to take him along with some key physicians to the devastated island within 16 hours of the quake, while the country was still rocking with aftershocks.

The team arrived at the destroyed Toussaint Louverture International Airport with medical supplies stuffed in garbage bags and immediately set to work. The best way to characterize the atmosphere was that of a civil war type environment, in which there were no supplies or local hospitals to take care of the wounded. Using the resources from the University of Miami Miller School of Medicine, supplies began to filter in daily towards the makeshift University of Miami Hospital that was set up on the grounds of the Port au Prince airport.

On the University of Miami Medical School Campus, a relief taskforce was created to help coordinate flights of volunteer workers and supplies. Communication on the ground relied on satellite phones and for the first few weeks there were more volunteers than could be handled. In Haiti, basic supplies increased, but initially there were no X-rays or blood tests and most treatments were based on physical exams and improvisation. When we received the first form of imaging assistance, a digitalized X-ray machine (Figure 2), within an hour it revolutionized our diagnosis of treatment of spinal fractures. Before this, our diagnosis was limited to palpation of the spine and a neurological exam. For the first time, we could actually see the fractured spine.

The majority of injuries were traumatized limbs, infected open wounds requiring debridement, sepsis and dehydration, but also a significant number of traumatic brain and spinal cord injuries. The first of countless amputations was done on January 14 by one of the UM trauma surgeons. By day three, the volunteer staff had grown to over 100 members and it was clear that a Mobile Army Surgical Hospital (MASH) type unit needed to be set up. Ron Bogue, Miller School Assistant Vice President for Facilities and Services, flew to Haiti on day four and began to coordinate a huge tent hospital, consisting of a 2,500 square foot area, which included 250 beds as well as a supply headquarters (Figure 3) and, for the first time, covered sleeping quarters for the numerous volunteers (Figure 4).

For the first two weeks, there was no running water or sanitation facilities. Formal operating suites began to develop, initially by using picnic tables and makeshift IV holders. Literally, 40 to 50 amputations and wound clean-outs were performed on a daily basis. At the beginning, there was no set-up for general anesthetic and all surgeries, including major limb amputations (Figure 5) were done under local nerve blocks and ketamine sedation, all of which were remarkably effective. The occasional patient would awake momentarily during the procedure to catch a glimpse of the surgery, always an eerie feeling for the treating surgeon. I ended the trip (Figure 6), transporting 16 seriously brain and spinal cord injured patients assessed at the UM hospital state side with the assistance of the military, on a C-130 airplane.

Within two weeks, sheer chaos became organized madness and the volunteer rank swelled to well over 100 dedicated physicians, surgeons,
nurses, physical therapists, occupational therapists and administrators, etc. The University of Miami Hospital was one of the busiest hospitals in the makeshift compounds near the airport, which included the United Nations Hospital and the Israeli Hospital, as well as the Military Hospital and the USNS Comfort stationed not too far down the coast. Some of the key members in the department who also assisted in the volunteer services included Drs. Wang, Guest and Ragheb, as well as administrators Marianne Finizio and Gillian Hotz, PhD.

Working in a field of medicine that is critically dependant on high-end resources and technology, one is quickly humbled when providing care in a devastated environment in an already impoverished country. Despite the suffering and agony, the spirit of the Haitian people prevailed and their smiles amidst the turmoil needed no translation, making us realize how privileged we are. Perhaps the photo I captured of this Haitian child (Figure 7), still playing with a rubber tire sums up the resiliency of these people.

To this day, more than eight months* after the catastrophic earthquake, the University of Miami hospital is still one of the busiest, most efficient, well-equipped and staffed medical facilities on the devastated island. Although some normalcy has returned, the reconstruction work is still far from beginning. But these obstacles have not held back the Haitian people who continue to live amongst the rubble in dozens of tent cities which have popped up in Port au Prince (Figure 8). From a professional standpoint, I am honored to have been a small part of this early response team in the aftermath of what will undoubtedly be remembered in history as one of the most destructive earthquakes of all time.

* At the time of writing.
It is impossible to understand the roots of the Haitian earthquake disaster without understanding the Haitian political, economic and ecological situations. I came to Haiti for the first time in 1989. At that time, Papa and Baby Doc (François and Jean-Claude Duvalier) had gone but their system of oppression remained in place. The country was under the control of a man named Avril who had taken power in one of a series of coup d’etats. The Tonton Macoutes, a system of paramilitary right-wing death squads, continued to enforce the status quo of the social and economic power structure. Oppression was a necessary part of a system of government in which a succession of dictators and their cronies siphoned off much of the country’s resources into foreign bank accounts; in other words, where there is widespread corruption, there must be oppression. At that time, I was in Haiti with Physicians for Social Responsibility, evaluating tortured political prisoners and the conditions in the Prison of Port au Prince.

Throughout the latter part of the 20th century, the people of Haiti were left to fend for themselves with little in the way of regulation or social programs. Without good roads or electricity, wood was the major means of both fuel and construction. Because of this, the country became almost entirely deforested.

As one looks down on Haiti from an airplane coming in to land, the absence of trees on the mountains and plains is striking — particularly in comparison with the lush green of neighboring Dominican Republic. In the 70s and 80s, deforestation led to massive erosion and the loss of much of the country’s arable soil into the Caribbean. In turn, the agrarian base of the economy was compromised, displacing thousands of peasants into Port au Prince and other major cities. Slums, ironically named Brooklyn and Boston, grew up around Port au Prince. In the absence of readily available wood, most buildings were either shanties or subcode concrete buildings. Thus, the political disaster led to an ecological disaster (deforestation and erosion), that led to a social disaster (rural to urban population shift). The result was huge numbers of people crowded into subcode concrete structures and shanties. Enter the earthquake.

So the 2010 earthquake was not simply a natural disaster. It struck a population that was uniquely vulnerable, with a government that was poorly suited to cope with the disaster. Project Medishare for Haiti, Inc., an organization founded by Dr. Barth Green, co-chairman of the University of Miami Department of Neurosurgery, had been working to train Haitian healthcare workers to provide primary care to the people of the remote central plateau. As strange luck would have it, Medishare had become involved with helping the Haitian government create a disaster response plan shortly before the quake. When the quake struck, Dr. Green already had connections and a rudimentary plan in place that enabled Medishare to deploy enormous Miami Event Tents as a field hospital on borrowed space near the Port au
Prince airport runway. I wandered into that field hospital 10 days after the earthquake.

Originally, I was supposed to connect with a “Haitian” doctor in Petionville. I caught a flight operated by Missionary Flights International out of Ft. Pierce on an airplane borrowed from NASCAR. While waiting for my equipment to arrive on a later flight, I wandered into the Medishare Hospital and found neurosurgeon Jim Guest, MD, who was functioning as the chief surgical officer at that time. By the next day, we were treating a pediatric open depressed skull fracture.

Immediately after the earthquake, the hospital was full of patients with amputations and severe open wounds. Debridements, wash-outs and vac dressing applications were being performed in the pediatric and adult tents in three different stations. Four operating tables were set up in a part of the pediatric tent, and were used for more complex wound debridements, fracture repairs and whatever general surgery could be accomplished. While there, I performed three craniotomies, one sciatic hematoma decompression and two shunt procedures. I also functioned as an ER intern, wound debridement assistant, general neurology consultant and quartermaster. By my fifth day at the Medishare Hospital, I was operating as the interim Chief Medical Officer. I organized spine fractures and arranged for transfers of others to the Medishare Facility and handed them off to Mike Wang, who performed 13 fusions on the weekend of my departure.

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> **DOING NEUROSURGERY AT HBMPM WILL CHALLENGE YOU IN NEW WAYS. WHILE YOU WILL NOT FUNCTION AT THE LEVEL OF EFFICIENCY TO WHICH YOU ARE ACCUSTOMED, YOU WILL PROVIDE SERVICE THAT WILL OTHERWISE NOT BE AVAILABLE. <

There was a huge flux of volunteers with personnel turnover that approached 50% every four days. Both infrastructure and standard operating procedures were in a state of rapid evolution to accommodate the dynamic situation. For instance, while many amputations were performed in the first few days, by day 10 an epidemic of tetanus struck creating the demand to procure toxoid and adapt procedures. In addition, because the general medical system of Haiti had been decapitated, the military and civilian relief hospitals began functioning as general hospitals. In this context, our PACU began to function as an ICU, requiring expansion of facilities to accommodate crashing and critical patients. In the first week after the quake, we had a portable X-ray machine, a C arm that functioned sporadically and pulse oxymetry. Occasionally, laboratory results and blood could be obtained from the military hospitals. Balancing the huge number of patients was the availability of many hospitals in the US accepting transfers, as well as the Hospital Ship Hope. In many ways, Medishare was serving as a MASH unit in the early days, stabilizing patients and evacuating the ones whose critical care or surgical needs could not be handled on site.

In the summer, Medishare shifted operations from the airport tent hospital to Bernard Mevs Hospital in Port au Prince. The hospital has fewer beds (40), but moving out of the tents dramatically improved conditions and sterility. Hospital Bernard Mevs Project Medishare (HBMPM) has its own laboratory and can now perform gram stains, chemistries and cell counts. Critical shortages of equipment continue to exist, particularly for neurosurgery. In April, Medtronic generously agreed to donate an O-Arm for use as a CT scanner. As I write this article in Port au Prince, the O-Arm is still stuck in Haitian customs. There are no bipolar cauterity units and no spine instrumentation trays. For that matter, the only neurosurgical tool on site is a Hudson Brace. The hospital is facing particular challenges in the area of hydrocephalus and spine. The severely compromised sterility has forced Medishare to enforce a relative moratorium on shunt implantation. Nonetheless, hydrocephalus patients continue to present with shunt infections, CSF leakage or untreated hydrocephalus. I have been implanting Rickham reservoirs as a temporary measure to decompress patients and prevent leakage, while treating the CSF infections. There is clearly a profound need for a focused effort in hydrocephalus including the ability to attempt ventriculoscopic surgery. In addition, there is a profound need for surgeons equipped to perform cervical, thoracic and lumbar instrumentation and reductions of fractures.

Medishare faces a particular challenge. Many relief efforts, including my own past work in Guatemala with Karin Muraszko, have targeted focused areas of subspecialty need (hydrocephalus and neural tube defect repairs). This type of intervention, when conducted in collaboration with a committed host organization capable of gathering candidate patients and supporting follow-up, can be extraordinarily successful and even efficient. Other efforts, like those of FIENS that focus on educating local neurosurgeons, can also have a profound impact. In contrast, Medishare is attempting to run a general hospital in a city with extremely limited resources. This afternoon, I will attempt to perform an occipital cervical fusion using arm longbone plates and screws. With help from an orthotist, we fashioned a head holder out of a crutch and a brace, to serve as a substitute for a Mayfield head holder. Two days ago, we performed a decompressive cranietomy on a herniating 17-year old who is now verbal and purposeful. Equipping and staffing a general hospital might appear impossible, but a tremendous amount of good is being accomplished.

I encourage any neurosurgeons interested in volunteering to contact me or Medishare directly. Doing neurosurgery at HBMPM will challenge you in new ways. While you will not function at the level of efficiency to which you are accustomed, you will provide service that will otherwise not be available. You will constantly be forced to adapt and improvise. These experiences are, in themselves, profound, but there is another element to surgery in these environments. The people whom you meet in each aspect of the enterprise, the patients, volunteers and professionals, are extraordinary and deeply affect your perspective.
In February 2010, I volunteered to accompany a group of physicians to a hospital in Milot, Haiti after the devastating earthquake that affected the country. I practice as a pediatric neurosurgeon at Children’s National Medical Center in Washington, DC. As I heard the news reports of the dire medical situation after the earthquake, I looked for ways to help. It was very difficult to find an organization that had adequate resources or infrastructure to provide medical services on the ground. I inquired about multiple medical groups, but I was unable to find a group in which I could be an asset rather than a burden.

Several weeks after the earthquake, I heard about a group of orthopedic surgeons from my hospital leaving for Haiti. They were joining medical groups from around the US to provide care at Hopital Sacre Coeur in the town of Milot, which is near the northern coast of the country. I got a call from their group leader, Dr. John Lovejoy, explaining that they were looking for a neurosurgeon. One catch — they were leaving in 6 hours. Fortunately, I was not on call, and the hospital was very quiet after having just been through one of the largest blizzards in DC’s history. My partners were very understanding, and agreed to cover my patients while I was gone.

The trip to Haiti was surprisingly quick. Although it is only a couple of hours from the US mainland by plane, it is truly a world away in most other aspects. The town of Milot is near Cap-Haitien, the second largest city in Haiti. The area was not affected by the earthquake, and a functioning infrastructure meant that many injured Haitians fled to this area to seek medical treatment. Hopital Sacre Coeur was staffed by very dedicated Haitian doctors and nurses.

Our group, called the CRUDEM foundation, had a long-standing partnership with the hospital, and medical teams regularly came and worked with the Haitian staff. After the earthquake, the group of foreign (mostly American) medical staff tripled to about 80 personnel. The local staff was very welcoming, and they generously provided food and shelter for the volunteers.

I was the first neurosurgeon to visit the hospital. While it was one of the best equipped medical facilities in the area, the conditions were fairly austere when compared to what we are used to in the United States. While the ORs had most of the necessary basic equipment, we had to be much more thoughtful about the use of donated supplies so that nothing was wasted.

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wasted. We also had to be careful about the occasional flying insects in the OR.

While I was in the operating room much of the day, I also spent quite a bit of time seeing patients on the wards. There were six huge overflow tents that housed hundreds of injured patients. These tents were crowded, hot and muggy, but the patients were just happy to be receiving care. I was constantly amazed by the resilience of the patients and their families to cope under such conditions. The surrounding community supported them as well by bringing them meals.

We made rounds every day. Given the number of different volunteer providers who came and went, records could be scattered, but we tried our best to make coherent plans that would last after we left.

Given that neurosurgery is so technology-driven, I had to make major adjustments to respond effectively to the conditions on the ground. There was no CT scanner, so I had to rely on the clinical exam, plain X-rays, and limited lab results. We coordinated with the USNS Comfort to have the most critical patients sent there for CT scans, and US Navy Blackhawk helicopters made regular trips transporting patients between our hospital and the hospital ship.

I saw a variety of injuries at the hospital, including head trauma, spinal fractures, facial fractures/lacerations and infections. A number of patients had infected scalp wounds that required debridement. For example, one teenager presented with pus coming out of an infected scalp wound with a depressed skull fracture. I took him to the OR to wash out and explore the wound. I could see the bone fractured into the posterior aspect of the superior sagittal sinus. Fortunately, the boy was neurologically intact; I washed out the wound, left the bone where it was, and closed. He was one of the lucky ones.

There were a number of patients with thoraco-lumbar burst fractures and compression fractures. Some had complete neurological injuries, but there were a number of patients with incomplete injuries. We were visited by Dr. Dennis Rivet, a US Navy neurosurgeon stationed on the hospital ship USNS Comfort. We did not have the resources to do instrumented spinal fusions at the hospital, so some of these patients were transported to the Comfort for surgery. Dr. Rivet and I noticed a similar pattern of injury in many patients: cuts on the backs of their hands, backs of their heads and backs. Many patients also had thoraco-lumbar fractures. One can imagine that as many of these people were crushed by falling roofs, they covered their heads and flexed their backs as debris fell on them.

Besides victims of the earthquake, children with non-earthquake related conditions were also brought to the hospital. After word got out to the community that there was a neurosurgeon in town, a number of infants with hydrocephalus were brought to see me. Last year, I spent some time in Uganda and treated many children with massive hydrocephalus, the vast majority of which were post-infectious in etiology. This helped prepare me for some of the patients in Haiti.

There were a range of expectations with these children, and I was unclear if the parents or caregivers understood the full implications of hydrocephalus and shunts. For each patient, I sat down with the parents and explained the short- and long-term implications via an interpreter. As one would expect, the mothers wanted everything possible to be done to help their children.

I struggled with what I perceived to be an ethical dilemma with respect to treatment and long-term care prospects for these children with hydrocephalus. Coming for a limited period of time, putting
in a shunt and leaving the country did not sit well with me. It was unlikely children would have access to neurosurgical care in case of shunt malfunctions. I discussed the dilemma with other staff members. Their view was that the children would definitely die without shunts, and this would at least give the children and their families some hope in the near term; however, I wanted to find a better, longer-term solution.

Fortunately, I met a Haitian general surgeon on staff, Dr. Jerry Bernard, who was very interested in learning about neurosurgical techniques. He clearly had the commitment to the patients and the skill to learn the basics about the treatment of hydrocephalus. I gave him a crash-course in shunts and basic neurosurgical techniques. He scrubbed in with me on almost every surgery, and I taught him how to insert and revise shunts. While not a perfect solution, my goal was to teach him to be able to take care of a shunt malfunction in an emergency, and I believe he developed those skills.

While a neurosurgeon may not be able to do the most complex cases in a setting with limited resources, one can still make a real and immediate impact in patient care. Even with a limited amount of time, working with and educating local medical providers is important to having a more long-term impact. I hope to continue this type of work.

My experience in Haiti was both exhausting and extremely rewarding. It made me appreciate the sophistication of US medical care, which we normally take for granted. In addition, I learned so much from the dedication and perseverance of the many patients and staff members. The sheer magnitude of human injury was only matched by the resilience shown by so many of the patients.
US NAVY NEUROSURGICAL EXPERIENCE IN HAITI ON THE USNS COMFORT

On January 12, 2010 a magnitude 7.0 earthquake struck the island of Haiti, centered in the southern portion of the capital city Port au Prince, a city of more than three million residents. The earthquake devastated the island nation and led to the largest worldwide humanitarian effort in over 50 years. The earthquake caused massive destruction of homes and buildings and either destroyed or rendered non-functional the majority of the Haitian healthcare system in the region of the largest population center in the country. The initial earthquake resulted in an estimated 200,000 casualties mostly from the collapse of un reinforced buildings.

Among the massive mobilization of relief efforts which were immediately organized by the United States, the USNS Comfort hospital ship (T-AH 20) was deployed from Baltimore, Maryland on January 15, 2010. The ship carries the capability to support 10 operating rooms, 1,000 beds and 75 ICU beds and was able to quickly augment a multitude of land-based field hospitals which had been assembled with the capabilities of an on-site tertiary care medical center. The ship was able to begin accepting casualties via helicopter within seven days of the quake.

We served as medical personnel on the ship, which included over 1,000 physicians and staff, mostly from active duty US Navy personnel who had boarded with only 36 hours notice. The crew was also supplemented once on-station by a variety of other military and civilian government agencies (USAID), as well as volunteer non-governmental agencies including the Orthopedic Trauma Association, American Red Cross, and Project HOPE.

We arrived at the ship via air transport on January 20 and immediately went to the operating rooms. As in other earthquakes, the majority of the patients’ injuries resulted from their being struck by falling debris. The initial cases were triaged and mainly consisted of open depressed skull fractures, many complicated by secondary infections and some of which had undergone some form of debridement or stabilizing measure at a field hospital. Due to the local infrastructure and logistics, there was minimal ability to perform land-based in-country medical evacuation. Within 72 hours after arrival, the Comfort had accepted 254 patients and this census quickly rose to more than 430 patients.

There was a characteristic pattern of injury which resulted from the low-velocity, high-force trauma caused by falling debris. The ship focused resources on patients with complex, multi-system injuries and typical injuries included skull fractures, multiple long bone fractures, pelvic fractures, soft tissue wounds often with gangrene, and spinal fractures. Identification and triage of patients was performed by several US Navy triage surgeons in conjunction with the Haitian Ministry of Health and multiple field hospitals.

Initial surgical efforts were maximized to provide as much care to as many as patients as possible. The majority of the patients on the ship were young adults, and a third of the patients were children. The age range of surgical cases was from one month old to 61 years. In the first three weeks, more than 60 spinal fractures and 15 cranial injuries were treated surgically. Almost all of the spinal cases were complex fracture dislocations some of which involved fixation and fusion of every spinal level from the craniocervical junction to the sacrum. The treatments typically consisted of open reduction and fixation with posterior instrumentation and locally harvested autograft bone for fusion. The distribution was heavily weighted towards thoracolumbar levels and in general, priority was given to patients with incomplete or intact neurological status during the triage process. In addition, we encountered and treated a variety of other pathologies: craniofacial reconstructions with plastic and otolaryngology colleagues, debridement of infections including Clostridium species and gangrene, as well as CSF diversion procedures for monitoring or traumatic CSF leaks.

Participation as neurosurgeons in the disaster relief response provided us with an experience unlike any other. We learned many lessons on a multitude of subjects ranging from logistics of disaster response and patterns of injury, to the role neurosurgeons specifically have to play in such an event. Given the certainty of a similar event on some scale, it is an experience we hope to convey to our colleagues for the benefit of patients. It would be impossible to recognize all of those who made our contributions possible, but in particular we would like to acknowledge our medical and nursing colleagues as well as the work of hundreds of US Navy and American Red Cross volunteer translators who somehow found a way to translate in situations that we found challenging to describe in any language. ■
MINIMALLY INVASIVE SPINAL SURGERY IN CRISIS SITUATIONS

In the 1950s Gavril Ilizarov, a Russian Orthopedic surgeon, was confronted with an interesting dilemma. While working in Kurgan, Siberia he became aware that the conventional treatment for complex/open lower extremity fractures, whether with casting or open surgery, was associated with unacceptably high infection and complication rates. In response to the harsh working environment, Ilizarov innovated an external fixation device initially developed out of bicycle parts (Figure 1). This device markedly reduced the infection rate, while allowing fracture re-alignment and healing. While initially viewed with skepticism, the device spread to the West where it has become popularized as a standard treatment for complex long bone fractures.

The dilemma Ilizarov faced in the resource-poor environment of Siberia has been encountered by numerous surgeons working in response to disasters, be they geologic, political or economic. Like Ilizarov, the neurosurgeon faced with working in these situations must be innovative and mindful of the associated problems of malnutrition, poor hygiene and lack of nursing and therapy support. In addition, US neurosurgeons are typically accustomed to functioning in a very rich technological and human resource environment; however, the availability of ICU care, microscopes, imaging and surgical instruments can be quite limited in the Third World. Following the January 12, 2010 earthquake in Port au Prince, Haiti, numerous neurosurgeons arrived to lend support for the care of the devastated population. Interestingly, the scope of neurosurgical conditions, whether due directly to the earthquake or its aftermath, was immense. Cranial and spinal injuries were common, with a high incidence of spinal fractures due primarily to the collapse of physical structures (Figure 2). The majority of fractures seen in the hospital setting were highly unstable, consisting of either fracture-dislocations or complex burst fractures. In addition, these patients, treated primarily with bedrest and spinal precautions suffered from the expected sequelae in the absence of modern intensive care nursing, therapy and nutritional support (Figure 3).

Faced with these problems, we set out to manage spinal fractures that were highly unstable or unlikely to heal without fixation. Experience in the United States had already suggested that a reduction in soft tissue trauma could result in lowered infection rates using a minimally invasive surgery (MIS). However, these notions remained unproven in the spine, and the concept of bringing the most modern surgical techniques into the most devastated region in the Western hemisphere seemed daunting. Nevertheless, an MIS approach had distinct appeal as a methodology for overcoming the shortcomings of the situation (Table 1).
In two separate trips we were able to internally fixate the fractures in 15 patients, utilizing commercially available percutaneous screw-rod constructs (Figure 4). These implants, donated by DePuy Spine, Inc. (Raynham, Massachusetts) and Globus Medical (Audobon, Pennsylvania), allowed us to place standard pedicle screw-rod constructs through a multiplicity of small incisions. Typically, fracture fixation was accomplished with two levels of fixation above and below the injury (Figure 5). In this manner, we were able to minimize the need for electrocautery and no subperiosteal exposure was necessary.

All 15 patients underwent surgery without any immediate complications or significant blood loss. Patients were then rapidly mobilized with aggressive physical and occupational therapy (Figure 6). This was not only rewarding to our team, but also highly beneficial to these patients who had been immobilized on bedrest for weeks. In the ensuing months we did become aware of one case with wound breakdown and one case of a wound infection which were subsequently transferred to a hospital equipped with a truly sterile operating room.

While MIS thoracolumbar fixation could be considered successful for treating acute injuries in this small sample of patients who were managed in this, the worst of possible environments, several ongoing issues remain. For example, in the absence of a surgical arthrodesis, it is unclear if the fractures will heal properly, and it is possible that additional surgery will be necessary to treat any pseudarthroses or for delayed hardware removal.

MIS remains a promising and attractive complement to open spinal surgery. It is possible that reducing violation of the dorsal soft tissue envelope may be especially beneficial in compromised patients, such as those found in the Third World or crisis situations.


References:
THE MANAGEMENT OF MASS CASUALTIES

In Baghdad on August 19, 2003 at the UN headquarters, a flatbed Kamash utility truck loaded with 1,000 pounds of explosives tore down the access road, throwing stones into the nearby windows. The explosives included 120mm and 130mm artillery shells with 60mm mortars and hand grenades, depressing the entire flatbed by over a foot. Before anyone could intercept the vehicle it collided and detonated at the unfinished brick wall two stories below the UN top envoy office. The time was 4:28 PM. The top envoy, beloved Sergio Vieira de Mello, and 22 other UN employees died. Another 150 were injured and immediately evacuated to the Level III Combat Support Hospital in the area. The UN had no medical resources at the hotel or in the region. The 1st Armored Division rapidly set up a security perimeter, mobilized medical evacuation resources, and began triaging and evacuating patients to the 28th Combat Support Hospital located in the open desert 15 miles west of Baghdad.

The timing couldn’t have been worse for the 28th Combat Support Hospital, which was preparing to make a long awaited move into the Green Zone Hospital (Ibn Sina) after five hard months in the desert with sandstorms, temperatures over 120 degrees, limited power capacity and a CT scanner that hadn’t worked since June. The unit was divided between the two sites, and had just recently dealt with a mass casualty attack when the Iraqi prison was mortared by insurgents and 30 injured arrived the prior evening. The 28th CSH had the only neurosurgery and ophthalmology capabilities in Iraq, consisting of 207th Neuro-Team LTC (ret) Richard Teff, MD and myself. Everyone was looking forward to a better life.

All that had to be placed on hold, however, as late in the day casualties began to arrive. This attack struck at our weakest moments when our unit and equipment were divided with limited power capacity. Patients were sorted at the scene, and those with any cranial-facial-orbital or chest injuries were diverted to the 28th CSH in the desert while those with isolated extremity injuries were forwarded on to Ballad where another CSH could manage their injuries. Of the 150 patients, 50 required surgical care, with 25 having sustained some form of head and neck trauma. This is most likely related to the position that most of the victims were in, sitting at their desks with flying glass and debris as a secondary mechanism of impact. Surgery had to be kept short, as only three OR trailers were operational with two beds per trailer for a congested six OR capacity. No imaging was available other than plain X-ray, so clinical diagnosis was the order of the day.

The first wave of patients was surprisingly responsive. Most of the overwhelmingly distressed were placed on the first wave of helicopters. Yet it was the second and third wave of patients who had the most severe injuries, because these individuals required more resuscitation at the scene before transport could be performed. In the majority of cases they required more urgent surgery.

The injuries were comprised primarily of complex lacerations, open depressed skull fractures, complex cranial-facial avulsion injuries and multiple extremity fractures.

The majority of cranial-facial-orbital operations were focused on decompressing mass lesions, removal of foreign bodies and repair of lacerations. Patients with lateralizing signs were treated first with evacuation of epidural hematomas, open depressed skull fractures, and extraction of a large four foot window frame from the nasopharynx and skull base. Over 20 patients had ocular trauma, and the single military ophthalmologist ended up operating for over 30 hours. Several of these patients required more extensive surgery for significant defects of the skull base, frontal sinus injuries and delayed hematomas. These procedures were performed by Army neurosurgeons in Kuwait at the 47th CSH, LTC Daniel Donavan and LTC John Ischandar of the 252nd Neuro-Team. They were essential in providing definitive surgery to the damage-control procedures we began in Iraq.

In the final analysis, what benefited patients most was the well-established rapid medical response of the US Army. This included medics on the ground, Blackhawk Medivacs, and two nearby Combat Support Hospitals. Our response could have been more robust with CT imaging, more ORs and operational capacity in the Green Zone at the Ibn Sina Hospital. The UN dramatically overhauled its practices worldwide after this event, with improved security and planned mass-casualty exercises. This allowed for better preparation with medical supplies on hand, and established modes of medical evacuation to nearby hospitals.

The “greatest good for the greatest number” are the marching orders for mass casualty care. In order to accomplish this, patients must be identified, sorted and triaged. This requires excellent on-site patient evaluations, which entails identifying those who will have treatable wounds given the level of care or medical evacuation.
available. The management of mass casualties comes down to a simple algorithm: identify those with the most salvageable injuries first. Medical resources are overwhelmed in the early course of an event, and sorting casualties into medical priorities takes first order. The risk of “over-triage” of patients exists and can severely overwhelm the medical resources. Additionally, significant post-traumatic stress and psychiatric casualties need to be identified and treated. These are more common in civilian mass casualty situations, where the indoor explosive violence is exorbitant.

This puts the neurosurgeon in a contrastingly different role from his typical duties. In a mass casualty situation the neurosurgeon is most useful in identifying those casualties who are the least salvageable and are best triaged as expectant. You don’t want to waste limited resources on those who will die despite your intervention. Typically the first patients who arrive at the treatment facility are not usually the most severe, as was described here. It is the second and third wave of patients that tend to be the most neurologically and hemodynamically unstable. These patients have required more treatment at the scene, therefore a delay in their immediate treatment from the point of injury occurs.

The neurosurgeon is also very useful in triaging which patient should undergo imaging first. These patients must first be hemodynamically stable with a clear airway. In some cases the neurosurgeon may not have the advantage of imaging, so patients may be taken immediately to the operating room. In such cases the neurosurgeon may need to place an ICP monitor, ventriculostomy, exploratory burr holes or, if indicated, a cranial decompression with hematic evacuation or an appropriate craniectomy.

Examples of mass casualties in wartime include terrorist attacks with suicide bombers, vehicle-delivered bombs and large remote explosive detonations in crowded environments. Those that occur in buildings are associated with the difficulties of unstable structures and delayed extraction. The patients who survive may suffer from the sequela of crush injuries, ongoing blood loss, infection and multiple region injuries. Examples of such attacks include those in New York City and the Pentagon on September 11, 2001, the UN Attack in August 19, 2003 in Iraq, and rail/train attacks in Madrid on March 11, 2004 and in London in 2005.

In many of these events the percent of dead approached 95%, as was the case on 9/11 in the Twin Towers, leaving fewer patients to treat.14

Rapid evaluation, evacuation and continuous re-evaluation for treatable injuries are a constant challenge for the treating medical teams. The precept of Combat Casualty Care predominates and can be applied in these scenarios. This includes first removing the patient to a place of safety, especially if under enemy fire. In combat, suppressive fire can allow a casualty to be removed from the “kill zone” as the enemy will typically target additional rescue attempts knowing our warrior ethos of leaving no man behind. Secondary attacks in a suicide bomber incident can be larger than the initial one as more personnel and equipment is committed to rescue the injured. Therefore a first priority must include establishing a security perimeter to allow safe medical evacuation. In situations where a separate force cannot be provided for security, a military medic will provide individual suppressing fire to allow patient extraction.

Those patients who expire at the scene from a large blast are usually dead as a result of overwhelming brain, lung or diffuse body injury, decapitation and avulsion. In the majority of mass casualties there is an overwhelming number of dead compared to survivors, so an immediate on-site mortuary with victim identification should be considered. Patient identification can also be difficult. In Israel wristbands with written identification of patient number, event and time is made for future more detailed identification. Accounting for all victims and ensuring proper identification of the deceased is a critical element to the management of large mass casualties where chaos and disorder is the rule.

In summary, the preparation for a mass casualty event should encompass redundant forms of communications (no cell service!), delayed resupply (consider continuous surgical operations for 48 hours), and need for evacuation to higher levels of care. Surgery should focus on damage control only, with avoidance of prolonged operations. Sending patients to more advanced centers with greater capabilities should be anticipated early. The avoidance of expending enormous resources on non-survivors is also a harsh reality of mass casualty management. Placement of a chest tube is one example of one of the most beneficial procedures in a patient with a tension pneumothorax, which is a clinical diagnosis and requires minimal time. Additionally, in the military it is essential that neurosurgeons maintain their Advance Trauma and Life Support skills (ATLS), critical care skills and Combat Casualties Skills Training, allowing them to serve greater numbers in the face of a mass casualty event. □

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Member Survey Success!
Thank you to all members who participated in the CNS Member Education Activities Survey this September. With a nearly 30% response rate, this survey was a tremendous success, providing the CNS with a wealth of insight into your training needs and education preferences. Keep an eye out for new programs and developments to be announced throughout the coming year as a result of your valuable feedback.
The Early Years

Prior to the mid-1980s, neurosurgeon involvement in spine care was essentially relegated to decompressive operations for degenerative pathologies, tumor and trauma. Spine instrumentation and complex reconstruction procedures rarely fell within the neurosurgeon’s domain unless they pertained to limited cervical spine applications. Orthopedic surgeons, as a group, were the first to employ complex thoracic and lumbar stabilization technologies. Thus when operations requiring complex stabilization technologies were initially undertaken, neurosurgeons often performed the decompression component, while the orthopedic surgeons performed the stabilization component. At times, disharmonious relationships developed between orthopedic surgeons and neurosurgeons regarding the acquisition of surgical skill sets and privileges. Many local and national debates and discussions ensued. Most were confrontational, and orthopedic surgeons and neurosurgeons began posturing along their respective party lines.

In the early 1980s, a handful of neurosurgical departments and centers began performing complex stabilization and decompression spinal procedures. The relative absence of a complex spine surgery armamentarium for practicing neurosurgeons concerned organized neurosurgery, for two reasons. First, the education of neurosurgeons regarding complex spine instrumentation procedures was not uniform and often deficient; and second, significant and long-lasting turf issues and conflicts would be inevitable if this were not corrected. On the one hand, neurosurgeons appropriately felt that complex spine surgery fell within their domain, while orthopedic surgeons, on the other hand, were concerned about losing a portion of what they considered their area of expertise.

The Era of Controversy and Conflict

The American Association of Orthopedic Surgeons (AAOS), the Congress of Neurological Surgeons (CNS) and the American Association of Neurological Surgeons (AANS) aggressively positioned themselves along their respective party lines. Other organizations that represented both surgical disciplines, such as the Cervical Spine Research Society (CSRS), the Scoliosis Research Society (SRS), the North American Spine Society (NASS) and others began to deal with these issues, but with the knowledge that their constituency, to one degree or another, was composed of both orthopedic surgeons and neurosurgeons – thus, altering the nature of alliances.

The Spine Task Force

In 1987 David Kelly, secretary of the AANS, embarked on a mission that eventually led to the establishment of a Spine Task Force (STF). This task force was commissioned by then-President of the AANS George Tindall in 1988 for the purpose of dealing with the perceived threats to the viability of spine surgery, particularly complex spine surgery, as an integral domain of neurosurgery. It was accurately perceived that suboptimal neurosurgeon spine education and the “loss of spine turf” to orthopedic surgery were looming issues. Hence, the initial highest priority mission of the STF was to create an environment in which instrumentation of the entire spine was taught and mastered by neurosurgeons.

Spine Surgery Education and Training

The complacency of organized neurosurgery was challenged by the initiation of an accreditation process for orthopedic spine fellowships by the Accreditation Council of Graduate Medical Education (ACGME). Organized neurosurgery realized that students, resident and postgraduate physi-
cians would be exposed to spine research, education and associated critical thinking via ACGME certified orthopedic surgeons, not neurosurgeons. This perceived threat and the resulting ‘awakening’ of the neurosurgical community helped fuel the STF movement. As a result, the STF began vigorously addressing issues as they pertained to neurosurgeons and spine surgery, such as resident education, credentialing and issues of turf. Early meetings with the Society of Neurological Surgeons (SNS) were eventually successful in garnering SNS support. The task force initially concluded that 1. Neurosurgery would be best served by officially recognizing that spine education should become an integral component of all residency training programs, 2. Neurosurgeons should be trained to treat the entire spine by establishing a comprehensive spine surgery curriculum in each program, 3. Neurosurgery training programs should provide research opportunities in spine and spinal cord injury, and 4. Relations with orthopedic surgery should be an individual, programmatic and local decision.

The Controversy over Fellowship Training

Next, the task force specifically addressed the issue of spine fellowships, where significant debate ensued. After many discussions, occurring at multiple levels including interactions with orthopedic surgeons at several summit-type meetings, it was concluded that neurosurgeons, upon completion of residency training, are considered spine surgeons. To be clear, it was mutually deemed by both organized orthopedic surgery and neurosurgery that a spine fellowship is not required to certify a neurosurgeon as a spine surgeon; certification by the American Board of Neurological Surgeons (ABNS) confers an equivalency of training with orthopedic surgery spine fellowship training. It was agreed that spine fellowships for neurosurgeons were intended for advanced training and were to focus on developing the skills necessary to ‘ultra-specialize’ or to augment academic potential. Spine fellowships for neurosurgeons were expected to focus on training super-specialized spine surgeons who were well versed in spine research and spine biomechanics. This authoritative consensus conclusion (ABNS conferred equivalency) had an immense impact on the ongoing conflict. The implication that the ‘era of controversy and conflict’ was nearing an end seemed evident at the time and proved to be so as the political happenings of the next several years unfolded.

The Credentialing of Neurosurgeons as Spine Surgeons

The STF next addressed credentialing issues of both orthopedic and neurological spine surgeons at the local level. In many locations around the country, neurosurgeons were facing credentialing issues because they had not completed a spine fellowship or for other, often concocted, reasons. For example, orthopedic surgeon-derived and -initiated resistance to neurosurgeon credentialing was commonplace in the late 1980s and the 1990s. Many neurosurgeons, including two of the authors of this paper (VS and EB), were challenged regarding their ‘competence’ as spine surgeons by orthopedic competitors and hospital credentialing bodies. These challenges usually revolved around an antiquated and revived (or a new and often contrived) credentialing process. This nearly uniformly unwarranted and incredibly demeaning process was repeated over and over during the late 1980s and 1990s. With the support of organized neurosurgery, neurosurgeons held their positions in this volatile arena. As a result, an emerging responsibility and duty of the STF was to address the practical issues related to neurosurgeons being recognized as spine surgeons because they were either on track for certification or certified by the ABNS (ABNS-conferred equivalency). It was argued by > ON THE ONE HAND, NEUROSURGEONS APPROPRIATELY FELT THAT COMPLEX SPINE SURGERY FELL WITHIN THEIR DOMAIN, WHILE ORTHOPEDIC SURGEONS, ON THE OTHER HAND, WERE CONCERNED ABOUT LOSING A PORTION OF WHAT THEY CONSIDERED THEIR AREA OF EXPERTISE. <
organized neurosurgery and the STF that spine surgery, including complex spine surgery, is simply a component of the overall skill set of a neurosurgeon. In fact, in 1990, the Board of Directors of the AANS changed the definition of ‘neurosurgeon’ to include modern spinal surgery with instrumentation. The ABNS and the Residency Review Committee (RRC) for neurosurgery similarly changed their definitions. The task force’s posture on fellowships and the task force’s influence on the clarification and dissemination of the definition of neurosurgeon (i.e., as a spine surgeon) opened the door for significant changes regarding the relationship between orthopedic surgeons and neurosurgeons in both the clinical and academic arenas. This, combined with the aforementioned ABNS conferred equivalency to orthopedic fellowship training, facilitated the assumption of the spine surgeon role by neurosurgeons, both individually and as a group. It also set the stage for a relatively prolonged period of often low-level conflict with orthopedic surgery in the educational, academic and credentialing arenas.

The Emergence of Neurosurgery Spine Surgery Fellowships
Spine fellowships for neurosurgeons entered the scene in the early 1980s, with Sanford Larson at the Medical College of Wisconsin leading the charge. Larson developed the first true spine surgery fellowship for neurosurgeons in 1979. Under the impetus of Larson and some of his early residents and fellows, spine biomechanics and the physical sciences as they pertain to spine surgery gradually became an integral component of the vernacular of neurosurgery. Biomechanics as a science became a vital part of neurosurgery, as it had been for orthopedic surgery. This, in no small part, helped secure the image (and reality) of neurosurgeons as spine surgeons.

Didactic and Hands-On Neurosurgeon Spine Education
In 1987, the first spine practical course was held at the CNS Annual Meeting. This course focused on, among other techniques, the twisting of small gauge wires for cerclage applications in the dorsal cervical spine. In 1990, the AANS established the Professional Development Committee (PDC). Spine educational courses, under the influence and direction of the PDC and the STF, began to teach the skill sets necessary to perform complex spine surgery. This was an extraordinarily successful project, beginning with didactic courses in 1990, two-day hands-on courses in 1991, and subsequently four to six day courses that have, over the years, trained numerous surgeons in biomechanics, clinical decision making and complex instrumentation techniques. Although these courses have morphed into a much broader educational platform over the years, their initial conceptualization, development and evolution originated from the STF and the PDC. This comprehensive educational offering facilitated the training of neurosurgeons, including residents and fellow trainees, so they could re-enter their own clinical and academic environments at even higher levels. The entire process was relatively rapid. Over a several year period, the majority of the neurosurgery training programs in the United States incorporated complex surgical spine training strategies and provided ‘state of the art’ spine surgery techniques to their patients.

Pedicle Screws, the Plaintiff’s Legal Counsel, and the ‘Attack’

THAT WHICH DOES NOT KILL US, MAKES US STRONGER.
— FRIEDRICH NIETZSCHE

In the early 1990s, spine surgery faced a significant threat in the form of pedicle screw litigation and the attack on both orthopedic and neurosurgeon spine surgeons, as well as the device industry. Legal battles between the attorneys (Plaintiff’s Legal Counsel; PLC) who filed a class action suit against the AANS, NASS, AAOS, and industry ensued. It was a very, very expensive fight. Organized spine surgery and industry lost the first class action suit. Subsequently, a much larger battle was lost, in the form of a $100 million settlement by another device manufacturer with the PLC. Eventually, and not without significant wounds, industry and the AANS, NASS, AAOS and others won the ‘war.’ The leadership of the AANS and NASS were vital in fighting the lawsuits. One should not underestimate the importance of this conflict to modern-day spine surgery; without neurosurgery’s struggle, spine surgery would be very different today.

Adversity can, indeed, odd bedfellows make. Orthopedic surgeons and neurosurgeons found themselves, for the first time, solidly on the same side of a controversy. They quickly and seamlessly collected and collated data and collaborated to create a publication on the safety and efficacy of pedicle screw fixation for thoracic, lumbar and sacral spinal fusions. Based in large part on this impressive demonstration of ‘team play,’ the FDA Advisory Panel on Orthopedic and Rehabilitative Devices recommended that pedicle screws be reclassified from FDA Class 3 to Class 2 devices. After substantial further cost and many more lengthy legal battles, the FDA eventually reclassified pedicle screws to Class 2 on July 27, 1998.

As Nietzsche so eloquently stated, “That which does not kill us, makes us stronger.” Such was the case for the relationship between
orthopedic surgery and neurosurgery. The bond has become even stronger as the years pass.

**The Spine Task Force’s Final Mission**

By the mid-’90s, the goals of the STF were broadened to include: 1. To enhance patient care by improving the scope of neurosurgical training and practice; 2. To facilitate neurosurgeons’ opportunity to participate in further education and practice of spine surgery; 3. To develop new techniques that improve results of surgery; 4. To study medical and surgical treatments via clinical trials; 5. To take a critical look at the effectiveness of surgical treatments currently being rendered and study the possibility of overuse or abuse of spinal surgery based on clinical outcome studies; 6. To significantly increase basic and clinical neurosurgery research; and 7. To represent the proper role of neurosurgeons as total spine specialists. The committee was instrumental in effectively addressing and furthering all of the aforementioned goals.

**The Council of Spine Societies**

In 1997, the Council of Spine Societies (COSS) was formed. It was comprised of orthopedic surgeons, neurosurgeons and physiatrists each representing member organizations such as the CNS, AANS, AAOS, and NASS. The first COSS President was Ed Dawson, an orthopedic surgeon. The second and fourth presidents were two neurosurgeons, Ed Benzel and Rick Fessler. COSS played a seminal role in the cementing of a much needed vehicle that provided palpable closure to an era of controversy and conflict.

**MOVING ON: THE ERA OF COLLABORATION**

The controversial era was punctuated by an article written by J.T. Robertson in 1993, entitled *The Rape of the Spine*. Subsequent editorials and an awakening of sorts among neurosurgeons and orthopedic surgeons alike caused the spine surgery community to pause regarding our obligations pertaining to the utilization of resources and the harm that can be rendered as a result of our surgical interventions. That same year, the STF was disbanded by Julian Hoff with this statement: “This task force has propelled our specialty back into modern-day neurosurgery. You and all the members of the task force deserve neurosurgery’s standing ovation.” The AANS/CNS Section on Disorders of the Spine and Peripheral Nerves then accepted the responsibility of addressing the concerns raised regarding spine surgery in excess (à la J.T. Robertson) and the provision of continued surveillance and management of the issues that had been so methodically addressed by the STF. The ‘Joint Section’ took on this new charge with vigor. It has admirably guided spine neurosurgeons into and through the early years of the new millennium.

From its uncertain and often hostility-ridden beginnings, complex spine neurosurgery has evolved and matured. Neurosurgeons now actively participate and lead at all levels in organized spine endeavors and organizations (such as NASS and CSRS). Joint orthopedic and neurosurgery spine programs and departments are becoming increasingly prevalent. Today, orthopedic surgeons and neurosurgeons often work hand-in-hand to address mutually beneficial educational and political tasks and goals.

Times are very different than they were a decade or two ago. We now truly understand the meaning of the words spoken by one of our country’s forefathers:

**WE MUST HANG TOGETHER, OR MOST ASSUREDLY, WE WILL HANG SEPARATELY.**

— BENJAMIN FRANKLIN

The young spine neurosurgeons of today have yet to face the need to fight for what they perceive is theirs. To them, much of the information provided here is new. Make no mistake, however, there will be battles. Let’s hope that young and seasoned neurosurgeons alike do not forget the words of Benjamin Franklin and the lessons we seasoned neurosurgeons have learned from our own experiences.

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MOC PROCESS

Congratulations! As of today you are a certified Diplomate of the American Board of Neurological Surgery, Inc.” What a relief it was to get that letter this past June from the Board after so many years of training and practice. However, as expected, the letter went on: “Your certificate, like all certificates issued since 1999, is 10-year time-limited. It will expire December 31, 2020. Your first 10-year Maintenance of Certification cycle will begin January 1, 2011.”

Maintenance of Certification (MOC) is a significant advance for neurosurgery (time-limited certification has been in place for general surgeons since 1976). Just as I am more comfortable knowing my pilot is mandated by the Federal Aviation Administration to demonstrate continued proficiency by annual simulator time, our patients will be more comfortable with evidence that their neurosurgeons are keeping up with the literature and modern surgical techniques. A Gallup poll in 2003 confirmed that the general public is overwhelmingly in favor of physicians undergoing periodic re-evaluation of qualifications, periodic written tests of medical knowledge and evaluation of success rates for frequently performed treatments.

This is not an unreasonable desire. There is evidence that the farther one is out of training, the less familiar one is with guidelines and the worse the surgical results can be for specific procedures. Hopefully this trend can be reversed with the development of increased Continuous Medical Education (CME) opportunities, including accredited simulation centers.

Much of the MOC process is mandated by the American Board of Medical Specialties. General competencies are defined as patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism and systems-based practice. The MOC program is designed to address these competencies via the following components:

Part 1. Professional standing.
Part 2. Lifelong learning.

There has been some freedom given to the various specialty Boards to determine how these components are fulfilled. There are three-, six-, nine- and 10-year deadlines, but this process is best addressed as a continuous process of self-improvement and validation. There are 6-month grace periods, but inability to meet these deadlines without exterminating circumstances results in reinstatement fees, which have been $2,500 to date.

Professional standing is determined by evaluations by patients and colleagues. Lifelong learning is largely fulfilled by CME. Many of the CME requirements can be fulfilled with SANS. Other opportunities are through meetings, the CNS University of Neurosurgery, the AANS/SNS online module project (which currently has 30 modules), the Journal of Neurosurgery and Neurosurgical Focus. Cognitive expertise is assessed with SANS and the Cognitive Exam, which must be passed by year 10. Part Four involves submission of key cases in the diplomate’s practice.

Certain components are in flux. The Board has attempted to balance the need for general neurosurgical expertise amongst the diplomates with the recognition that many neurosurgeons subspecialize. Currently, SANS and the Cognitive Exam can be weighted towards more pediatric or spine questions. Full details of the current requirements are available at www.abns.org/content/moc_info.asp.

The first group of diplomates with time-limited certificates has done well. Of the 124 neurosurgeons board-certified in 1999, 120 have received new 10-year time-limited certificates. The other four have failed to maintain MOC and are no longer board-certified. As of March 2010, 395 diplomates have taken the Cognitive Exam. All but three have passed.

While neurosurgeons certified before 1999 are not required to participate in Maintenance of Certification (MOC) to maintain board certification, approximately 100 participate in the MOC process voluntarily. All directors of the American Board of Neurological Surgeons are required to participate in MOC. There may be greater financial incentive for participation in the future. Insurers may yet give increased reimbursement to physicians participating in the MOC process. One can also conceive of malpractice insurers taking participation in MOC into account in setting rates.

Participating in MOC places economic and time burdens. However, like many of us, I chose to go into neurosurgery for the opportunity of lifelong learning in a field that promises to advance over the course of my career. As part of our public trust, we need to demonstrate as a field that we are keeping up with the exploding amount of knowledge required to be the best physicians we can be in a specialty-specific way. This is not fulfilled by merely maintaining state licensure.

Many thanks to Hunt Batjer, MD and Nelson Oyesiku, MD in providing current data and reviewing this manuscript.

References:
Electronic medical imaging (EMI) has facilitated the ability to store, retrieve, share, and manipulate images in ways not readily accomplished with film-based imaging. This technology works incredibly well when used within a single medical center. However, with the development of competing products by imaging companies with no standardization of these imaging studies, sharing this information can be a lesson in frustration and more importantly a patient safety issue. Of particular concern is that the quality of images viewed by the radiologist for interpretation – and billing – is regulated; however, the quality of the images available to consultants is not only unregulated, but often a secondary consideration. Fortunately, this situation is changing for the better. This is a case in point of “organized medicine” working with industry and avoiding government interference to effect a change on a widespread scale for patients and physicians.

Current EMI formats are problematic for a variety of reasons. Each vendor has unique methods of encoding data and is inconsistently able to transfer this data. Additional issues include decreased resolution of images, lack of windowing tools for optimal visualization of tissues and inability to generate reference lines or perform simple measurements. There are also no standards for keys, legends or functionality. Finally, the statement “not to be used for diagnosis or treatment” is included on most electronic imaging media.

Dysfunctional Compact Discs (CDs) have resulted in delays in patient care and repeated imaging. Physician errors may occur from variations in the data reporting of the axes (left to right versus right to left), poor image quality and difficulty in comparing images stored on multiple CDs. Valuable patient and physician time is wasted learning new formats, functions and icons. And finally, there are the potential legal and ethical issues raised by using images of downgraded quality (referred to as “lossy” programs) in clinical decision making, or at a minimum using images in a manner which the vendor states is “inappropriate.”

This problem was first brought to the attention of national organizations by the neurological community. In 2006, the Congress of Neurological Surgeons (CNS) and the American Association of Neurological Surgeons (AANS) brought the current inadequacies of EMI before the American Medical Association (AMA), and Resolution 539 (A-09) was unanimously adopted at the AMA’s Annual Meeting. The “Development of Standards for MRI Equipment and Interpretation to Improve Patient Safety” aimed to influence the imaging industry. This included a presentation to the imaging industry regarding perceived problems with EMI, and resulted in the formation of a panel that outlined each of these inefficiencies and provided recommendations for each issue. A further directive ensued to convene meetings with MRI manufacturers and interested medical specialties. The final result was an agreement to create standards in EMI, including data manipulation and localization, and to ensure that each electronic format be equipped with the capability to load and launch its images on physicians’ computers.

In 2008, the Congress of Neurological Surgeons introduced to the AMA the idea that imaging safety and standardization should be mandated. Resolution 523 (A-08) was created and included presentations to regulatory bodies as well as a meeting of the panel members with the Radiological Society of North America (RSNA) and Integrating the Healthcare Enterprise (IHE). At this point it was suggested that the panel recommendations be incorporated into previously adopted IHE Portable Data for Imaging (PDI) rules, although the panel stood firm that the issue primarily concerned patient care; therefore, a “Safety Statement” was adopted into the IHE PDI. This statement proposed that “All medical imaging data distributed should be a complete set of images of diagnostic quality in compliance with the IHE PDI.” This statement was then adopted by a number of other national medical societies (Table 1). Following the adop-

Table 1: Medical organizations approving the IHE PDI statement

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tion of the IHE PDI, the AMA committee met with the IHE to tackle the issue of a viewer standard and requested the development of basic image review (BIR) profile and electronic protocols for how an image viewer should function. The AMA committee worked with the IHE to create the BIR protocol. The resulting recommendations of the panel were then posted for public comment in March of 2009, and received a record number of responses from healthcare providers across the spectrum of specialties.

The proposed end result of these efforts is to influence the industry to produce portable media, such as CDs, or web-based interactions, which allow for the export of diagnostic quality images to the physician’s own computer for viewing with the PACS program of the physician’s choice. Furthermore, all CD-ROMs with imaging must include a simplified but powerful viewing program with a standard set of functions that may be universally applied across all specialties. Implementation of both basic and advanced viewing modes, standardized icons (Figure 1), and a set of required capabilities for diagnostic viewing has been established via the BIR protocol.

The progress made thus far by the CNS, AANS, Council of State Neurosurgical Societies (CSNS), American College of Surgeons (ACS), AMA and other governing bodies is to be commended as a successful utilization of organized medicine to recognize a widespread problem for practicing clinicians and effect a change to improve patient care. The achievements thus far in this effort should call forth increased support from the medical community, and the methods used to implement these changes may be useful in other areas of medical practice. With the advent and increasing use of electronic medical records (EMR), which are developing along the same lines as medical imaging and may face similar difficulties, this process may need to be adapted and repeated to ensure continued advocacy for patients and physicians.

References:
ACGME DUTY HOURS PROPOSAL: ONE SIZE DOES NOT FIT ALL

The message of neurosurgery to the Accreditation Council for Graduate Medical Education (ACGME) Committee on Duty Hours Regulations has been “one size does not fit all.”

Public interest groups and the media, fueled by concerns arising in part from the Institute of Medicine “Crossing the Quality Chasm” report and the “100,000 Lives Campaign,” have pressured Congress and public regulatory bodies to further restrict the hours worked by medical and surgical trainees in the United States. Unfortunately, little definitive information exists about the impact that the current duty hour regulations, imposed by the ACGME five years ago, have had. In fact, some studies suggest the possibility that increased patient handoffs and decreased continuity of care under the current system may actually harm patients in certain circumstances.

As originally planned, the ACGME has recently undertaken a five-year review of the initial duty hour regulations and their impact on the quality and safety of patient care and residency training at academic medical centers (AMCs). The review is designed to look objectively at both the benefits and unintended consequences of current duty hour regulations and to develop new standards in a way that helps patients and promotes safe, quality health care.

To accomplish these goals, the ACGME has orchestrated the Neurosurgical Summit and its constituent organizations the Society of Neurological Surgeons, the Neurosurgery Residency Review Committee (RRC), the American Board of Neurological Surgeons, the Congress of Neurological Surgeons and the American Association of Neurological Surgeons. The senior author of this article (RGD) has been a member of the ACGME Task Force that drafted the recently released revised duty hour standards proposal.

During the debate, neurosurgical leaders have emphasized the differences between various medical and surgical specialties in the length and nature of training, methods of supervision during training, practice environment and demands in practice. These important differences argue against the ‘one size fits all’ solution to duty hour regulations that has been in place for the last five years. In overview, the newly proposed ACGME regulations would require much stricter limitations on the duty hours of PGY1 residents, but provide for more flexibility than currently allowed during the final years of training in order to promote personal responsibility for the care of individual patients, continuity of care and professionalism, which are core tenets of our specialty.

The new proposed regulations are notable for the following:

- Graduated requirements for time off between duty shifts are established, again most strict at the beginning of training (10 hours), with more flexibility in subsequent years (eight hours).
- Regulations are recommended to promote fatigue mitigation, safer patient handoffs, better continuity of patient care and enhanced resident safety.

The ACGME has requested public comments on the newly proposed regulations from all stakeholders, including medical and surgical specialty societies. In its response, organized neurosurgery has supported both the overall

> SOME STUDIES SUGGEST THE POSSIBILITY THAT INCREASED PATIENT HANNOFFS AND DECREASED CONTINUITY OF CARE UNDER THE CURRENT SYSTEM MAY ACTUALLY HARM PATIENTS IN CERTAIN CIRCUMSTANCES. <
goals and most methods of the proposed duty hour regulations but has also noted the inordinate impact of certain regulations on very small and complex specialties such as ours.

For example, the proposed requirement for continuous in-person supervision of PGY1 residents is not logistically feasible for our small specialty, which has recently successfully adopted responsibility for the preliminary year of training. However, rather than dismissing the goals of that proposed regulation, neurosurgery has devised an alternate, specialty-specific solution to the problem. Neurosurgery’s solution emphasizes special training at the inception of residency in a safe, structured and non-patient care environment, designed to teach both basic procedural skills and aspects of professionalism and communications that will allow new trainees to function effectively as part of a hierarchical supervisory team.

Central to this effort is a new nationwide fundamental skills course for neurosurgical PGY1 residents created by the Society of Neurological Surgeons (SNS) made up of Program Directors, Departmental Chairs and other educational leaders. This course concentrates on basic clinical skills, professionalism and communication in an educationally designed, systematic and safe environment. Held for the first time in July 2010 at six regional centers around the country, approximately 94% of US neurosurgery PGY1 residents participated in what has become known as the ‘Neurosurgical Bootcamp.’ In addition, approximately 37% of residency programs contributed faculty to one of the six regional courses.

SNS educators utilized extensive experience and data to shape the first ‘Bootcamp’ courses, including a needs assessment survey of all United States Program Directors and feedback from learners and faculty who participated in local and regional pilot courses in 2009. There were three principal goals:

- Enhance the safety and effectiveness of training by teaching important professional, communication and basic procedural skills at the inception of residency in a non-patient care environment using didactic, hands-on exercises and simulation.
- Advance a culture of professionalism, supervision and safety through explicit teaching and modeling by leading educators in the field.
- Encourage a sense of professional identification and collegial interaction to support learners throughout their training, including establishing informal regional networks of colleagues and mentors.

Working in concert, neurosurgical societies, leadership and educators have crafted a constructive and coordinated response to the national ACGME revised duty hour regulations proposal that seeks to promote the safest and highest quality care for our patients and best outcomes for the training of the next generation of neurosurgeons who will care for future patients, including ourselves. The impact of neurosurgery’s input to the process has far exceeded the size of our specialty and has allowed neurosurgery to bring new ideas and educational methods to the debate.

The final result of the duty hour regulations revision process remains to be seen. Already clear, however, is that a strong and principled collaboration between neurosurgery and the ACGME has benefited not only our specialty, but also our profession.

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Dr. Dacey is Chair of the Neurological Surgery RRC, Accreditation Council for Graduate Medical Education, and a member of the ACGME National Duty Hours Task Force.

Dr. Burchiel is a member of the Neurological Surgery RRC and Secretary of the Society of Neurological Surgeons.

Dr. Barbaro is Chair of the Committee on Resident Education, Society of Neurological Surgeons.

Dr. Selden is Chair of the Bootcamps Subcommittee of the Committee on Resident Education, Society of Neurological Surgeons, and Secretary of the CNS.
The articles in Perspectives are the opinion of authors and do not necessarily represent the opinions of the CNS or the CNSQ. In order to facilitate discussion and opinions on all aspects of neurosurgery, we have devoted this portion of the CNSQ to you, the reader. Please send your responses to this article, as well as any other opinions or articles, to info@1cns.org.

SHOULD YOU SELL YOUR PRACTICE TO A HOSPITAL AND BECOME EMPLOYED?

Neurosurgeons who are considering selling their practices believe that by becoming employed they will protect themselves from uncertainty and changing healthcare economics and will secure their future. My first reaction is, “Not so fast.” Why do I say this? Because this is not a one-sided negotiation. The advantages of hospital employment may be what the neurosurgeon wants, but what does the hospital want? What is their perspective?

First, you can never negotiate if you cannot walk away. Unless you are prepared to walk if the terms are not acceptable to you, you have no negotiating power.

Next, what value do you bring to the hospital? Neurosurgeons make the most per case of any specialty in the hospital. Taking the average figure of $6,000/case for all cases, multiplied by the number of cases you perform, will give you a figure equal to roughly the amount of revenue you will generate for the hospital. If you are in a group, that number only increases. The $6,000/case number may be higher with vascular cases and lower with spine cases. Remember, also, that the hospital may not be reimbursed for spine instrumentation depending upon the payer. If you are an interventionalist, the $6,000/case may rise to $20,000-$50,000 per case, depending upon the cost of devices you use, because the hospital is paid for a DRG for stroke and most coiling cases will leave within a few days. So, the rest of the DRG money is profit for the hospital.

The hospital administration is equally concerned about its revenues in the future. By capturing you and your practice, the hospital will guarantee its future income. If they buy your practice and your service along with it, they guarantee their future just as you wish to guarantee your own. Now the negotiations have become two-sided; you bring value to the table. For the hospital, you can attract other neurosurgeons they cannot and provide other ancillary revenues to the hospital, increasing the total revenue from neurosurgery. So, that is what they want from you.

Why should you give them all of this without an equal amount in return? Do you want them to guarantee your income? Usually, guaranteeing income leads to decreased productivity. How will your productivity be measured? That is also a subject for negotiation. Is it based on RVUs and if so, what is the target RVU number? That may depend upon the number and type of cases you do. How will your income be determined? If you are an interventionalist, for instance, that assessment will be very low—below what you can make on your own.

What if the hospital gives you a three-year contract, which reduces or stops your pay after that? In that situation they will keep getting your business and you will have surrendered your practice and its operations, which would mean you would have to reconstruct it if you left. And they may have a non-compete clause in the contract. Now where are you?

Is it really an employment contract you want, or is it a commitment on both sides to develop a partnership? There is value in this approach because it commits both sides to a mutually beneficial arrangement in which both sides will profit. If you bring in new business that the hospital did not have, should you benefit from this creativity you demonstrated? Stark laws prevent you from being directly compensated for this work, but arrangements can be made so that the hospital can put money in a neuroscience fund to be used for the expansion of your practice.

So to reiterate, there are things that you want and things that the hospital wants. Pursue this arrangement purely on business terms. Make a list of what you would ideally want. What will make you happy in your future? They will have their own list. Also, neither side knows for sure what the future of healthcare economics will be. So, neither side can have an unconditional guarantee for the future. What you can do is to PARTNER with the hospital. If they are thinking in the future, then both of you together can have combined POWER and more leverage in the future. Sometimes either one or both parties are not open to thinking this way.

Finally, a mistake made by all players in the healthcare business today is that their first goal is to make money. Changing economics, national debt, the number of uninsured, rising healthcare costs and the desire for industry and insurers to make money all put the patient last. This strategy will fail in the run long for all involved. Few understand this concept, but time will prove me correct. The key obligation for those in health care is to provide quality healthcare to the largest number of people at the lowest cost.

That goal will make lots of money for those who execute it because it is the RIGHT thing to do. It is focused on the needs of the public, the problems of the system and the doctor’s devotion to provide quality medicine.

No other group involved in health care except doctors can understand this principle fully, because doctors are the ones who care for the patients. That is not why you went into the profession of medicine. Stick with the RIGHT PRINCIPLES and you will do fine. Remember, “The patient comes first.”
SPECIAL REPORT

FLUORESCENCE-GUIDED RESECTION OF MALIGNANT GLIOMAS

Efforts are currently underway to perform a multicenter trial in North America to determine whether fluorescence-guided resection can result in more extensive resection of malignant gliomas in comparison with standard microsurgical resection. Most neurosurgeons would agree that performing a radical resection of a malignant glioma in a safe manner is the goal, regardless of the procedure. Currently, neuronavigation and intraoperative MRI have been helpful in achieving the best possible resection of malignant gliomas. Yet both of these technologies have important limitations. Neuronavigation relies on preoperative imaging and therefore is not as accurate once a craniotomy and tumor resection is performed due to shifting of the brain. Intraoperative MRI can provide

> REAL-TIME VISUALIZATION OF TUMOR BY FLUORESCENCE MAY POTENTIALLY BE MORE RELIABLE THAN THE USE OF NEURONAVIGATION AND STANDARD MICROSCOPIC “WHITE LIGHT” VISUALIZATION OF TUMOR. <

Figure 1. Fluorescence-guided resection of a glioblastoma multiforme (GBM) tumor. A., Preoperative axial T1-weighted MRI of the brain after gadolinium administration showing a right frontal contrast enhancing mass. B., Postoperative axial T1-weighted MRI of the brain revealing gross total resection of the right frontal mass using intraoperative fluorescence. C., Intraoperative microscopic view (white light) of tumor resection cavity. D., Intraoperative microscopic view of tumor fluorescence (shown by arrows) utilizing “blue light”. Figures kindly provided by Dr. David Roberts of Dartmouth-Hitchcock Medical Center, Lebanon, New Hampshire. Reproduced with permission from Van Meir EG, Hadjipanayis CG, Norden AD, Shu HK, Wen PY, Olson JJ. Exciting new advances in neuro-oncology: the avenue to a cure for malignant glioma. CA Cancer J Clin 2010;60:166-93.
imaging of the brain during tumor resection to avoid the effects of brain-shift and provide better information in the final stages of tumor resection. However, this technology is quite expensive, time-consuming and limited to a small number of major medical centers.

Fluorescence-guided resection of malignant gliomas relies on the light excitation of a fluorescent agent that preferentially accumulates in cancer cells for direct visualization (Figure 1). The oral pro-drug, known as 5-ALA (5-aminolevulinic acid), is metabolized by the heme biosynthesis pathway in malignant glioma cells into the fluorescent agent, protoporphyrin IX (PPIX) (Figure 2). Use of the operative microscope adapted for visualization of PPIX with “blue light” allows the neurosurgeon to visualize the tumor as “red” in color optimizing intraoperative tumor resection (Figure 3). Real-time visualization of tumor by fluorescence may potentially be more reliable than the use of neuronavigation and standard microscopic “white light” visualization of tumor (Figure 1). Minimal side effects have been reported after administration of 5-ALA; they include skin photosensitivity.

In Europe, the benefit of 5-ALA was demonstrated in a multicenter German trial, led by Dr. Walter Stummer. Patients with newly-diagnosed malignant gliomas were randomized to have surgery with standard microsurgery using “white light” or fluorescence-guided resection using “blue light” after oral administration of 5-ALA. All patients in this study underwent adjuvant radiotherapy after their surgery. The frequency of complete resections of tumors in patients was increased from 35% to 65% with the use of ALA. Furthermore, the randomized, controlled phase III study revealed a doubling of the six-month progression free survival in patients with malignant gliomas who underwent fluorescence-guided resection by ALA administration. Interim analysis resulted in the early termination of the trial with primary endpoints being the number of patients without contrast-enhancing tumor on MR (within 72 hours of surgery) and six-month progression free survival.

Upon completion of the German multicenter trial, 5-ALA was granted marketing authorization in Europe in 2007 as the agent known as Gliolan (photonamic GmbH & Co. KG, Wedel, Germany). Thousands of patients with malignant gliomas have undergone fluorescence-guided resections of their tumors in Europe confirming the safety of 5-ALA (Gliolan). Unfortunately, 5-ALA is only available in the United States in a small number of centers as an investigational new drug. Momentum is now in full swing to obtain FDA approval of 5-ALA (Gliolan) in the United States with a potential clinical trial for 2011. This trial would focus on the use of Gliolan as an intra-operative diagnostic agent to enhance the complete resection of malignant gliomas in a randomized comparison with standard microsurgery.

References:

INSIDE THE CNS

SECRETARY’S REPORT

The Congress of Neurological Surgeons (CNS) has had a celebratory 60th Anniversary year. Under the leadership of President Gerald E. Rodts, Jr., President-Elect Christopher C. Getch, Past-President P. David Adelson, Vice President Christopher E. Wolfia, Secretary Nathan R. Selden, and Treasurer Daniel K. Resnick, the CNS has continued its signature focus on premiere neurosurgical education, unparalleled member services and thoughtful public advocacy.

CNS Annual Meeting

The 2010 CNS Annual Meeting was held October 16-21 in the internationally fêted city of San Francisco. As suggested by its theme, the CNS Annual Meeting received unprecedented and record numbers of abstract submissions, which were presented at a ‘must see’ installment of the CNS Top Ten Abstracts, at the Neurosurgical Forum, and as CNS Digital Posters. All of this original neurosurgical science has been added to the archive of CNS Annual Meeting material available at the CNS University of Neurosurgery online.

Other special lecturers included Dr. Eric Topol, Director of the Scripps Translational Science Institute; Colonel Ronald Poropatich, Director of Advanced Technology Research for the US Army Medical Research Command; Colonel Rocco Armonda, Director of Neurosurgery at the Uniformed Services University of Health Sciences; Dr. Gregory Dumanian, expert in reinnervation in arm amputees; Dr. Eric Mann, Captain in the United States Public Health Service and FDA device regulator; and Dr. Bernard Lo, Director of the Program in Medical Ethics at the University of California, San Francisco.

The participation of the Korean Neurosurgical Society (KNS) as the 2010 International Partner Society at the CNS Annual Meeting was highlighted by addresses from KNS President Dr. Kyu-Sung Lee and by an International Leadership Lecture by Yoon-Woo Lee, the Chairman of the Board of Directors of Samsung Electronics.

In addition to an array of innovative, interactive educational programs, including CNS Consensus Sessions, the Annual Meeting Program included a wide variety of Practical Courses, Luncheon Seminars and Special Courses. The popular Live 3-D Cadaveric Demonstration of Cranial Surgical Approaches was joined by an equally compelling Live 3-D Cadaveric Demonstration of Spinal Surgical Approaches course, staffed by internationally renowned spinal surgeons. For the first year, the Annual Meeting also included a new Sunday scientific Opening Session and two Dinner Seminars.

For the third consecutive year, the CNS Annual Meeting received unprecedented and record numbers of abstract submissions, which were presented at a ‘must see’ installment of the CNS Top Ten Abstracts, at the Neurosurgical Forum, and as CNS Digital Posters. All of this original neurosurgical science has been added to the archive of CNS Annual Meeting material available at the CNS University of Neurosurgery online.

Finance & Administration

Careful financial management, prudent cost savings and efficient performance in each major area of organizational activity have benefited the financial position of the CNS, despite generally challenging financial times. In order to more accurately support the direct, marginal costs of member services, the CNS also raised its member dues for the first time in many years. CNS annual dues continue to compare very favorably to those of other major medical and surgical organizations. The CNS maintains tremendous additional member benefits beyond those (such as subscription to the journal NEUROSURGERY®) that are covered directly by dues payments.

The CNS also commenced a comprehensive review of its important public advocacy activities. Led by CNS Past-President Dr. Mark Hadley and Secretary Dr. Nathan Selden, the Public Advocacy and Review Committee (PARC) is charged with analyzing, strengthening and focusing the public advocacy missions of the CNS, and assuring the highest standards of regulatory compliance in an era of increasing government oversight of not-for-profit organizations. With the valuable participation of an additional five senior neurosurgical leaders and CNS Past-Presidents who serve on the Committee, the PARC will soon issue its full report and recommendations.

Education

The CNS remains committed to international neurosurgical education. Under the leadership of Drs. David Adelson and Saleem Abdulrauf, the CNS International Division is expanding. Our highly successful partnership with the Neurological Society of India (NSI) at the 2009 CNS Annual Meeting was followed by CNS participation in the NSI Annual Meeting held in Jaipur, India, in December 2010. The CNS is also co-
sponsoring resident education courses in Europe, as well as participation by European residents in the highly popular CNS 3-D Chief Resident Dissection course held each year in the United States. Other significant international collaborations are being planned. CNS international membership (particularly the International Vista member category) continues to climb.

Because neurosurgeons are among the busiest professionals, the CNS continues to introduce and expand learning opportunities that are conveniently available via internet connection from around the world. The Self Assessment in Neurological Surgery (SANS) continues to be a mainstay of the American Board of Neurological Surgery MOC process. In the Fall of 2010, the CNS SANS Committee, under the direction of Dr. Jason Sheehan, introduced an additional supplemental self-assessment module, SANS: Neurotrauma.

Under the auspices of the CNS Education Committee, chaired by Jamie Ullman, CNS members have access to a webinar series, interactive online sessions that draw on the expertise of faculty from every specialty and subspecialty area. The highly successful 2009-10 Tumor Webinar Series, presented in conjunction with the AANS/CNS Joint Section on Tumors, is only one example. Similarly, the online CNS University of Neurosurgery (led by Ashwini Sharan) and the CNS NeuroWiki (edited by Elad Levy) have continued to dramatically expand their offerings, which are available to learners at all stages of training and practice from any networked computer at any time. Technology infrastructure for these online activities plus maintenance of a completely redesigned CNS web site are directed by Michael Steinmetz and Brian Ragel. Under the direction of Alan Scarrow, MD, JD, the CNS has also undertaken many enhancements to its rigorous program of professional best practices, helping to assure the continued excellence of CNS educational and scientific programs.

**Fellowships**

The CNS also advanced its educational mission last year with the launch of a foundation for Industry Support for Innovation, Teaching and Education (InSITE). InSITE will continue the strong tradition of the CNS in supporting fellowship training for young neurosurgeons. The CNS will also continue to directly offer the prestigious Dandy, Cushing and Wilder Penfield fellowships, in order to help develop neurosurgical leaders of the future.

**Publications**

The CNS publications group has thrived over the past year. The official journal of the CNS, *NEUROSURGERY<sup>®</sup>*, continues as the highest-impact neurological journal in the world. The Editor-in-Chief, Nelson Oyesiku, has led the journal from strength to strength and introduced a number of improvements to the editorial process and structure, as well as cutting-edge online content features. *NEUROSURGERY<sup>®</sup>* truly serves as ‘the register of the neurosurgical meme.’ The *Congress Quarterly*, edited by Jim Harrop, continues to serve not only as the official membership publication of the Congress, but also as a highly topical update on social and professional developments in our specialty, while *Clinical Neurosurgery* (edited by Gerald Grant), highlights peer-reviewed information from our Annual Meeting.

**Advocacy**

Through partnership with the AANS, the CNS provides significant socioeconomic service and leadership to organized neurosurgery. The AANS/CNS Washington Office, under the direction of Katie Orrico, oversees many of these activities. In the last year, for example, CNS Executive Committee members have led the AANS/CNS Washington Committee Quality Improvement Workgroup (Dan Resnick) and Joint Guidelines Committee (Mark Linskey). The CNS continues to strongly support the Council of State Neurosurgical Societies (CSNS), which has recently undertaken a number of joint educational projects. The CNS Caucus of the CSNS has been invigorated under the skilled leadership of Dr. Charles Rosen. Finally, the CNS is exceptionally proud that neurosurgery’s representative to the American Medical Association, Peter Carmel, is now the first neurosurgeon ever to be chosen as President-elect of that organization.

**Membership**

As of 2010, CNS Membership continues to grow to record levels. There are currently 7,250 CNS members, including 3,255 Active members, 1,090 Resident members, 454 Active International members, and 567 International Vista members. Membership growth has been ably promoted by Committee Chair Zohar Ghogawala and Resident Chair Catherine Mazzola.

The officers and Executive Committee of the CNS are grateful for the experienced and highly diligent work undertaken by Executive Director Laurie Behncke and her very talented Headquarters Office staff on behalf of all members. Their tireless pursuit of excellence enables all CNS activities to go forward.

The CNS Executive Committee also warmly thanks Gerald ‘Rusty’ Rodts for his long and dedicated tenure of service to this organization. Finally, we also welcome Christopher Getch as the new CNS President.
The Congress of Neurological Surgeons has 7,250 members and of those, 1,090 are neurosurgical residents. Residents represent about 15% of our total membership and are an integral part of the CNS. Because the CNS is a world leader in neurosurgical education and innovation, the CNS is strongly committed to providing the best educational resources for residents in the United States, Canada and Mexico. Recently, the CNS introduced another membership category for international residents, called International Vista Resident membership. Currently, the CNS has 59 International Vista Resident members. The CNS web site www.cns.org provides accurate and up-to-date information on our membership statistics and is updated quarterly by our headquarters staff.

The CNS Resident Membership is available to residents in approved neurosurgical residency training programs. The American Board of Neurological Surgery (ABNS), the Royal College of Physicians and Surgeons in Canada, and the Mexican Council of Neurological Surgery accredited residency training programs are considered approved residencies. For a one-time application fee of twenty-five dollars, residents enjoy complimentary subscriptions to NEUROSURGERY®, Operative Neurosurgery, Clinical Neurosurgery and all supplements, as well as discounts on the CNS Annual Meetings and SANS Lifelong Learning. Membership applications are available online. The CNS University of Neurosurgery also provides an invaluable resource for residents at all levels of training, through a comprehensive image database, webinars, the Lecture Hall, suggested curricula and other tools for gaining and maintaining meaningful education and training in neurosurgery.

Upon completing his or her residency training, senior residents are promoted into the Transitional membership category, before becoming full Active members. Every year, about two hundred resident members are promoted to Transitional membership, as they progress to full Active members. Similarly, there are about 200 new neurosurgery residents enrolled into our Resident membership category annually. In FY10, at the end of June 2010, we had approved 219 new Resident Members for CNS membership. This made a total of 1,201 Resident members. The total number of neurosurgical residents enrolled in the CNS has increased every year.

Recently introduced, the International Vista Resident Membership category provides international residents an opportunity to participate in CNS activities. For annual dues of $50, any neurosurgical resident enrolled in an international neurosurgical training program outside North America can join the CNS. International fellows who have completed a residency training program are also allowed into this category of membership. International Vista Resident members are provided with internet access to NEUROSURGERY®, Operative Neurosurgery, Congress Quarterly, Clinical Neurosurgery and all supplements and CNS University of Neurosurgery. Reduced registration rates for our CNS Annual Meetings and savings on SANS Lifelong Learning are also benefits of International Vista Resident Membership.

Medical students interested in a career in neurosurgery, who are enrolled in Association of American Medical Colleges (AAMC) approved North American Medical Schools, may join CNS. Medical students enrolled in accredited medical schools approved by the American Osteopathic Association (AOA), or the Faculties of Medicine of Canada (AFMC) may also be accepted into the Medical Student membership category. Along with access to the CNS University of Neurosurgery, Medical Student Members are also given reduced rates for the CNS Annual Meeting registration and SANS Lifelong Learning. Through action by the CNS Executive Committee, the Medical Student Membership is now available to qualified medical students at no charge.

The membership benefits provided by the CNS for neurosurgical residents and interested medical students, both nationally and internationally, are remarkable. The CNS has fulfilled its mission statement by becoming an international leader in neurosurgical education, through innovative educational opportunities available to all neurosurgeons worldwide.
This patient is a 32-year old male with history of Bipolar Disorder. His roommate was a paranoid schizophrenic who had become non-compliant with his medications. The patient presented to our emergency room after his roommate enucleated the patient’s left eye using his fingers. The roommate was attempting to enucleate the right eye when repeated pleas from the patient finally ended the assault. On presentation the patient’s left eye globe was found to be hanging external to the orbit, tethered only by his stretched optic nerve. His right eye was severely proptotic. He was taken to the operating room by Ophthalmology where the left optic nerve was cut inside the globe. Prosthesis was placed. The right eye suffered significant retinal detachment and avulsion of the medial rectus. The patient lost functional vision in the right eye and was discharged to a facility for the blind. Coronal (Figure 1) and axial computed tomographic images (Figure 2, 3) demonstrate the enucleated left eye and the proptotic right eye. Axial magnetic resonance imaging (Figure 4) demonstrates a prosthetic left eye. 

Submitted by: Zachariah George, MD and Jamie S. Ullman, MD
Department of Neurosurgery
Mount Sinai School of Medicine
Call for Abstracts!

CONGRESS OF NEUROLOGICAL SURGEONS
2011 ANNUAL MEETING

Be a vital part of the 2011 CNS Annual Meeting and submit your abstract at www.cns.org!

Deadline: March 17, 2011

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Russell R. Lonser, MD
Annual Meeting Chairman

Ganesh Rao, MD
Scientific Program Chairman

H. Hunt Batjer, MD
Honored Guest

Washington, DC         October 1-6, 2011