EDITOR’S NOTE

The CNSQ staff and I would like to welcome the readership to enjoy the recent changes that we have made to the CNSQ as seen throughout this issue. As always, we encourage and appreciate all readers’ active input, since this is your magazine. As was seen in our previous issue, we have made some modifications, which we do hope will further stimulate your interests and reinforce your readership.

This spring issue consists of Dr. Daniel Resnick’s informative and inclusive President’s Message and is strengthened by CEO David Westman’s piece about the overview of our society.

This issue is dedicated to neurosurgery’s commitment to improving pain treatments as well as the overall condition of this disease process. The CNS and neurosurgery as a whole have long been leaders in the field of neuroscience. Dr. Alon Y. Mogilner reviews neurosurgical chronic pain patients and when to “just say no.” In addition, Dr. Deborah L. Benzil discusses the New York State i-STOP policy and why all neurosurgeons should be involved. Dr. Garrett Zoeller appraises on the strategies of pain management in the pediatric population. Drs. Catherine A. Mazzola and Edward J. Zampella analyze medical marijuana and how it is perceived by the neurosurgical community and patients alike; particularly how this “medicine” could be applied to chronic pain patients. Drs. Julie G. Plitisis and Julia Prusik discuss New York State Medicaid decisions on reimbursing intrathecal pumps. Further, we are honored to have Dr. Julie G. Plitisis, chairperson of the AANS/CNS Pain Section, discuss the Pain Section in her article What’s New in Pain? Lastly, in order to continue with our theme of controversies, we have a debate on the case of intrathecal pumps with Dr. William S. Rosenberg discussing the advantages and Dr. Ashwin Viswanathan debating the contention associated with the use of intrathecal pain pumps.

In addition, we do have two articles concerning functional treatments, one being, Yes...I Will Be Using a Laser! Laser interstitial thermal therapy (LITT) for tumors and epileptic foci by Dr. Robert Gross, and occipital nerve stimulation by Drs. Andre Machado and Sean J. Nagel.

In the featured sections, we are very fortunate to have Dr. Julian Bailes discuss how to deal with concussions in young athletes. In addition, a review by Dr. Christopher M. Maulucci examining hereditary neuropathies and the repetitive issue of pressing palsies in this patient population. A recent legislated tribute to the CNS advocated spinal cord injury guidelines was reviewed by Dr. Timothy Rankin.

The CNS is excited and looking forward to the 2014 annual meeting in Boston, Massachusetts. We are privileged to have Drs. Ashwini Sharan and Elad I. Levy discussing the highlights to this exciting program. In addition, Drs. Russell R. Lonser and Steve Lothary discuss the CNS Treasurer’s Report. Dr. Krystal Tomei reviews the 2014 CNS Resident and Medical Student Committee Report. The CNS has been rapidly expanding in terms of education, particularly on the international stage. Dr. Bernard R. Bendok and I highlight the CNS’s simulation-based neurosurgical training program and discuss this continued expansion and growth. I would like to thank Anne Davis for her assistance with the front cover choice. Lastly, the CNS back page reviews another interesting clinical case, which highlights visual aspects.

In summary, CNS is very appreciative of all the members who help contribute to this journal. In addition, we once again seek the memberships, directions, as well as contributions.

Thank you once again.

A Special Thank You
For nearly six years, the Congress of Neurological Surgeons has been privileged to have April L. Booze serve as the Manager of Marketing and Member Communications and Congress Quarterly Staff Editor. April has been such a valuable part of our team, always demonstrating excellence and leadership, and for that, we thank her for all of her hard work and dedication over the years.
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CNSQ BACK PAGE

Images in Neurosurgery
Growing up, I spent many hours sprawled on the carpet in front of my parents’ console stereo listening to classic rock and roll. This was a furniture-sized apparatus the size of a large dresser with a hinged lid that when lifted, exposed the turntable recessed deep inside its wooden bowels. I can easily recall the mixed aroma of mahogany and ozone from the warm electronics. As a child, being allowed to manipulate the device was a privilege and a bit of a technological feat given the fact that it was quite difficult to reach the turntable when less than four feet tall! My care in manipulating the stylus arm to avoid damage to the stereo or to the LP was quite similar to how I now treat the placement of Teflon felt between the superior cerebellar artery and the fifth nerve. In any case, among my favorite bands is The Moody Blues. Probably best known today for the orchestral Days of Future Passed, they created a series of thematic albums in the late 1960s and early 1970s, the titles of which read like an autobiography of a troubled youth: Days of Future Passed, In Search of the Lost Chord, On the Threshold of a Dream, To Our Children’s Children, Every Good Boy Deserves Favour, A Question of Balance and Seventh Sojourn.

To say that this music struck a chord would be a significant understatement. The phrase “A Question of Balance” has been used in multiple contexts to connote the resolution of a conflict where there are compelling forces diametrically opposed. The Moody Blues explored the theme of youthful individualism conflicting with a seemingly immutable natural order in a coming-of-age parable: Question is a loud, boisterous statement of wonder and is immediately followed by the grounding How Is It (We Are Here). A nihilistic, The Tide Rushes In follows, describing an apparently Sisyphean struggle against irrelevance. The chorus of this song describes the ocean washing lovingly constructed sand castles away. Fittingly, this song is followed by the self-deprecating Don’t You Feel Small.

A struggle toward self-awareness continues through the album, eventually culminating in the mature Melancholy Man who finally achieves Balance.

The profession of neurosurgery is in many ways a troubled youth. We struggle to define our place in society and to manage multiple legitimate, but conflicting, agendas. We are called upon by society to perform spectacular technical procedures, yet limited by law in the hours that we can use to train to do these procedures. We help develop cutting-edge tools; revolutionizing our ability to diagnose and treat life-altering disease, yet are limited in the application of these tools by seemingly insurmountable regulatory hurdles. All of us face daily decisions regarding the appropriateness of care — is a redo craniotomy a good idea for a recurrent, high-grade glioma? Is revision fusion for axial pain ever worthwhile? Do we really need a follow-up CT on patients with minor head injuries? These issues merely scratch the surface. In addition to concerns regarding every facet of clinical neurosurgery, we must find balance between defensive medicine and cost effectiveness, technological advances and patient safety as well as, professional and personal life. This year’s Annual Meeting will focus on negotiating resolution of legitimate and conflicting drivers of neurosurgeon behavior. Look for more details in the article on page 26. I look forward to welcoming you, October 18-22, in Boston.
The Congress of Neurological Surgeons has a proud history as the global leader in neurosurgical education. This past year, the CNS has made a concerted effort to expand our international reach – making good on a commitment the Executive Committee and I have been focused on since my joining the CNS in 2012. The process started by engaging an external consultant to help us define a multiyear international strategy. With the strategy finalized and ratified by the Executive Committee, we have proceeded with implementation along numerous fronts, including ad hoc collaborations with partner societies and federations, participating and exhibiting at international meetings, as well as the launch and growth of our CNS-SIM Simulation program.

Feet on the Ground
Since September of 2013, I’ve had the privilege of attending numerous international meetings, including the 2013 European Association of Neurosurgical Societies (EANS) Annual Meeting in Tel Aviv, Israel; the Neurological Society of India (NSI) Conference 2013 in Mumbai, India; and the 2013 World Federation of Neurosurgical Societies (WFNS) World Congress of Neurosurgery in Seoul, Korea. At each venue I attended meetings with the leaders of various international neurosurgical societies – discussing opportunities for “win-win” collaboration focusing on education delivery. However, I spent most of my time manning the CNS booth in the three exhibit halls. This gave me invaluable opportunities to connect with individual neurosurgeons from over 60 countries! I was able to hear directly from members and non-members alike and offer immediate information on how the CNS provides neurosurgeons at each stage in their career and from every corner of the globe the education they need to continue advancing neurosurgery and improving lives. Through our various collaborations and partnerships, we will continue to expand our international presence so we can be more responsive and truly be the global organization our founders envisioned over 60 years ago.

Increasing International Members’ Impact
The CNS is pleased to report that we have two new memorandums of understanding (MOUs) with the European Association of Neurosurgical Societies and the Neurological Society of India. The EANS MOU provides members living in North America, Israel, Europe and Turkey the opportunity to participate in a partner membership agreement which benefits our members in North America by receiving special membership rates to EANS, while providing special CNS membership options to members of EANS. The NSI MOU includes a plethora of collaboration initiatives. We look forward to the numerous options and collaboration these and other future MOUs with other neurosurgical societies will provide our members to advance the field of neurosurgery worldwide. Contact membership@1cns.org with any questions on these new opportunities.

Global Simulation Education
The CNS was pleased to expand our CNS-SIM curriculum last year at the EANS Resident Vascular Neurosurgery Course in Prague (as you read about in the Winter issue of the Congress Quarterly) as well as to the Neurological Society of India Conference 2013 in Mumbai. Simulation training is an increasingly important requirement for learning and certification in medical specialties. Our comprehensive platform utilizes the latest in simulation technology in conjunction with a standardized curriculum, task validation and prospective objective assessments. The CNS-SIM curriculum includes web-based, virtual reality, haptic feedback devices, as well as physical models for the spine, skull base, trauma, vascular, endovascular and functional sub-specialties. Multiple additional partnerships utilizing the CNS-SIM curriculum are being planned with our international colleagues and partner societies across the world.

Our Commitment to Philanthropic Education
The CNS recognizes that many neurosurgeons, especially those in the world’s least economically developed countries, lack access to the education they need for serve their patients. With this in mind, in February of 2014 the CNS was pleased to launch our World Wide Webinar Program, which provides complimentary access to our vast Webinar Library for members and non-members from the world’s 36 least economically developed countries (identified by the World Bank’s Data and Income Statistics). Members in other countries will continue to access CNS webinars complimentarily, and non-members from these countries will access the CNS webinars at the non-member rates. This new feature allows the CNS to truly exemplify our mission and provide the educational resources necessary to neurosurgeons in need.

As Dr. James Gay, one of our founders, reminds us, “The word Congress was all inclusive American, European, Asian, South American (intercontinental).” We are truly excited about what the future holds at the CNS as we make good on the promise our founders instilled in us as the Congress of Neurological Surgeons.
Neurosurgery for Chronic Pain: When to “Just Say No”

The arrival of a pain neurosurgeon to a given institution/community is usually met by the local medical establishment with a combination of curiosity: What exactly do you do? Bewilderment: Why in the world do you want to take care of those patients? And relief: I have a few patients I would love to send your way! The reluctance of many neurosurgeons to deal with these difficult patients (for reasons which seem obvious) provides an opportunity for those willing to do so to rapidly develop a practice and referral base. Moreover, as neuromodulation procedures remain at the lowest rung of reimbursement in our field, many of our colleagues, when asked to assist an interventional pain physician with a patient or procedure, will do so only reluctantly, and are thus happy to refer them to interested colleagues.

Therefore, a young and aggressive pain neurosurgeon may quickly find his or her office filled with patients requesting yet another surgical procedure to alleviate their physical and emotional distress. Most current surgical interventions for chronic non-malignant pain involve neuromodulation techniques. The established safety of neuromodulation suggests that, when in doubt, one may lead towards intervening, given the low risk of doing so and the potential benefit of helping someone who has remained refractory to all other treatments.

As a functional/pain neurosurgeon firmly ensconced in mid-career, my own experience to date would suggest that the most intelligent decisions I have made over time are when not to intervene. A completely non-scientific review of my decision making and experience suggests a number of recurring themes and variations:

1) Beware the unknown/inexperienced pain physician’s referral for a neurostimulator implant:

Just as pain procedures are at the lowest rung of neurosurgical reimbursement, they remain — for now — at the highest rung of reimbursement for non-surgeon interventional pain physicians. This creates an environment where stimulator trials are frequently performed on inappropriate patients and referred for implant with a report of a successful trial. The most common such scenario is that of a patient with predominantly mechanical axial back pain or neck pain, as opposed to radicular pain. Moreover, psychosocial issues such as severe depression, excessive narcotic use, pending litigation and personality disorders may portend a zero likelihood of success down the road, notwithstanding the report of the trial. Such patients may present for a permanent implant with a report of a successful trial, and it may place us in the very uncomfortable situation of turning down an implant despite assurances that the trial was successful.

I have been told by referring physicians that, at times, I have “scared away” patients from a permanent implant after having a frank discussion with the patient as to the long-term likelihood of success after surgery — I would not be surprised if I have also lost referrals from physicians for similar reasons. Nonetheless, if your experience and training suggests a disagreement with the referring physician, a frank discussion with the patient and referrer would be the appropriate course of action.

2) Review all imaging yourself, regardless of the referring physician and radiology reading.

One must not forget that neurostimulator device implant surgery, specifically an epidural spinal cord stimulator lead implant, is in fact the antithesis of a routinely performed neurosurgi-
cal procedure: we are performing a neural compression procedure, as opposed to the usual decompression procedures. Thus, a report of a thoracic or cervical spine MRI stating that there is no cord compression may be technically true, but nonetheless the anatomy may not be favorable for placing a paddle electrode without putting the patient in harm’s way. I have had the opportunity to review a significant number of malpractice suits where the end result was spinal cord injury following paddle lead placement. A recurring theme in these cases was the lack of appreciation of mild/moderate spinal stenosis which would likely have remained asymptomatic, but presented disastously after paddle lead placement.

3) Carefully classify and assess facial pain patients prior to recommending intervention.
Despite the technical ease of most interventional pain procedures for facial pain, only a small number of pain physicians are comfortable dealing with these conditions, and neurosurgeons remain primary in the care and treatment of these patients. The ignorance in the general medical community as to the appropriate classification schemes for facial pain frequently results in patients being referred with the diagnosis of trigeminal neuralgia, having failed the usual interventions, while a simple history would have revealed a different diagnosis, for example, trigeminal neuropathic pain. This is compounded by the fact that many neurosurgeons that perform percutaneous trigeminal neurolytic procedures are frequently unaware of the distinctions between the various forms of facial pain. A further destructive procedure, while easy to perform, may be devastating to a patient with trigeminal neuropathic pain, while neuromodulation techniques have not shown to be efficacious for trigeminal neuralgia. The Burchiel classification\(^1\) is, in my opinion, the most appropriate scheme, and an understanding and utilization of this scheme is essential prior to recommending — or dissuading a patient from — further intervention.

4) Take ownership of your patients.
The difference between a neurosurgeon specializing in pain and a neurosurgeon who dabbles in the field is one of ownership. Even if you are confident that a patient will follow-up with another physician as they well should, one should continue to be involved with every patient with an implantable pain device indefinitely, or at the very least ensure that a qualified colleague is doing so.

And finally:

5) Do not be afraid to tell a patient and the referring physician that you do not recommend any (further) intervention.
At the risk of restating the obvious, if a surgical intervention is highly unlikely to benefit the patient, resist the urge to proceed, even if others would be willing to do so. In addition to being the correct thing for the patient, prudent and appropriate utilization of high-cost surgery and implantable devices will be beneficial to our specialty in the long term.

References
We All Need to i-STOP

If you ever get the call, it will change your life forever. I did. It was the Saturday following Thanksgiving when I learned my 18-year-old niece, an ambitious freshman at Drexel University, was found dead after an overdose of oxycodone. My experience is far from unique. In 2010, drug-related fatalities surpassed Motor Vehicle Accidents (MVAs) as the cause of death in 29 states. Since that fateful day in 2011, I never write a prescription for these powerful drugs without pausing a moment to be sure I am doing the right thing. Now, an innovative program known as i-STOP in New York has provided the first statewide mandatory registry for narcotics.

In 1995, the American Pain Society declared pain as the fifth vital sign and by 2000, The Joint Commission (JCAHO) had published their guidelines for aggressively addressing this issue as a cornerstone for accreditation. During the following decade, sales and prescriptions of narcotic painkillers have quadrupled. According to the CDC, in West Virginia, New Mexico, Nevada and Kentucky, drug-related deaths have topped 20 in 100,000 residents. For every one death there are ten admissions for abuse, 32 ER visits for abuse or misuse, 130 individuals who abused or are dependent and 825 non-medical users. Unfortunately, most of the abused medications can be directly linked to physician prescriptions.

As a result of these staggering statistics, states have begun to introduce mechanisms to augment existing Schedule III and IV regulations, which were clearly insufficient to curtail abuse. Currently, 36 states have operational Prescription Drug Monitoring Programs (PDMPs) — state-run electronic databases used to track controlled substance prescriptions. They are designed to prevent abuse, doctor-shopping and identification of high-risk behaviors. Vermont and New Mexico are felt to have the strictest rules designed to prevent prescription drug abuse (according to the Trust for America’s Health), including sharing information across state lines; but even in these states, death rates continue to rise.

In 2011, the Internet System for Tracking Overprescribing Act, or i-STOP, was introduced in New York and passed unanimously in 2012. The goal is to provide data to prevent dangerous drug interactions, identify potential abuse and help those with addictions. i-STOP is the first state program that mandates physician use of the database before issuing a Schedule II, II or IV substance. The program also requires real-time reporting by pharmacists for these schedules — one of just two states to do so. Beginning in December 2014, e-Rx of all controlled substances will also be mandated; currently, New York and other states specifically prohibit e-Rx for controlled substances. The legislation tinkered with the schedules — notably moving hydrocodone to Schedule II — and established a safe repository for unused/expired controlled prescription drugs.
The reality for individual physicians is that each time a controlled substance prescription is issued, the physician (or their designate) must sign onto the i-STOP site, enter name, sex and date of birth for the patient and then read the data presented. Currently, there are no further requirements, such as reporting of suspicious activity or mandates against issuing a prescription if other medications are found. The site does allow for easy reporting if it is deemed warranted.

As a neurosurgeon, I regularly prescribe controlled substances for the short term after craniotomies, simple spine operations and peripheral nerve surgery. Longer term (up to three months) prescriptions may be issued for those undergoing complex spine reconstruction. I have been using i-STOP for several months. My biggest complaint is not the 3-4 minutes it takes to sign in, enter the data and fulfill my mandate, but rather that the site has so far proven useless — with many of my own patients’ medications not being listed. I also know that medications issued just ten miles away in Connecticut or New Jersey are not included in the information I can review. So although it is a step in the right direction, it is a very small one for such a massive problem.

Adequately addressing this public health issue will require far more than state PDMPs. Several groups have made the following recommendations:

- PDMPs need to be expanded beyond state lines, as traditional “doctor shopping” does not respect state lines
- PDMPs should have the technology to focus on patients at highest risk and prescribers who deviate from accepted medical practice
- PDMPs must be directly linked to EHR for practical implementation and compliance
- Patient claims should also routinely be reviewed (CMS, Workman’s Comp, Insurances) to insure coordination of care and prescriptions
- Clear definition of safe and effective use of prescription drugs should be established based on high quality evidence
- Better access (including appropriate reimbursement) to substance abuse treatment is essential

**Scary Facts About Non-Medical Use of Rx Drugs**

- One in six teens have used
- 1.5 million American kids have abused
- One in three teens have a close friend who abuses
- More deaths from overdose than MVAs in 29 states
- Highest rate in males aged 25-54
- Rate among women rising faster than that in men
- 1.9 million Americans meet criteria of abuse
- Enough painkillers prescribed in 2010 to medicate every American around-the-clock for 30 days!
Pain Management in Pediatrics

Pain strongly affects the physiological and emotional well-being of the pediatric population, and as such, poor pain control may adversely affect a child both physically and psychologically. Pediatric patients historically have had insufficient pain management, the reasons for which were outlined in a joint statement in 2001 by the American Academy of Pediatrics and the American Pain Society:1

1. The myth that children suffer less from pain or feel it differently than adults.
2. The lack of routine and quantifiable pain assessments in children.
3. The lack of knowledge regarding proper pediatric treatment modalities and dosing of analgesics.
4. Concerns surrounding possible adverse effects of pain medications, including respiratory compromise and narcotic dependence.
5. The notion that pediatric pain prevention requires overwhelming time and effort.

Neuroscientists have demonstrated that nociception may be processed by the human nervous system prior to birth, and therefore, infants and young children clearly experience pain. The combination of a more robust inflammatory response and an underdeveloped central inhibitory response in children may actually produce a stronger reaction to painful stimuli than is seen in adults. This may lead to long-term negative consequences, such as a lowered pain tolerance following even minor pain-producing events.2 Personal beliefs held by parents and health care professionals about the value of pain in developing character in the child should not overshadow the importance of identifying and treating pain in young patients.

The first essential step in treating pediatric pain is the assessment of its severity. Multiple reliable pain assessment scales have been developed for use amongst variously aged patient populations based on the cognitive, behavioral, emotional and psychosocial milestones achieved by those patients. For example, the FLACC (Face, Legs, Activity, Cry and Consolability) Scale, which has been validated for patients between two months and seven years of age, allows medical staff to quantify a child’s pain level by scoring observed behaviors over several minutes, such as the presence of a grimace or frequency of limb movement.3 Other scales in preterm and neonatal age groups may rely on physiologic parameters, such as the heart rate, to determine the patient’s degree of pain. Self-reporting scales may be used once the patient is old enough to communicate; the Faces Scale depicts ten faces of varying levels of discomfort from which the patient may choose, while the Poker Chip Tool offers the child the opportunity to show the observer how many “pieces of hurt” he or she may have.

In recent years, many major pediatric medical centers have been moving toward offering a multidisciplinary approach to pain management by providing teams of pediatricians, advanced practice nurses, anesthesiologists, psychologists, physical and occupational therapists and child-life specialists to manage their patients with both pharmacologic and non-pharmacologic treatments. Anxiety and anticipation of painful stimuli have been shown to make painful medical procedures even more distressful for the patient, and cognitive-behavioral interventions may help considerably reduce the emotional experience of pain. A parent holding their child’s hand during a painful procedure, using distraction techniques such as focused breathing or mental imagery and offering prizes for mastery of the emotional response to pain are all excellent tools that are simple, rapid and without adverse effects.

A number of non-opioid medications are available for treatment of acute and chronic pain. The most common pain medication used in the pediatric population is acetaminophen, as it is effective in treating mild-to-moderate
pain and has limited side effects. It is usually dosed at 10-15 mg/kg every 4-6 hours, up to a maximum 75 mg/kg/day to prevent hepatotoxicity. NSAIDs such as oral ibuprofen (5-10 mg/kg every 6 hours; maximum 40 mg/kg/day) and intravenous ketorolac (0.25-0.5 mg/kg every 6 hours; maximum 2 mg/kg/day) have few side effects in children as compared to adults, particularly in the acute setting. Additionally, around-the-clock administration of acetaminophen or NSAIDs may help significantly limit the amount of narcotics necessary to achieve adequate pain control, particularly in the immediate postoperative period.

As in adults, a decent number of narcotic medications, each with its own unique efficacy and dosing regimen, are available for use in children, although special mention of several is merited. Meperidine, as in adults, is metabolized to normeperidine, which may cause seizures in predisposed neurosurgical patients; therefore, it typically is not used in this population. Codeine, once a popularly prescribed medication for children given its perceived (although unfounded) lack of adverse effects (such as respiratory depression) when compared to other opioids, is falling out of favor, likely due to its wide variability in efficacy, which depends on its metabolism of morphine by the liver. Hepatic enzyme activity levels have been shown to vary widely between “slow” and “ultra-rapid” metabolizers, and typical codeine doses have been linked to a few pediatric deaths in such fast metabolizers. Tramadol combines μ-opioid agonist activity with inhibition of norepinephrine and serotonin reuptake, which offers decent analgesia while causing less dependence and abuse potential, although it may cause serotonin syn-

The mode of medication administration is as important as the type of medication and its route of delivery. Patient-controlled analgesia (PCA) allows for a preset dose of a chosen medication to be delivered intravenously to the patient with a maximum rate of allowance, enabling the patient to receive multiple, frequent, small boluses of drug delivery for maximum pain control while limiting the potential for respiratory depression and other adverse effects. It has been shown to be quite efficacious in patients over five years of age who are cognitively normal, leading to superior pain control than intermittent intravenous boluses. While some controversy exists over the potential for error with a “PCA by proxy” system, nurse-controlled analgesia (NCA) may be an option for children who do not possess the physical or mental capability of controlling their own pain medication.

In addition to inpatient and outpatient acute pain management consultation services, several hospitals have created chronic pain rehabilitation programs (termed “biopsychosocial therapy”) that manage children with intractable pain. These programs routinely last one to two months and combine medication management (and, when useful, nerve blocks) with daily intensive physical and occupational therapy in addition to psychotherapy, family therapy and educational provisions to help the patient maintain a stable academic standing.

Pain is a subjective experience that is molded by the sensory, emotional, cognitive and behavioral capabilities of each patient, which may vary significantly amongst children of different ages. A substantial amount of insight into pediatric pain has been achieved through research in recent years, yet universal application of this knowledge has yet to be seen. Through continued research on pediatric pain and institution of guidelines on pain management, we may achieve a more effective approach to controlling pain in the pediatric population.

References
“Yes...I WILL Be Using A Laser!”: Laser Interstitial Thermal Therapy (LITT) for Tumors and Epileptic Foci

I distinctly remember being a first year neurosurgery resident consenting a patient for a resection of a meningioma. When I was done, she asked: “Will you be using a laser?” Suppressing a laugh, I proceeded to explain that cautery (“What is that?”) and ultrasonic aspiration (“What is that?”) were more effective tools in the removal of tumors. First described in 1959 and introduced into neurosurgical practice in various incarnations in the ensuing decades, this “high tech” tool captured the public imagination to a greater extent than its actual usefulness as a neurological instrument. Depending on various factors, including the wavelength of light used, the laser produces photovaporization (cutting) and photocoagulation of tissue, and has been instantiated mainly as a handheld or microscope-mounted device. Ergonomic and practical considerations, however, have limited the enthusiasm for the use of lasers by neurosurgeons, and their use has substantially waned. The recent introduction of a flexible CO2 laser using optical fibers and omnidirectional mirrors may increase its usage as a handheld device.

In contrast to the more familiar use of lasers externally to the surface of tissues, in laser interstitial thermal therapy (LITT), the laser energy is delivered within tissue via implanted optical fibers. Thus, the delivered photons scatter through the tissue and lead to local heating and photocoagulative necrosis and devascularization. LITT has undergone successive developments since first used on cerebral gliomas more than 20 years ago with the Nd:YAG laser. Thermal damage is a temperature-dependent process: Below 43°C tissue is not damaged regardless of exposure time; tissue heated from 44° to 59° undergoes thermal damage in a time-dependent manner; tissue heated from 60° to 100° undergoes instantaneous denaturation of proteins and thermocoagulation; and above 100° tissue is vaporized. A critical advance, therefore, was the coupling of LITT to MR thermal imaging (MRTI), first qualitative and then quantitative using phase mapping, to allow real-time monitoring of tissue heating of both the region being ablated as well as nearby tissue at risk to be preserved.

A number of recent developments have significantly advanced the usefulness and usability of LITT. First, the advent of the diode semiconductor laser allows for a wider range of wavelengths than was previously available, and has a superior ergonomic profile allowing it to be readily adapted to the space-limited MRI environment. Second, cooled catheters (CO–2 or saline) allow greater control of the heating, allowing larger lesions with no carbonization and overheating events. Third, an automated or surgeon-controlled feedback loop has been incorporated that can monitor temperatures anywhere in the imaging planes and shut off the laser should predetermined limits be exceeded. Finally, accurate real-time estimates of the thermal damage zone have been incorporated using a time and temperature calculation based on the Arrhenius equation.

Two systems incorporating these advances have recently come to market helping to drive progress forward in the use of the LITT technology (Figure 1: Visualase® MRI-guided Laser Ablation Technology, Visualase Inc.; Figure 2: NeuroBlate®, Monteris® Medical Corp.). Both use diode lasers, cooled catheters, real-time MRTI and damage map estimations. They differ in several features, however. The Visualase system uses a 1.65 mm (outer diameter) saline-cooled catheter, a laser fiber with a diffusing tip that produces an elliptical light emission, and a 980 nm diode laser. NeuroBlate uses a 1064 nm diode laser 3.3 mm delivered via a CO2-cooled laser assembly, with a perpendicular, side-firing sapphire tip that can be rotated for segmental light delivery or a diffusing tip that produces a spherical delivery. The 980 nm light has greater water absorbance leading to less light scattering with much faster heating, and resultant sharper demarcation zones between damaged and preserved tissues, whereas the 1064 nm laser has deeper tissue penetration, and can produce larger lesions with a single trajectory. Another difference between the two systems is the implantation technique. Whereas the Visualase system uses a stereotactically (e.g., frame or frameless) implanted bone anchor placed at any entry point on the skull and through which the fiber assembly is passed, NeuroBlate typically utilizes a probe driver (with remote controls for surgeon-directed rotation and translation) mounted upon a propietary MRI-compatible trajectory guidance device (AXiiS®) for laser probe implantation, but can also use the StarFix microframe to facilitate epilepsy and multiple trajectory applications.

Recent clinical studies have generated a great deal of interest in the present LITT technologies. Both systems have been used to perform laser ablations on patients with a variety of neoplastic lesions. The first report was of a series of seven patients with 15 brain metastases who underwent LITT with the Visualase laser, with no recurrences in the lesioned sites occurring out to 30 months afterwards. Both systems have now been used for tumor recurrence after glioblastoma resection, radiation necrosis, and for a variety of other tumors. The Visualase system has also been used to treat epileptic foci. Curry et al. reported the initial five patients, all pediatric, with hypothalamic hamartomas (2), cortical dysplasia (1), cortical...
Recently they reported a series of 14 patients with hypothalamic hamartomas, 12 (86%) of whom are seizure-free at mean of 14 months without any surgical or neurological complications. Many pediatric centers are now performing LITT for a variety of lesions as well as for non-lesional epilepsy. The NeuroBlate system was also recently used for a case of non-lesional epilepsy localized to the insula. In adults, mesial temporal lobe epilepsy is much more prevalent, and early results show great promise. The multicenter experience was recently reported at the annual meeting of the American Epilepsy Society, showing 58% of 64 patients becoming seizure-free for at least six months following surgery, improving to 67% in the most recent cohort (N=33) reflecting ascendance of the learning curve. Moreover, patients with MTLE treated by LITT experienced fewer cognitive sequelae than those undergoing standard open resections, and also are discharged sooner and with significantly less perioperative discomfort.

Stereotactic laser ablation using LITT holds great promise as a minimally invasive procedure for treatment of neoplasms, radiation necrosis and of a variety of types of epileptic foci. Of course, more data is required before this new technique can be fully adopted. Towards that end, prospective multicenter trials are being carried out or will soon be launched for both treatment of brain neoplasms and MTLE.

**References**


Dr. Gross receives research funding from Visualase, Inc., which develops products related to the research described in this paper. In addition, the author serves as a consultant to Visualase, Inc. and receives compensation for these services. The terms of this arrangement have been reviewed and approved by Emory University in accordance with its conflict of interest policies.
Occipital nerve stimulation was pioneered nearly 15 years ago by Weiner. It has significantly impacted the field of chronic pain management and neuromodulation as a promising therapy for patients with chronic headaches including cluster headaches and migraines. It is frequently used by clinicians in North America, Europe and other parts of the world to manage patients with pharmacologically refractory conditions. As for other neurostimulation therapies, occipital stimulation can be accomplished with percutaneous cylindrical leads (Figure) or paddle leads connected to a pulse generator. Typical areas for implantation of the generator include the infraclavicular area, in a fashion similar to the generators for deep brain stimulation or the lumbar and posterior hip areas in a fashion similar to spinal cord stimulation. Despite significant gains in popularity, the procedure remains “off label” in the United States. Several studies, both prospective and retrospective, controlled and open label have evaluated the safety and efficacy of occipital nerve stimulation. While the safety of occipital nerve stimulation is not much disputed and there is a growing body of evidence and experience supporting its efficacy for occipital neuralgia, the extent and durability of its effects in patients with migraines is still under investigation. Here, we briefly review two recent blinded randomized controlled studies evaluating the efficacy of occipital nerve stimulation for migraines.

Saper and colleagues reported in 2011\(^1\) on the results of the ONSTIM study, a well-designed prospective, randomized, blinded, controlled, industry-sponsored study of occipital nerve stimulation in adult patients with chronic, frequent

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> OCCIPITAL NERVE STIMULATION HAS SIGNIFICANTLY IMPACTED THE FIELD OF CHRONIC PAIN MANAGEMENT AND NEUROMODULATION AS A PROMISING THERAPY FOR PATIENTS WITH CHRONIC HEADACHES INCLUDING CLUSTER HEADACHES AND MIGRAINES. <
and medically refractory migraines. Seventy-five patients that reported benefit from an occipital nerve block were randomized to one of three treatment groups: medical management, adjustable stimulation and preset, non-adjustable stimulation. Patients who did not respond to the block also received occipital nerve stimulation, but in an ancillary group. Disease duration, disability scores and headache frequency were similar across groups. Patients receiving adjustable stimulation reported a mean improvement of 27% at three months follow-up compared to preoperative baseline while those undergoing medical management reported an average 4.5% improvement. Patients receiving preset stimulation (parameters could not be adjusted) improved only 8.8%. Interestingly, the five patients who did not improve with occipital nerve block and were enrolled in the ancillary group had a mean improvement of 40%, indicating that local anesthetic blocks are not good predictors of response to occipital nerve stimulation. When analyzing the data in terms of percentage of individuals achieving 50% reduction in days with headaches, the authors found that approximately 40% of patients undergoing adjustable stimulation achieved this response criterion. None of the patients in the medical management group achieved the 50% response level. Although this study failed to meet the intended endpoint of 50% improvement in 50% of patients, it indicated that occipital nerve stimulation could be efficacious in a select group of patients with medically intractable migraines. The most common device-related adverse effect was lead migration, reported in 24% of patients. This high percentage of failure to adequately deliver stimulation to the targets may have prevented a more positive outcome.

Silberstein and colleagues reported last year on another industry-sponsored, randomized, controlled, double-blinded study of occipital nerve stimulation in patients with chronic and medically refractory migraines. One hundred seventy-seven patients were enrolled, evaluated and then underwent a trial of occipital stimulation with externalized leads. Twenty patients failed to achieve a 50% improvement and exited the study. One hundred fifty-seven patients were implanted with the medical device and were randomized 2:1 (active: control). Patients in the active group were programmed for adequate stimulation. Patients in the control group were given a sham programmer that did not communicate with the pulse generator. As for the Saper et al. study, patient characteristics were similar between the groups, with similar severity and duration of disease. Response was defined as a 50% reduction in mean daily pain reported by the visual analog scale. No difference in response rate was identified between the groups, with 17% of patients in the active group achieving 50% pain relief compared to 13.5% in the control group. The authors then performed a continuous proportion responder analysis to search for possible inter-group differences at different levels of pain relief. A significant difference was found at the 10, 20 and 30% pain relief levels. Approximately 40% of patients receiving active stimulation reported 30% pain improvement in relation to the pre-stimulation baseline compared to approximately 15% of patients achieving the same level of response in the control group. Similar results were seen when measuring the proportion of patients with 30% reduction in headache frequency. Migraine disability scores were also significantly improved in patients receiving active stimulation, but not for those in the control group.

These two studies have added significantly to our understanding of occipital nerve stimulation for migraines. Both studies failed to meet their intended efficacy endpoints, but the results put to question the validity of the current efficacy standards. While 50% reduction in 50% of patients continues to be accepted as the efficacy “bar” in neuromodulation trials for chronic pain conditions, it may be that 30% improvements are acceptable and clinically meaningful. This is corroborated by the significant improvements in disability scores found by Silberstein et al. These are arguably more relevant to quality of life and functionality than changes measured solely by the visual analog scale.

Figure Legend: Lateral skull film showing bilateral occipital neurostimulation leads anchored through a single retroauricular incision, as proposed by Konstantin Slavin. Both leads are unilaterally tunneled to a pulse in the infraclavicular area.

References
Debate – The Case For Intrathecal Pumps: Pro
The Case for Use of Intrathecal Drug Delivery in Patients With Severe Refractory Chronic Pain

When systemic pharmacologic therapy does not provide adequate relief from chronic pain or causes intolerable side effects, patients may benefit from intrathecal drug delivery (IDD). IDD is considered effective and safe for cancer and non-cancer patients who have failed more conservative approaches to pain management.1

Approximately 10-20% of cancer patients experience refractory pain that cannot be managed with conservative treatment.2 Even when oral analgesics are effective in controlling cancer-related pain, common side effects can lead to significant toxicity, compromising quality of life and/or leading to undertreatment. IDD’s dosing advantage (1:300 intrathecal to systemic efficacy), combined with the flexibility to use other compounds, such as local anesthetics, results in a highly favorable therapeutic index. Thus, much more effective analgesia can be achieved with much lower toxicity.

The use of IDD for refractory cancer pain is supported by a multicenter, randomized, controlled trial comparing a combination of IDD plus comprehensive medical management (CMM) to CMM alone.2 The study demonstrated that more patients in the former group (including many of the most refractory) achieved clinical success (defined as at least a 20% reduction in pain and toxicity), a difference on the margin of statistical significance (p=0.05). Arguably of greater importance, IDD uses significantly reduced medication-induced side effects by 50% overall, reflecting a 33% improvement when compared to patients in the CMM group (p=0.004). This was particularly evident with respect to fatigue and lethargy.

Research suggests that IDD can improve survival, possibly by minimizing side effects that may contribute to mortality, such as anorexia and decreased gut motility.3 Additionally, when the pain control achieved using IDD allows a bedridden cancer patient to remain ambulatory, the patient is more easily able to continue treatment (e.g., consistently attend chemotherapy or radiation treatments), and it is less likely that issues such as deep venous thrombosis, pulmonary embolism or pneumonia will contribute to mortality.4 IDD can also be more cost-effective than conventional opioid therapy, even within the first six months of cancer pain treatment.5 Though counterintuitive given the relatively high initial cost associated with IDD, ongoing maintenance costs are relatively low due to the small dosages required for effective analgesia.

Patients suffering from poorly controlled, chronic, nonmalignant pain (e.g., chronic postoperative back pain, Complex Regional Pain Syndrome, spinal stenosis and peripheral limb pain) can also benefit from the use of IDD. Several systematic reviews of IDD for chronic noncancer pain have reported that at least a subset of patients experience improvement in pain and functioning when other, less invasive treatment has failed.6 As with cancer pain, IDD helps relieve chronic, nonmalignant pain using significantly lower medication dosages than required with oral analgesics, minimizing often intolerable medication-related side effects. Even though similar considerations such as physiological dependence and tolerance need to be considered with IDD just as with systemic analgesics, this modality can play an important long-term role in managing chronic nonmalignant pain in appropriately selected patients.

Although IDD for nonmalignant pain is associated with relatively high initial costs related to the device and the implant surgery, a model used to compare analgesia costs revealed that intrathecal morphine administration is less expensive than branded oral pain medication, even after considering the device-related expenses.8 A similar study involving real patients with chronic postoperative back pain and actual cost data determined that IDD is a cost-effective treatment when compared to conventional pain therapy, with conventional treatment being the more expensive option at 28 months or longer.9 This was true even for “worst-case” patients with multiple complications. The authors note that IDD also increased ability to work and improved quality of life with better pain control.

> RESEARCH SUGGESTS THAT IDD CAN IMPROVE SURVIVAL, POSSIBLY BY MINIMIZING SIDE EFFECTS THAT MAY CONTRIBUTE TO MORTALITY, SUCH AS ANOREXIA AND DECREASED GUT MOTILITY.3 <
An additional benefit of IDD for nonmalignant pain is that, compared to oral pain medication, it offers physicians greater control over a patient’s use of prescription analgesics. This can help reduce the accidental or intentional misuse, abuse and diversion. According to the Centers for Disease Control and Prevention, almost 75% of prescription drug overdoses are caused by opioid pain medication and these maladaptive behaviors have received widespread attention in both clinical publications and the lay media. With IDD, inappropriate patient access to these medications is eliminated or at least significantly curtailed.

The benefits of IDD are dependent on appropriate patient selection. Selection criteria for cancer patients include inadequate pain relief/intolerable side effects, body size sufficient to implant the pump, no contraindications to the therapy or surgery, life expectancy greater than three months, and a favorable response to the screening test, although the latter two are somewhat controversial. Selection criteria for noncancer patients include inadequate pain relief/intolerable side effects, psychological clearance, treatment for any substance abuse, sufficient body size to implant the pump, establishment of therapy goals/realistic expectations, no contraindications to the therapy or surgery, and a favorable response to the screening test.

The implantation of an IDD system may appear to be prima facie an overly expensive and/or aggressive intervention for chronic pain, whether caused by cancer or another mechanism. A more critical and in-depth analysis is required to fully understand whether this is true. Based on the best available clinical evidence, compassionate patient care and consideration of major societal issues, there is definitely a role for IDD in the treatment of both cancer-related and nonmalignant chronic pain.

References
I recently treated a patient who developed an intrathecal (IT) hematoma following the implantation of an IT catheter and pump. The patient developed postoperative weakness prompting an MRI to be performed, revealing the compressive hematoma (Figure 1). Surgical evacuation of the hematoma has led to some improvement in her symptoms, but it will require significant inpatient rehabilitation for the patient to resume her level of functioning prior to the surgery. Though in neurosurgery we become somewhat inured to the fact that occasional serious complications occur, this particular experience leads me to reflect on the evidence which supports the use of IT drug delivery in the treatment of chronic pain.

Without question, there are certain patients whose quality of life changes tremendously with the introduction of IT opioids. We have all treated the suffering patient with cancer-related pain and intolerable systemic side effects from oral opioid administration, who is able to eliminate opioid-induced side effects while maintaining excellent pain relief after the implantation of an IT pump. However, what is the evidence for the equally common cancer or chronic pain patient who finds limited relief with 100mg oxycontin twice a day, and is referred for IT pump placement to aid in pain management?

Demonstrating that a therapy such as IT opioid administration is superior to comprehensive medical management is difficult, even when applied to the best of indications. In the 2002 industry-sponsored trial comparing comprehensive medical management (CMM) with the intrathecal opioid administration, patients included in the trial had a VAS ≥ 5, despite a morphine equivalent dose of 200mg/day. The mean visual analog scale of 72 patients randomized to CMM was 7.81 ± 1.63 at baseline, and was reduced by 3.05 ± 3.16 at four weeks. Of the 71 patients randomized to IDD, the mean VAS at baseline was 7.57 ± 1.79 and was reduced by 3.9 ± 3.42 at 4 weeks. Even in this setting of cancer-related pain, which is accepted by most as an excellent indication for IT therapy, demonstrating objective evidence of a statistically significant benefit was not seen when comparing the change in VAS between the two groups. High-quality data for IT therapy in noncancer pain is much more limited.

Our increasing experience in the treatment of chronic pain patients with IT therapy has shown that high-dose IT regimens may not be the best long-term strategy. Opioid-induced hyperalgesia is a known problem with oral opioid administration, and an identified, but likely under-recognized phenomenon in patients receiving IT therapy. In addition, the incidence of catheter tip granulomas is clearly related to the daily IT dose administered and the concentration of the opioid being administered. This finding has led to recommendations of morphine dosages of less than 10mg/day with a maximal morphine concentration of 15mg/mL. However, the problem of tolerance and dose escalation is prevalent in patients receiving IT therapy both for cancer and noncancer pain. In one recent study of IT dose in non-cancer patients, the dose was found to increase by 750% +/- 450% at 12-month follow-ups in patients younger than 50. Interestingly, this group of patients did not experience any change in their oral opioid consumption also, though they were found to have improvement in their pain scores at one year post surgery.

The problems of tolerance and dose escalation have prompted some to suggest the concept of microdosing in patients who receive IT therapy. Prior to performing the IT trial, patients are systematically weaned off of their opioid therapy, and a trial of intrathecal opioids is performed in the opioid naïve state. If a positive result is seen, patients can then be implanted.
with an IT pump, with beginning opioid dosages of 0.1mg morphine or less. It is not every chronic pain patient that will be able to be weaned off of their high-dose opioid regimen for consideration of microdosing. Furthermore, if a patient is able to be successfully weaned off of their opioids for consideration for IT therapy, perhaps the best long-term therapy for the patient is not opioids at all. As more data is collected on the long-term effectiveness of microdosing, it will become clear whether this is a viable strategy for chronic noncancer pain.

Increasing experience with ziconotide and trials with novel agents such as resiniferatoxin will expand the options for intrathecal drug delivery in the setting of both cancer and noncancer pain. In addition, as neurosurgery begins to acquire high quality data on minimally-invasive cancer pain interventions such as CT-guided cordotomy and myelotomy, hopefully more evidence-based treatment options will be available to the cancer patient who suffers from pain. With our knowledge today, however, intrathecal drug delivery for noncancer pain remains a therapy with limited data to support its use, and must be undertaken with mindful perspective of the long-term impact on the patient.

References

Figure 1c & 1d: Intradural view before and after evacuation of the large hematoma.
In August of 2013, Dr. Sanjay Gupta, neurosurgeon and chief medical correspondent for CNN media, wrote an essay on the CNN website retracting his previous argument against medicinal cannabis. In 2009, Dr. Gupta wrote a TIME magazine article entitled, Why I Would Vote No to Pot. More recently, Sanjay changed his position statement and opined that he originally "was too dismissive of the loud chorus of patients whose symptoms improved on cannabis." Now, Dr. Gupta believes that medical marijuana has "legitimate medical applications" and is sometimes "the only thing that works," and he feels that it is time to reassess our opinion about medicinal cannabis.

There are several methods for the administration of medicinal marijuana, including vaporizing or smoking dried buds, drinking or eating extracts and swallowing capsules. The efficacy of each of these methods was the subject of an investigation executed by the National Institutes of Health. The report was released by the NIH in April of 1997, after experts reviewed the evidence supporting the use of medical marijuana.

The topics researched in 1997 by the NIH expert panel included:

a) What research has been done previously and what is currently known about the possible medical uses of marijuana?

b) What are the major unanswered scientific questions?

c) What are the diseases or conditions for which marijuana might have potential as a treatment and that merit further study?

d) What special issues have to be considered in conducting clinical trials of the therapeutic uses of marijuana?

There were several conclusions made by the IOM in 1999, which included the following six recommendations:

1. **Research should continue into the physiological effects of synthetic and plant-derived cannabinoids and the natural function of cannabinoids found in the body.** Because different cannabinoids appear to have different effects, cannabinoid research should include, but not be restricted to, effects attributable to THC alone.

2. **Clinical trials of cannabinoid drugs for symptom management should be conducted with the goal of developing rapid-onset, reliable and safe delivery systems.**

3. **Psychological effects of cannabinoids such as anxiety reduction and sedation, which can influence medical benefits, should be evaluated in clinical trials.**

4. **Studies to define the individual health risks of smoking marijuana should be conducted, particularly among populations in which marijuana use is prevalent.**

5. **Clinical trials of marijuana use for medical purposes should be conducted under the following limited circumstances: trials should involve only short-term marijuana use (less than six months), should be conducted in patients with conditions for which there is reasonable expectation of efficacy, should be approved by institutional review boards and should collect data about efficacy.**

6. **Short-term use of smoked marijuana (less than six months) for patients with debilitating symptoms (such as intractable pain or vomiting) must meet the following criteria:**
   - Failure of all approved medications to provide relief has been documented
   - The symptoms can reasonably be expected to be relieved by rapid-onset cannabinoid drugs
   - Such treatment is administered under medical supervision in a manner that allows for assessment of treatment effectiveness
   - Treatment involves an oversight strategy comparable to an institutional review board process that could provide guidance within 24 hours of a submission by a physician to provide marijuana to a patient for a specified use

Interestingly, now even conservative states, such as New Jersey, have adopted medical marijuana policies. The New Jersey Department of Health (NJDOH) has developed a website to assist in the implementation of the New Jersey Compassionate Use Medical Marijuana Act. On the NJDOH website, there is information for patients, physicians, alternative treatment center operators and other residents of New Jersey. The requirements and eligibility criteria for physicians interested in participating in the compassionate use of medicinal marijuana are listed. Alternative Treatment Centers (ATCs) are also listed for interested patients and families. Medicinal marijuana has been used for pain control, nausea and vomiting and more recently, as an anti-epileptic medication.

In our opinion, it is time to take a second look at medicinal marijuana. Perhaps, for the right reasons and for selective patients, medicinal marijuana may offer a distinct advantage. It will be interesting to look at the scientific evidence once we have some completed clinical trials.

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New York State Medicaid Decision on Intrathecal Pain Pumps

As of November 1, 2013, New York State Medicaid discontinued providing its beneficiaries with coverage for implantable infusible pumps that deliver an opioid for the purpose of non-malignant pain management. These pumps have been used and covered nationally under Medicare since around 1984 for indications of intractable chronic non-cancer pain, cancer pain and refractory spasticity. This decision affects citizens of New York insured with Medicaid who suffer from chronic pain that is not associated with cancer, and that is refractory to extensive conservative and invasive management options. While the state government gave no explanation for the discontinuation of coverage, we can look at cost and research as potential influences to better understand this decision in pain management.

For the better part of 30 years, implantable intrathecal pumps (ITPs) have been administering opioids to patients with chronic pain. Placed surgically, the device consists of a catheter inserted in the intrathecal lumbar space that is most commonly tunneled to the thoracic region and connected to a battery-operated pump placed subcutaneously on the abdomen. These pumps are left implanted indefinitely, necessitating revision when either the battery running the pump reaches end of life, or if unexpected problems arise. The opioid can be refilled in an office setting simply with a needle inserted into a port in the device, palpable under the patient’s skin. Often, these pumps are placed as a last resort, when the efficacy of pain relief from rehabilitation, pharmacotherapy, surgery and other neuromodulatory techniques have been ruled out. In non-cancer pain, they are generally recommended for patients who need extensive pain relief for more than one year. For many of these patients, the only form of relief comes from opioid therapies. Intrathecal opioid pumps provide patients with longer, more effective pain reduction without the systemic side effects, such as debilitating nausea, constipation and sedation.

Each year, it is estimated that the management of chronic pain costs about $100 billion dollars in the United States alone. According to Medtronic (April 2013), the average national Medicare coverage for an implantation of a pain pump as an outpatient procedure in an approved hospital was around $14,111. Of this amount, 20% of the Medicare approved amount must be paid by the patient’s secondary insurance or the patient him/herself. A recent study conducted by Guillemette et al. examined the cost-effectiveness of intrathecal pumps for pain management with non-cancer indications. It was concluded that while initially there is a large investment, after a period of two years, the implantation of a pain pump ends up financially equaling the cost of more conventional pain therapies. After the initial two-year period, the cost of conventional pain therapy is projected to cost around $3,111 more each year than opioid administration from an intrathecal pump. While it seems that this new coverage decision will primarily save the government money, as the implantation of intrathecal pumps will no longer be funded, after a period of two years, those patients who could have utilized intrathecal pain pumps will be directed towards alternative forms of opioid pain therapy, and management of their pain will increase the government’s overall expenditures.

Recent literature seems to be unclear whether or not intrathecal pain pumps are as effective as originally thought. While there are many studies that examine the successes and failures of intrathecal opioid pump placement and administration, research over the past ten years is limited in its conclusions as objective data is sparse. Perhaps the money being saved with no coverage decisions should be used to increase funding to the study of the cost-effectiveness/efficacy of these pumps. Overall, most studies appear to conclude that barring all complications, intrathecal pain pumps provide patients with better pain management.

References:
SECTiON nEWS

What’s New in Pain?

Julie G. Pilitsis, MD, PhD
Chair – Pain Section

There are greater than 100 million patients living in the U.S. with chronic pain. In 2011, the Institute of Medicine concluded that there is a “need for a social transformation in the way pain is perceived, judged, and treated.” The patient suffering with pain needs to know that we are hearing their issues, working towards them and making progress. Chronic pain is often isolating and causes people to lose hope. Offering reasonable hope to pain patients can be a valuable adjunct to a general neurosurgery practice.

Though approximately 70 percent of neurosurgeons have a predominant spine practice, even spine surgeons interested in pain shy away from pain procedures because of concerns/misunderstandings about profitability, demands of pain population on office staff and limited experience with the procedures. To that end, we are offering the CNS/AANS Joint Section on Pain Biennial Symposium on Integrating Pain with Your Spine Practice. The symposium will be held at The Moscone Convention Center in San Francisco on April 4. This session is geared towards familiarizing general and spine neurosurgeons with the economics, politics and details of neurosurgical procedures for spinal and other pain syndromes. We will have a hands-on session utilizing simulations for spinal pain, including a percutaneous, minimally invasive and paddle station. The education sessions will be directed at pain neurologists, spine surgeons, residents, medical students, nurse clinicians and physician assistants, and will be directly applicable to their practices.

DESCRIPTiON

At least 70 percent of neurosurgeons have a predominant spine practice however, many spine surgeons interviewed in pain society board meetings said they were interested in pain because their patients were expressing need for these procedures. As a result of this added pressure to increase pain procedure we are requesting a hands-on experience with the procedures. This session is geared at familiarizing attendees with the economics, politics and details of neurosurgical procedures for spinal and other pain syndromes.

LEARNING OBJECTIVES: Upon completion of this CME activity participants should be able to:

- Describe the benefits of incorporating pain procedures into your practice from a spine development standpoint.
- Determine which patients are candidates for these procedures; and
- Describe techniques of spinal cord stimulation.

DISCLOSURE STATEMENT

Before the program, anyone in control of the educational content of this activity will disclose the existence of any financial interest and/or the relationship they or their significant other have with the manufacturer(s) of any commercial product(s) to be discussed during their presentation. Disclosure will be included in the final program.

CONTINUING MEDICAL EDUCATION CREDIT

This activity has been planned and implemented in accordance with the Essential Areas and policies of The Accreditation Council for Continuing Medical Education (ACCME) through the joint sponsorship of the AANS and AANS/CNS Section on Pain. The AANS is accredited by the ACCME to provide continuing medical education for physicians.

The AANS designates this activity for a maximum of 6.00 AMA PRA Category 1 Credits. Physicians should only claim the credit commensurate with the extent of their participation in the activity.

REGISTRATION AND HOUSING

Registration and housing will open on Friday, Nov. 1. To register visit the Pain Biennial Meeting website or call the AANS/CNS Section on Pain office at 888-566-2267. For information and book your housing refer to the 2014 AANS Annual Scientific Meeting housing website.

MEETING REGISTRATION

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The issues relating to concussions in sports continue to be both in the public spotlight and the forefront of brain injury research. In male athletes at the high school and collegiate levels, football, ice hockey, lacrosse, wrestling and soccer are consistently associated with the highest rates of concussions. Considering female athletes, the high school and collegiate sports of soccer, lacrosse, basketball and ice hockey have the highest rates. We don’t have much data on other classes of athletes, as there has been little research on the frequency of concussions among athletes in recreational activities, intramural and club sports and in athletes younger than high school age.

The importance of youth participation in sports is greater than ever, as alternative activities such as video games and the threats of inactivity, obesity, competing activities and other intrusions continue to influence both mental and physical well-being during childhood. It is realized, however, that in contact sports or those with the possibility of collisions, greater speed, playing techniques and bold styles make injury a constant potential. While there is a greater awareness of the possibility for brain injury, even if considered minor, the importance of refining the definition, management and prevention strategies for youth sports has been emphasized as never before by society, organizations, legislators, physician leaders and parents. At various levels of play and among numerous sports, there is concern for how to care for and prevent brain injury by all involved parties.

Many believe that we are witnessing a cultural shift, as coaches, educators, athletes, parents and politicians are involved as never before in changing perspectives and strategies for the care of athletes with brain injuries. There are many examples of these phenomena, including legislation that has passed in nearly all states, policy changes in various sports organizations and educational efforts to reach all those affected by concussion. It is agreed upon that an athlete who is suspected of having sustained a concussion should be removed from that practice or game, and not
return until cleared by a qualified medical professional. It is also important that both physical and mental rest be a part of the recovery process, but complete removal from all school educational activities may not be required in all cases. For instance, identifying the most stressful class or subject and making specific academic accommodations is often the best course for recovery. To completely remove a youth athlete from school for rest may only be counterproductive, and lead to other problems such as anxiety, depression, isolation from peers and other adverse feelings. There should also be consideration given to investigating other potential contributing factors such as vestibular dysfunction, psychological aspects, cervicogenic headaches, somatization disorders and others.

The Institute of Medicine and the National Research Council, supported by a number of government agencies and private groups, convened an expert committee to review the science of sports-related concussions in youth from elementary school through young adulthood, as well as in military personnel and their dependents. Sports-Related Concussions in Youth: Improving the Science, Changing the Culture, released in October 2013, finds that while some studies provide useful information, much remains unknown about the extent of concussions in youth; how to diagnose, manage and prevent concussions; and the short- and long-term consequences of concussions as well as repetitive head trauma.

Although millions participate in recreational and organized sports activities, many experts feel that concussions in youth may be underreported, and that the subtleties of concussion diagnosis may contribute to that phenomenon. Just as at other levels of play, there can at times be a “culture of resistance;” ignorance of the presenting signs and symptoms of concussion, a fear of letting down one’s teammates and peer pressure which contribute to the ongoing problems. Loss of consciousness is rare in youth concussions and the majority is minor in nature, thus resolving in a matter of days. However, many may be more serious and persist, with the common symptoms being memory loss, headache, personality changes, diminished school performance, sleep disturbance and others.

There have been no long-term studies of the outcomes of youth concussion, nor has there been scientific consensus regarding at what age from youth to adulthood represents the period of greatest vulnerability. Brain development goes through various stages, including not only the time of maximal growth during childhood, but also the period of synaptic pruning in adolescence and myelination, which is completed in the early part of the third decade of life. However, the age at participation, injury rates, subconcussive impacts and extent of exposure (“hit counts”) are emerging factors which are incompletely understood. Thus, all of those involved with the care of injured youth athletes, including coaches, athletic trainers, parents as well as physicians, should be aware that concussion symptoms may not be readily apparent, and that undetected and recurrent concussions may have deleterious effects.

Nevertheless, it is important to remember that childhood and adolescence are not a time of immunity from injury due to numerous endeavors, and not necessarily a period of risk-averse activities. Each year, several hundred fatalities occur due to bicycle accidents and other sports such as skiing and skateboarding, which are also associated with serious injury and death. Therefore, organized sports offer a way of not only learning many life lessons, but also for enjoying the physical and mental benefits of participating in sports.

There are many new and emerging concepts which have bearing upon how society views activities which have the potential for concussive injury, whether from recreational activities or contact or collision sports. Several initiatives have been instituted to reduce the exposure to repetitive head impacts, such as eliminating head-to-head contact in practice, as Pop Warner Football did beginning in the 2012 season. This rule change was felt to have reduced the seasonal exposure by nearly one-half compared to previous conventional practice techniques. This strategy has also been adopted by other levels of play, and represents a logical approach to reducing the amount of seasonal and lifetime impacts.

Many advances in our understanding of sports concussion have been made in recognition, sideline assessment, clinical evaluation, athlete management and return to play strategies. For example, sideline evaluation tools and neuropsychological testing specific for youth have now been validated and being implemented, and should provide a valuable adjunct to diagnosis. As neurosurgeons are involved in caring for the participants of school and recreational events in their communities, their roles will continue to be vital not only for patient care, but for education and prevention as well.
Hereditary Neuropathy with Liability to Pressure Palsies – A Review

It is not uncommon to have a patient with multiple compressive peripheral neuropathies. Typically nonsurgical measures are instituted, and if symptoms persist or worsen, decompression can be considered. However, should a patient less than 30 years of age without a history of significant trauma or performing activities which could lead to such a condition, hereditary neuropathy with liability to pressure palsies (HNPP), be considered as a diagnosis? This disease is an autosomal dominant condition caused by a defect in the 17p11.2 chromosome which codes for peripheral myelin protein 22 (PMP22). The result is production of focal regions of thickened abnormal myelin in both large and small nerve fibers which are more susceptible to injury by compression. Although, perhaps, underdiagnosed due to the heterogeneity of its presentation, the incidence is estimated to be 16/100,000.

The median, ulnar and peroneal nerves are most commonly affected. However, there have been reports of the brachial plexus being affected in those who carry objects on their shoulders. Typical age at presentation ranges from 10 to 30 years. Often, a family history of similar symptoms or multiple decompressive procedures can be elicited. Upon physical exam, muscle wasting may be observed as well as absent reflexes and deformities of the hands or feet. Electrodiagnostic testing demonstrates distal sensory conduction velocity slowing and distal motor latency prolongation. Occasionally, the muscles innervated by the affected nerves demonstrate evidence of denervation. These findings are also characteristic of conditions such as diabetic polyneuropathy, and are exaggerated in HNPP. However, there are no universally accepted electrodiagnostic criteria for the diagnosis of HNPP. Magnetic resonance imaging (MRI) may demonstrate the neural hypertrophy in a “sausage-like” pattern due to the discrete regions of myelin overproduction. The most reliable way to secure a diagnosis is through genetic testing; a deletion or point mutation in the PMP22 gene can be identified. Given the utility of genetic testing, there is seldom a need to perform a nerve biopsy.

Prevention of compression of nerves at vulnerable sites is the best treatment strategy once a diagnosis has been made. The use of protective padding and behavioral modification to reduce repetitive hand movements, leaning on elbows, crossing legs and kneeling may be instituted.

When the symptoms of compression develop, orthoses such as wrist splints and ankle-foot orthoses may be used temporarily, as their overuse may lead to continued or new symptoms due to the pressure they themselves exert. Full recovery usually occurs in days to months for a majority of patients. Those who have incomplete recovery are seldom left with a debilitating deficit.

The role of surgery has not been well-defined in the treatment of HNPP. In cases with severe symptoms, disability or deformity, decompression or transposition may be considered. The surgical results are variable and only case reports exist in the literature. Improvement in symptoms may be from the decompression of the nerve or from the natural history of the disease, which is to improve over time. For young patients who have had surgery for what seemed to be typical compressive neuropathy by electrodiagnostic and physical exam evidence who do not improve, HNPP should be considered. Follow-up electrodiagnostic testing and genetic testing may be pursued before proceeding with a revision surgery. Even minor trauma can result in severe symptoms and observation over a period of months is warranted before electing to operate again. Furthermore, there have been case reports in which patients with HNPP have worsened after surgery, presumably due to the manipulation of the nerve.

In conclusion, HNPP is a diagnosis which the neurosurgeon should consider in a young patient with multiple peripheral neuropathies or an atypical presentation. If the symptom constellation and history seem unusual, genetic testing may be performed before electing to operate on a patient who may receive little benefit from a procedure.
SCI Guidelines Tribute

CNS/AANS Approved Spinal Cord Injury Evidence-Based Guidelines Recognized with a Congressional Commendation

On September 27, 2013, a 10-member group of surgeons sponsored by the CNS and AANS Joint Sections of Spine and Trauma were recognized by the United States Congress in the House of Representatives as part of Spinal Cord Injury Awareness month. The evidence-based guideline project resulted in the 22-chapter publication entitled “Guidelines for the Management of Acute Cervical Spine and Spinal Cord Injuries” published in February 2013, and is available online at http://journals.lww.com/neurosurgery/toc/2013/03002. The actual excerpt from the official Congressional Record is reprinted below.

E1394 CONGRESSIONAL RECORD — Extensions of Remarks September 27, 2013
RECOGNIZING THE CONTRIBUTORS TO THE UPDATED GUIDELINES FOR THE MANAGEMENT OF ACUTE CERVICAL SPINE AND SPINAL CORD INJURIES

HON. JAMES R. LANGEVIN
OF RHODE ISLAND IN THE HOUSE OF REPRESENTATIVES
Friday, September 27, 2013

Mr. LANGEVIN. Mr. Speaker, there are an estimated 12,000 spinal cord injuries every year in the United States. These injuries most often result in temporary or permanent loss of sensation and paralysis, and they can forever change the lives of those who have been injured. However, thanks to the dedication of top scientists and medical professionals across the country, we hold out hope for more effective treatments, and one day, a possible cure.

In recognition of September as Spinal Cord Injury Awareness Month, we’d like to take this time to acknowledge the leadership of several neurosurgeons who worked diligently to review and update the Guidelines for the Management of Acute Cervical Spine and Spinal Cord Injuries, published in the March 2013 edition of Neurosurgery. This work describes the “state of the literature” with regard to the treatment of patients with cervical spine and spinal cord injuries and is a useful guide to help clinicians make important decisions in the care of their patients.

The contributing members of this work include:
• Mark N. Hadley, Division of Neurological Surgery, University of Alabama
• Beverly C. Walters, Division of Neurological Surgery, University of Alabama and Inova Health System, Falls Church, Virginia
• Bizhan Aarabi, Department of Neurosurgery, University of Maryland
• Sanjay S. Dhall, Department of Neurosurgery, Emory University
• Daniel E. Gelb, Department of Orthopaedics, University of Maryland
• Mark R. Harrigan, Division of Neurological Surgery, University of Alabama
• R. John Hurlbert, Department of Clinical Neurosciences, University of Calgary
• Curtis J. Rozelle, Division of Neurological Surgery, University of Alabama and Children’s Hospital of Alabama
• Timothy C. Ryken, Department of Neurosurgery Iowa Spine and Brain Institute and University of Iowa
• Nicholas Theodore, Division of Neurological Surgery, Barrow Neurological Institute.

Mr. Speaker, the standardization and refinement of surgical techniques over the last decade embodied in this work is a substantial accomplishment. It is a testament to the experience and dedication of its contributors, and I, along with Representatives TERRI A. SEWELL, ELIJAH E. CUMMINGS, JOHN LEWIS, BRUCE L. BRALEY, and ED PASTOR, hope you will join us in recognizing them for their impressive work. Due to their commitment, numerous lives are improved daily through the increased understanding and treatment of spinal cord injuries.

*Remarks made included an incorrect publish date of March 2013 – the supplement was published in February 2013
Looking Ahead: 2014 CNS Annual Meeting

CNS 2014: A Question of Balance

At first glance, the title “A Question of Balance” may seem familiar, as this was the title for a chart topping album released by the Moody Blues in 1970. The album touched on the socio-political controversies resulting from the turmoil of the Vietnam War. Similarly, with the challenges imposed by our new health care environment, and with neuroscience, imaging and technology evolving at a breakneck pace, neurosurgeons are faced with a plethora of treatment options to offer our patients. How best to treat various pathological entities can be controversial. Accepted standards of care, newer technology, or enrollment in state-of-the-art clinical trials each have staunch followings, but as the album title suggests, perhaps the best treatment algorithms result from A QUESTION OF BALANCE, the theme of this year’s Congress of Neurological Surgeons Annual Meeting.

Perhaps more than ever, neurosurgeons are faced with challenging issues involving new health care regulations, changes in health care economics, and conflicting conduits of health care implementation. Consequently, CNS President, Daniel K. Resnick, MD, Professor at the University of Wisconsin School of Medicine and Public Health, has selected the theme “A QUESTION OF BALANCE” so that we may explore the complexities that impact our decisions in the daily practice of neurosurgery. This year’s meeting will host some novel and riveting additions to the traditional format, endeavoring to unravel some of these conundrums. A CONTROVERSIES session will be dedicated to exploring opposing paradigms proposed for the same pathophysiology, such as treatment of brain and spinal metastases, large and giant aneurysms, and minimally invasive surgery (MIS) versus conventional spine deformity correction. Also, sessions will be centered around “hot topics,” such as pediatric sports-related brain injuries.

Over the past three years, the CNS has introduced the LIVE SURGERY event, where surgical procedures are telecast into the lecture hall in real time. In this format, panelists interact with the surgical team so that we may learn about procedural techniques and decisions as they unfold. We hope to expand this unique, interactive learning experience to include more venues and expanded telecasts Monday through Wednesday. Further in-depth discussion of the nuances of surgical anatomy will be highlighted in the extremely popular 3D ANATOMY COURSE, which has been retooled to include new content this year.

While the CNS will continue to offer our most popular practical courses, simulation labs using teaching tools of the future will be featured. Simulation is an emerging teaching tool in many disciplines, and the Simulation course has expanded to include models for teaching angiography, microsurgery, skullbase techniques, and spine instrumentation. Alongside these courses, a newly featured NEURO-VATION SYMPOSIUM showcase emerging technologies that promise to play an increasing role in the care of our patients.

We are pleased to announce that the Honored Guest for CNS 2014 is Edward C. Benzel, MD, Chairman of the Department of Neurosurgery at Cleveland Clinic. Author of seven textbooks, his contributions to education and to neurosurgery are unsurpassed. As our honored guest, he will indisputably provide insight and perspective, elucidating the balanced ap-
> WHILE THE CNS WILL CONTINUE TO OFFER OUR MOST POPULAR PRACTICAL COURSES, SIMULATION LABS USING TEACHING TOOLS OF THE FUTURE WILL BE FEATURED. <

approach to the understanding and treatment of complex spinal disorders.
Please join us this autumn in Boston, one of the most spectacular historic cities in New England. The weekend of October 18th will offer practical courses, new symposia, and one of the greatest traditions in rowing, the Head Of The Charles Regatta. For more information about the CNS 2014 Annual Meeting, please visit our website at www.CNS.org. All of us at the CNS look forward to seeing you in Bean-town!
The Congress of Neurological Surgeons (CNS) continues to grow financially in a consistent, sound and responsible manner. The current CNS assets are at an all-time high and are in excess of $23 million dollars. Growth of CNS assets has been primarily the result of continued and now record membership expansion, the sustained strong financial success of the CNS annual meeting and outstanding CNS publications (Neurosurgery®, Clinical Neurosurgery and Congress Quarterly) fiscal management. The CNS Finance Committee provides stewardship to the financial activities of the CNS and is composed of Russell R. Lonser, MD (Committee Chair and CNS Treasurer), Daniel K. Resnick, MD (CNS Past-Treasurer and CNS President), Nathan R. Selden, MD (CNS President-Elect), Ali R. Rezai, MD (CNS Past-President), Alan M. Scarrow, MD, JD (CNS Secretary), David Westman, MBA, CPA, CAE (Chief Executive Officer of the CNS) and Steve Lothary, MBA, CPA (Chief Financial Officer of the CNS). The CNS Finance Committee provides organizational financial reporting and recommendations to the CNS Executive Committee.

CNS Assets
CNS long-term assets are principally contained within two investment instruments that include the reserve and long-term asset funds. The first fund is the reserve asset fund that contains over $5.3 million. This fund is a conservatively invested asset designed to preserve wealth and hedge against potential future financial hardship. Based on its overarching objective, this asset is maintained and grown in a manner that continues to adequately meet its stated purpose. The second fund is the long-term asset fund that contains over $12.5 million. This fund is used primarily to finance critical initiatives related to the CNS educational mission (new educational efforts, fellowships and other mission specific innovative opportunities). Overall, this fund represents the largest defined asset to drive the critical goals of the organization and is invested in a lower-risk, moderate growth portfolio. The remaining CNS assets are defined in the fiscal operating budget that underwrites the day-to-day business of the CNS.

CNS 2014 Operating Budget
The annual CNS operating budget (revenue and expenses) exceeds $12 million dollars. Primary revenue generators (these account for nearly 90% of total CNS revenues) include membership, the CNS Annual Meeting and CNS publications. Principal expenses include the CNS Annual Meeting, headquarters operations, journal operations and the CNS/AANS joint initiative support (e.g., the Washington Committee, Joint Section expenses and others). Additional expenses this fiscal year will include expansion of headquarters office infrastructure (particularly the enhancement of information technology capabilities) to better and more efficiently drive CNS educational efforts, as well as funding of new innovative educational opportunities, including a rapidly growing and critical guidelines effort and simulation.

Future Budgetary Opportunities
Based on responsible fiscal management and innovation in its primary revenue sources, the CNS is well-positioned for future financial growth. Specifically, the principal revenue sources (CNS Annual Meeting, publications and membership) are continually being improved and streamlined to more cost-effectively provide first-rate member offerings.

CNS Annual Meeting. Because of its broad-based educational appeal and volunteer drive, the CNS Annual Meeting continues to be a financial success. Meeting program leaders, including Alan M. Scarrow, MD, JD (2013 Annual Meeting Chair), Ashwini Dayal Sharan, MD (2013 Scientific Program Chair; 2014 Annual Meeting Chair) and Elad I. Levy, MD (2013 Annual Meeting Vice-Chair; 2014 Scientific Program Chair), along with the meeting organizers and volunteers, deserve all the credit for producing a world-class scientific program offering. New and innovative educational opportunities continue to be planned to drive the success of future CNS Annual Meetings for our membership.

CNS Publications. Continued excellent fiscal management and production of outstanding offerings, including Neurosurgery®, by Dr. Nelson Oyesiku, CNS Publications Committee (James S. Harrop, MD, Publications Committee Chair) and the headquarters office has led to sustained and robust profitability of the CNS-published products. Better than expected advertising revenue in Neurosurgery® and sound economic responsibility across CNS publications provide opportunities for sustained CNS
> BASED ON ITS VOLUNTEERISM, INNOVATIVE SPIRIT AND COST-CONSCIOUS EFFORTS, THE CNS REMAINS ONE OF THE MOST COST-EFFECTIVE SPECIALTY MEDICAL ORGANIZATIONS IN NORTH AMERICA. THESE INHERENT ORGANIZATIONAL QUALITIES CONTINUE TO UNDERLIE THE MISSION AND FINANCIAL SUCCESS OF THE CNS. <

publication profitability and exceptional products.

**Membership Growth.** Continued growth of CNS membership nationally and internationally (currently at a record 8,727 members) has created a secure financial foundation for the CNS to continue to develop innovative products, educational efforts and advocate for neurosurgery (e.g., Washington Committee) in a manner that meets member needs. Continued outreach and response to member desires will be used to grow CNS membership nationally and internationally in the years to come.

**Investment Funds and Development.** Improving returns in the current economic environment on reserve and long-term investment funds continue to improve the CNS bottom line. To better exploit future financial opportunities, the Investment Management firm, Treasurer and Steve Lothary, MBA, (Chief Financial Officer) continue to manage CNS funds as described above. Steve will continue to work closely with the CNS Finance Committee and David Westman, MBA, to develop strategic opportunities to better position the organization in the future and ensure its financial success in a variety of areas, including philanthropic support, collaborative relationships and other mechanisms.

**2013 Financial Audit**

This year’s independent audit, by Legacy Professionals, of the CNS finances and business practices returned a clean and unqualified report. This audit represents the fifth consecutive outstanding audit of the CNS business and finances. The audit findings underscore the transparent and careful oversight that marks the management of CNS assets and business practices. Specifically, translucent administration of CNS business practices, including contracts, business relationships with vendors, the CNS Annual Meeting, investment planning, publication offices and the headquarters office, have led to the consistently unqualified audits. The CNS Finance Committee, along with the CNS Executive Committee, will continue to remain vigilant in maintaining fiscal transparency and oversight in the years to come.

**Conclusions**

Based on its volunteerism, innovative spirit and cost-conscious efforts, the CNS remains one of the most cost-effective specialty medical organizations in North America. These inherent organizational qualities continue to underlie the mission and financial success of the CNS. The CNS is proud that its Annual Meeting registration fees, membership dues and other associated fees remain the lowest in the field and across other medical specialties. The CNS remains committed to maintaining and providing world-class, cost-effective educational opportunities for its members, while also supporting the broader goals of its membership. Please feel free to contact us at any time at info@1cns.org with questions or comments.
The Congress of Neurological Surgeons is dedicated to providing premier educational resources and innovative learning platforms for neurosurgeons at all stages of their careers. The membership benefits made available by the CNS to neurosurgical residents and medical students are substantial and contribute to fulfilling the CNS mission of leadership in neurosurgical education throughout the global community.

Since 2011, the CNS has provided complimentary, automatic membership to all residents in training programs approved by the American Board of Neurological Surgery (ABNS); and for a one-time application fee of $25, CNS Resident Membership is also available to residents training in programs that are approved by the Royal College of Physicians and Surgeons in Canada and the Mexican Council of Neurological Surgery.

All North American residents enjoy free online subscriptions to Neurosurgery®, Operative Neurosurgery®, Clinical Neurosurgery®, Congress Quarterly and the monthly Residents’ Report e-newsletter. Companion journal products such as the Neurosurgery® iPad app and Online Video Gallery are offered in tandem with online publications. Also available to Resident members are complimentary, members-only courses in the University of Neurosurgery, free live and archived webinars, exclusive member registration rates and complimentary housing at the CNS Annual Meeting (on a first-come, first-served basis). Further, Resident members have access to all SANS Lifelong Learning products at reduced rates and are eligible for CNS Fellowship Awards and the 3-D Surgical Anatomy Course for Senior Residents. The CNS continues to evaluate and develop opportunities for Residents to hone their leadership skills and contribute to the organization through participation on CNS committees; and through the CNS Career Center, Residents are provided access to a broad spectrum of neurosurgical career opportunities.

Medical Student Membership is complimentary for medical students enrolled in schools accredited and approved by the Association of American Medical Colleges (AAMC), the American Osteopathic Association (AOA) or the Faculties of Medicine of Canada (AFMC). This rapidly growing membership category includes access to the CNS University of Neurosurgery, discounts on SANS Lifelong Learning, exclusive member registration rates at CNS Annual Meetings, as well as opportunities for participation on CNS committees.

The CNS currently has 8,727 members. Residents account for 20% (1,785) of the total membership, with 1,599 North American residents and fellows and 186 International Vista Resident Members. Upon completion of residency, North American neurosurgeons are promoted into the Transitional Membership category before converting to full Active Members. There are currently 184 Transitional Members. The annual trends in resident and fellow membership are provided in Figure 2, with the notable inflection point corresponding to the granting of complimentary ACGME resident membership in 2011. There are currently 215 Medical Student Members, and the annual trend in this category is provided in Figure 3.
The Congress of Neurosurgeons (CNS) mission is to globally enhance health and improve lives worldwide through the advancement of education and scientific exchange. This is accomplished through the Annual Meeting, various publications (Neurosurgery®, Clinical Neurosurgery®, Congress Quarterly), Internet, electronic media and most recently, the introduction of the CNS Simulation Curriculum.

United States resident education underwent a paradigm shift when the ACGME initiated an 80-hour work week restriction, which led to a reduction in the amount of time residents in the midst of their task-based surgical residencies spent in the operating room. Educators throughout North America have therefore focused on ways to accelerate resident education. The result has been a rapid advancement in simulation-based education, which the CNS embraced.

The CNS initiated its simulation educational program with a resident simulation course in 2011, which was very successful. This program is unique in that it is modeled around a curriculum with objective didactic and technical scores.

The CNS simulation program has enjoyed growth year after year, and the recent 2013 CNS Annual Meeting was the most successful program to date. Although registration was closed when 45 residents committed to attending, there was an exuberance of excitement about the course. In fact, approximately 20-30 additional residents presented the morning of the course to see if they could also participate. The faculty made accommodations and all residents were able to attend.

The course has continued to expand and grow. The spine/peripheral nerve curriculum consisted of five modules: CSF repair, ACF, posterior cervical laminectomy, MIS lumbar fusion and cubital tunnel release. In the cranial simulation curriculum, there are both virtual reality and physical modules for craniotomy and decompression of the posterior fossa. Also, a traumatic skull fracture and a ventriculostomy module were present. The third major component consisted of the vascular simulation curriculum with angiography, aneurysm clipping and vascular bypass modules.

The course has been expanded and the CNS has had two recent international simulation courses in Prague with the EANS, and most recently, in India with the NSI. Both of these courses have been well-received, and have allowed the CNS to expand our global education efforts.

The CNS is very excited about the continued and rapid growth of our simulation program. We are happy to hear your comments and input at info@1cns.org.
Announcing the new **CNS World Wide Webinar Program**: A philanthropic educational initiative that will impact neurosurgeons in the world’s 36 least economically developed countries (identified by the World Bank’s Data and Income Statistics)!

This new initiative will provide many neurosurgeons who lack access to the education they need an opportunity for them to gain the latest education available that will allow them to better serve their patients. Access to the CNS World Wide Webinar Program, including cerebrovascular, epilepsy, pediatric and neuropathology topics among others, is available at [http://w3.cns.org/university/webinar/www.asp](http://w3.cns.org/university/webinar/www.asp) and will allow no-fee access to our Webinar Library.

CNS members in other countries will continue to access our online courses at no additional fee, and non-members from these countries will access the CNS online courses at the non-member rates.
A 21-year-old male presented with complex partial seizures since the age of 8 years. He underwent standard non-invasive pre-surgical evaluation for epilepsy surgery. An MRI of the brain revealed a right temporal cortical lesion (Panel A, arrow). Video EEG telemetry, neuropsychology and ictal SPECT and PET imaging findings were concordant with the right temporal focus. He underwent extended lesionectomy under intraoperative electrocorticography (Panel B - scalloping of the skull bone, Panel C - prominent vein of Labbe and Panel D - cortical lesion posterior to the vein of Labbe). Histopathology confirmed ganglioglioma.

Submitted by:
Professor Bhaskara Rao Malla, DNB, FRCS
National Institute of Mental Health & Neuro Sciences
The Congress of Neurological Surgeons is excited to announce our latest educational opportunity, Neurosurgical Oral Board Exam Preparation: Early Review Course, August 8-9, 2014 in Chicago, Illinois. Directed by Jamie Ullman and co-directed by Bernard Bendok and Costas Hadjipanayis, this course will offer neurosurgeons the opportunity for a comprehensive review of important neurosurgical topics well in advance of the November test date. The course differentiates itself by offering a variety of formats: didactic, case presentations, small group discussion, and panel discussions. Strengthen your confidence by learning the most up-to-date information spanning all relevant oral board topics, and by developing your test-taking strategies well in advance of the actual exam.

### Learning Objectives

Upon completion of this educational activity, participants will be able to:

- Identify strengths and weaknesses in neurological surgery knowledge.
- Integrate information from the many subspecialties of neurological surgery.
- Implement changes in clinical practice in accordance with recent advances and clinical guidelines.

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