GOLDEN YEARS
HOW NEUROSURGEONS
ARE ADDRESSING AN AGING POPULATION.
EDITOR'S NOTE

In this issue of Congress Quarterly (cnsQ), we take a brief look at the most rapidly advancing portion of the neurosurgeons’ practice, geriatric or elderly patients. This issue is dedicated to the challenges we as neurosurgeons and our patients face. Dr. Joseph Cheng provides an overview of the situation in Elderly Issues: Our Society Getting Older. Dr. Matthew McGirt and Dr. Saniya Godil detail a difficult question of aging, cost, and quality in their article Health Care Cost, Quality, and the Aging Population: A Challenge to the Neurosurgery Value Proposition.

The articles then shift their focus into disease-specific areas and the aging population. The first area covered is spinal disorders. Again, Dr. Matthew McGirt and Dr. Saniya Godil provide another interesting and detailed article on Prolonged Medical Management of Lumbar Spine Disorders in the Elderly: Questioning its Value, an Argument for Surgery. I discuss Spine Surgery in an Increasingly Aging Population. Lastly, Dr. Michael Wang discusses the challenges of Spinal Deformities in an Aging Population.

There are also numerous intracranial issues facing the elderly or geriatric population. Dr. Nicholas Ferraro, Dr. Ryan Kitagawa, and Dr. M. Ross Bullock discuss Traumatic Brain Injury in the Elderly. The Jefferson Hospital Neurovascular Team led by Dr. Robert Starke reviews Management of Cerebral Aneurysms in the Elderly, and Dr. Christopher Farrell and Dr. Steven Kalkanis discuss the decisions of when it is appropriate to treat in an article entitled Brain Tumor Management in the Elderly – Too Old to Treat? Dr. Jason Schwab and Dr. Rhonna Shatz discuss the increased and more common problem of Normal Pressure Hydrocephalus: A Multidisciplinary Approach. Lastly, Dr. David Krieger and Dr. L. Fernando Gonzalez review the carotid artery disease in the article Is it CAS or CEA That is Not Cost-Effective?

In addition, we are fortunate that this issue has numerous featured articles. Dr. Deborah Benzel and Dr. Srivivas Prasad review the Electronic Health Record (EHR), Neurosurgeons Define Meaningful Use. Also, discussing government health quality issues, Dr. Vincent Traynelis provides an article from the American Board of Neurological Surgery, the Maintenance of Certificate process and PQRS. Katie Orrico and Dr. Ann Stroink provide an overview of the numerous neurosurgeons that are involved in American Medical Association (AMA). Dr. Paul Kaloostian, Dr. Han Chen, and Dr. Martina Stippler review operative documentation for residency training. Lastly, Dr. Duane Gainsburg provides his outlook on aging in his article Locum Tenens: My Solution to Physician Burnout.

As always, we hope that you find this issue informative and interesting and if there is any way we can facilitate your needs, please do not hesitate to contact us at info@cns.org.
Since the inception of the Congress of Neurological Surgeons in 1951, we have strived to foster neurosurgical education and advance our specialty by collaborating and partnering with our international colleagues. Now, 60 years later, we are more committed than ever to our mission of the advancement of education and scientific exchange and enhancing health and improving lives worldwide.

Over the past decade, the CNS has significantly expanded its international society partnerships and exchange of activities and educational programs by jointly participating in each other’s Annual Meetings, events and activities. This scientific, cultural and social exchange has led to sustained relationships, collaboration and valuable friendships between CNS members and our colleagues from the Italian (SiNCH), European (EANS), German (DGNC), Japanese (JCNS), Brazilian (SBN), Indian (NSI), Korean (KNS), Spanish (SENEC), Central European (CENS) societies and others.

This year’s Annual Meeting partner society is the Chinese Neurosurgical Society. Leaders from both societies have been participating in the development of our joint meeting and its scientific programs. Additionally, this year we are pleased to welcome three honored guests, Dr. L. Nelson Hopkins III, Dr. Johannes Schramm and Dr. Andrew Kaye. Dr. Schramm and Dr. Kaye will join us to share their leadership and world-renowned expertise from Germany and Australia, respectively. This comes full circle to our humble beginnings, when our first two Annual Meeting honored guests were internationally-renowned neurosurgeons, Herbert Olivecrona from Sweden and Sir Geoffrey Jefferson from Britain.

The CNS is advancing global neurosurgical education with our comprehensive and innovative simulation (CNS-SIM) platform. Simulation training is an increasingly important requirement for learning and certification in medical specialties, and the CNS is providing a leadership role in defining and operationalizing the use of simulators in neurosurgery. Our comprehensive platform utilizes the latest in simulation technology in conjunction with a standardized curriculum, task validation and prospective objective assessments. The CNS-SIM includes web-based, virtual reality, haptic feedback devices, as well as physical models for the spine, skull base, trauma, vascular, endovascular and functional subspecialties. This platform is being utilized in partnership with the EANS resident course in summer 2013 in Prague, in Tel Aviv and also in December 2013 at the Annual Meeting of NSI in Mumbai, India. Multiple additional partnerships utilizing CNS-SIM are being planned with our international colleagues and partner societies across the world.

The CNS has always strongly emphasized the education of residents. Each year, we offer the highly successful senior resident 3D Anatomy Course. The CNS and the EANS send faculty and US residents to two surgical dissection-based courses in Europe, while inviting European residents to participate in our 3D course in the US.

The CNS is committed to developing a comprehensive international strategy, including learning more about practice and research environments for neurosurgeons in various countries and identifying initiatives and methods to engage with global and regional neurological societies. We believe that by continuing to build and foster these relationships, the CNS will continue to be an important organization of value for neurosurgeons worldwide.

We are honored to partner with our international colleagues and societies to mutually benefit each other’s missions, and look forward to even better connectivity, cooperation and collegial interactions as we collaborate to advance our specialty.
CEO UPDATE

David A. Westman, MBA, CPA, CAE
CEO, Congress of Neurological Surgeons

As I approach my one-year anniversary at the CNS, I want to take a moment to say THANK YOU! It has been an honor and privilege to work with and for an organization that has such a vibrant Executive Committee and other volunteer leaders, members who serve such a vital purpose in our society, and a contingent of dedicated staff in our Schaumburg Headquarters’ office who work tirelessly on behalf of all of you.

I would also like to provide a few key highlights of what the CNS is focusing on for you, our members as we move forward.

Renewed International Focus – As Dr. Rezai noted in his President’s Message (see previous page), the CNS is re-engaging and putting a renewed emphasis on our international partners and opportunities for collaboration and growth. We are exploring opportunities to expand our international educational offerings in support of international neurosurgical development. As the global leader in education, this is mission-critical.

Increased Engagement with Corporate Partners – We are doing more than we ever have to truly listen to our partners and construct win-win opportunities for their engagement with and support of the CNS.

Finalizing a Strategic Plan – One of my priorities since arriving at the CNS has been working with Dr. Rezai, CNS Executive Committee members and our Senior Management Team to construct our 2014-2016 strategic plan. This plan will provide a vision and focus to guide the CNS in identifying the most relevant strategic priorities for our members and other key stakeholders, as well as expanding our product and service offerings to effectively meet your needs.

I look forward to serving you and this outstanding organization for many years to come. The CNS will continue to grow and support you, our members, through our effective volunteer leaders, dedicated staff and most importantly, listening and responding to your feedback.
Elderly Issues:  
Our Society Getting Older

Our explosive growth in the utilization of neurological surgery can be linked to the associated rise in our aging American population. According to the 2010 Census, our society is getting older. While we typically associate the terms “elderly” and “older” with those who have retired, our aging population also affects our “younger” work force. The percentage of younger people in the United States between the working ages of 25 to 44 years old has declined by 3.4%, while the older population within the working ages of 45 to 64 years old has increased by 31.5%. The older working group now makes up 81.5 million people in the United States (US) population, and is associated with the rising average age of our work force.1

In looking at those old enough to be in the retirement age bracket in the US, age 62 years and older, this group has increased by 21.2%. Overall, those we expected to have retired from the workforce, people 65 years and older, make up 40.3 million people and represent 39% of our total United States population. Between 2000 and 2010, this older age group represented the fast growth in the US and has been associated with the rise in need of neurosurgical and spinal care, including adult degenerative spinal deformities (Table 1).

In addition to these statistics of the growing number of “Baby Boomers” nearing retirement age, the increase in our older US population is also related to a trend for longer life expectancy as noted with the fastest growing segment of our US population being those 90 years and older.4 The number of people in the US who are 90 years and older has tripled over the past three decades, reaching 1.9 million in 2010, and is expected to quadruple over the next four decades thanks to advances in medicine and healthcare.2 Due to our increasing life expectancy in the US, those over the age of 90 years now represent 4.7% of the population over the age of 65, as compared to being only 2.8% in 1980, and with a projected increase to 10% of our older population in the US by the year 2050.1,2

As the number of our senior citizens increase, so will the need for age-appropriate medical care. The majority of our older popula-

---

Table 1. Population Table of Age and Sex Composition Comparing 2000 to 2010 Data

tion in the US has one or more disabilities, with lumbar spondylosis and low back pain being the most frequently reported musculoskeletal problems.\textsuperscript{2,3,4} Compared to other medical problems, the disability associated with degenerative spine disease is significant with a lower quality of life based on EQ-5D, which is a standardized measure of health status developed by the EuroQol Group (Table 2). Based on a review of the literature, it would appear that the disability associated with lumbar spondylosis is more than twice that of prostate cancer, and is more disabling than diseases such as congestive heart failure, chronic obstructive pulmonary disease, or diabetes.

The disability associated with neurosurgical and spine diseases becomes more significant the older the patient becomes. For example, those over 90 years old typically do not live with their families, and either lives alone or in a nursing facility. Their ability to live alone versus being institutionalized in a skilled nursing facility becomes related to the management of their disabilities affecting their independent function.\textsuperscript{1} Given the prevalence of neurological and spinal disorders in the elderly population and their associated disability, it can be expected that the need for medical care to promote a higher quality of life, or increase their quality added life years (QUALY’s), including surgery, is expected to exponentially increase in an attempt to maintain the function and overall quality of life in our older patients.

Many authors have identified a trend of rising medical care for the treatment of neurosurgical and degenerative spinal disorders in our Medicare population, and assuming a stable incidence of disease, concluded that there is too much inappropriate medical and surgical care being delivered. However, the population data would indicate that we have a rapidly growing older US population and that this is associated with age-appropriate neurosurgical and degenerative spinal disorders needing medical and surgical care. Concern about our growing health care costs has led to discussions on the cost-effectiveness of treatment options. As neurological and spinal disorders are associated with some of the highest rate of disability and loss of independence for our patients, understanding of the epidemiology in our aging population is needed to avoid inappropriate rationing of care. The only way to assess the appropriateness of our neurosurgical and spinal treatments is to analyze the clinical variables and outcomes measurements for the effectiveness, versus looking at absolute costs or rate of growth data alone, as over-interpretation of any subset of data is potentially misleading and dangerous.

### Table 2. Overview of Baseline EQ-5D Indices, Number of Studies and Number of Patients for Selected Disease States

<table>
<thead>
<tr>
<th>Disease State</th>
<th>Number of Studies</th>
<th>Number of Patients</th>
<th>Mean EQ-5D Index (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate Cancer</td>
<td>6</td>
<td>2,317</td>
<td>0.79 (0.23)</td>
</tr>
<tr>
<td>Diabetes Type II</td>
<td>32</td>
<td>35,348</td>
<td>0.76 (0.22)</td>
</tr>
<tr>
<td>IBD</td>
<td>5</td>
<td>1,229</td>
<td>0.75 (0.23)</td>
</tr>
<tr>
<td>COPD</td>
<td>11</td>
<td>7,495</td>
<td>0.70 (0.24)</td>
</tr>
<tr>
<td>ERSD/RF</td>
<td>8</td>
<td>2,126</td>
<td>0.66 (0.26)</td>
</tr>
<tr>
<td>Rheumatoid Arthritis</td>
<td>24</td>
<td>28,569</td>
<td>0.66 (0.22)</td>
</tr>
<tr>
<td>CHF</td>
<td>12</td>
<td>5,067</td>
<td>0.63 (0.25)</td>
</tr>
<tr>
<td>Knee OA</td>
<td>10</td>
<td>3,029</td>
<td>0.52 (0.26)</td>
</tr>
<tr>
<td>PVD</td>
<td>9</td>
<td>1,824</td>
<td>0.50 (0.28)</td>
</tr>
<tr>
<td>OA of the HIP</td>
<td>9</td>
<td>36,301</td>
<td>0.41 (0.31)</td>
</tr>
<tr>
<td>Lumbar Spondylosis</td>
<td>24</td>
<td>11,801</td>
<td>0.39 (0.26)</td>
</tr>
<tr>
<td>Total</td>
<td>137</td>
<td>135,106</td>
<td></td>
</tr>
</tbody>
</table>

### References

HEALTHCARE COST, QUALITY AND THE AGING POPULATION: A CHALLENGE TO THE NEUROSURGERY VALUE PROPOSITION

The current growth in healthcare cost is unsustainable. Current healthcare costs are nearly 18% of the U.S. GDP. Cost of surgical care alone comprises 7% of U.S. GDP. Without reform, healthcare costs are expected to surpass half of U.S. GDP within the next few decades. In an effort to shift financial incentives from quantity of care to quality of care, to increase transparency amongst stakeholders, and empower the healthcare consumer, the healthcare landscape is rapidly shifting towards data-driven profiling and public reporting of quality of care. With the emergence of value-based purchasing, policy makers and payers aim to shift care away from low value treatments and low quality providers. This past year, CMS released its nationwide claims data, including physician identifiers, to the emerging private market so that any “certified” entity may provide physician and hospital performance reports to the public. Because the demand for such value-based purchasing has outpaced the infrastructure to collect the requisite data, the emerging environment of provider and hospital quality reporting is currently reliant on administrative claims data.

The Society of Thoracic Surgery (STS National Database), the American College of Surgeons (NSQIP), and recently, the AANS’ National Neurosurgery Quality and Outcomes Database (N2QOD), among others have emerged to offer more relevant and accurate platforms to report quality and value of surgical care. The Institute of Medicine (IOM) and Agency for Healthcare Research and Quality (AHRQ) define healthcare Quality as, “the degree to which healthcare services for individuals and populations increase the likelihood of desired health outcomes.” According to the IOM, Quality care is timely, efficient, patient-centered, equitable, safe and effective.

In the healthcare value equation (Quality/Cost), safety and effectiveness (Quality) of care is the numerator and healthcare cost the denominator. Central to patient centered evidence-driven reform is quality and value of care. As neurosurgeons enter a new era with an unprecedented demand to demonstrate the quality of their care and the value of the neurosurgical procedures they provide, awareness of the factors that influence these metrics is paramount.

As the demand to improve the value of care is rapidly rising, so is the U.S. population of adults over 65 years of age. Increasing age and the elderly in particular, present a challenge to the value proposition in neurosurgical care. In almost all surgical disciplines, advanced age is a major risk factor for adverse measures of patient-centered quality. Peri-operative morbidity, mortality, re-operation, and hospital readmissions are all elevated in the elderly. Evidence of health gains with surgery (effectiveness) in the elderly is sparse in the neurosurgery literature. Because variance in surgical morbidity is the largest driver of surgical cost and lack of health benefit from surgery contributes to elevated cost from continued resource utilization, today’s metrics suggest that the value of surgical care may be less for the elderly. Hence, an increased proportion of elderly in a given healthcare population will have a multiplied effect on the measured value of neurosurgical care; decreased quality with increased cost. Because many degenerative neurosurgical pathologies peak in the sixth decade of life, current value-based paradigms may not be well suited to re-wound neurosurgical care of those who need it most, the aging U.S. population.

Degenerative spine disorders represent the majority of neurosurgical practice in the U.S. Using degenerative spine pathology as a case study of cost, quality, and value, we present the following institutional registry analysis. In a single-institution, prospective, longitudinal outcomes spine registry at the Vanderbilt Spine Center (VSC), all elective surgical care is prospectively measured and a representative sampling of medical spine care is measured. Because this non-research, quality improvement registry does not require written consent, all care is measured as it occurs. Hence, a true representation of healthcare delivery is measured rather than a confounded subset of the most motivated patients agreeing to partake in research.

In our experience, surgical spine care of the elderly was associated with increased one-year direct healthcare cost, increased peri-operative morbidity, increased 90-day hospital re-admission, decreased effectiveness of care (quality of life and disability improvement), and decreased value (cost to obtain a full QALY-gain), Table 1. When comparing providers or hospitals within a market, or comparing treatments between various disease states, increased proportions of elderly will inevitably artificially deflate the measured quality and value of care. This highlights the tremendous importance of appropriate risk-adjustment in quality reporting and value analysis. Without valid risk-adjustment, value-based strategies will mislead consumers, and analytics will report variance in patient populations more than variance in quality of care within healthcare delivery.

Despite the negative effect advanced age had on quality and value of surgical spine care at the VSC, the observed utility of lumbar spine surgery in the elderly population (0.22 one-year...
QALY-gain) compares very favorably to other surgical treatments reported in the literature. Figure 1. Comparing baseline and one-year post-operative outcomes in the elderly within the VSC registry, lumbar surgery resulted in significant gains in back pain (VAS: 6.3 vs 3.2; p<0.001), leg pain (VAS: 6.1 vs 2.4; p<0.001), disability (ODI: 47.3 vs 28.0; p<0.001), physical quality of life (SF-12 PCS: 28.3 vs 38.9; p<0.001), and one-year QALY-gained (0.57 vs 0.78; p<0.001). In a comprehensive literature review of all studies reporting the EQ-5D QALY-gain after surgery, the health state gain observed with lumbar surgery in the elderly was superior to all surgical care except knee and hip replacement, Figure 1. Based on the literature to date and despite the challenges neurosurgeons face treating the elderly population, the value of spine surgery remains very high from a population health perspective, even in its highest risk population; the elderly, Figure 1.

In an emerging healthcare reform landscape with increasingly fixed resources, attention is turning towards the relative quality and value of care between disease states, treatments, and providers. The aging U.S. population presents a challenge to neurosurgical providers and therapies treating this population sub-group. While many neurosurgical therapies are highly effective and compare favorably even in the elderly, there is a growing need to generate evidence to prove this to outside stakeholders, and to study the effect increased age has on quality and value metrics. Current quality and value-based paradigms may not be well suited to reward neurosurgical care of those who need it most, the aging U.S. population. We as a specialty society and individual physician advocates for our patients must engage in the emerging quality paradigm, to help advance its methods for a patient-centered sustainable healthcare system.

References


| Table 1. Measure of cost, quality, and value (benefit per cost) of care for lumbar fusion for degenerative lumbar pathology as a function of patient age. |
|---|---|---|---|
| **Age** | **Safety** | **Effectiveness** | **Cost** | **Value*** |
| 70+ | 10% | 19% | 18% | $53,000 | $176,000 |
| 30-60 | 7% | 14% | 24% | $44,000 | $100,000 |

* All major and minor 90-day morbidity
** ODI: Oswestry Disability Index
*** Cost per QALY-gain as a two-year estimate

Figure 1. Mean quality adjusted life year (QALY) gains reported in literature after common surgical interventions. The health state gain observed with lumbar surgery in the elderly was superior to all surgical care except knee and hip replacement.
Surgical treatments of structural low back diseases are facing increasing scrutiny on whether their cost justifies the benefit to patients from a population health perspective. This is particularly true in the management of the elderly, where perceived risk is higher and clinical utility less known. In the current paradigm, many elderly patients with structural, and potentially surgically correctable spine pathologies are subjected to prolonged medical therapies given their age. However, evidence to support this practice is lacking. Whether prolonged medical treatments of structural lumbar pathologies provides effective improvement remains poorly studied in elderly patients, particularly after failing an initial medical trial when facing the option of surgery. In a single-institutional spine center-wide prospective longitudinal outcomes registry, we analyzed the two year outcomes of patients >65 years old whom had surgically relevant lumbar pathology (disc herniation, stenosis, spondylolisthesis) that decided to undergo prolonged medical management rather than surgery. All patients had failed an initial 6-8 weeks of physical therapy, epidural injections, and a multitude of non-narcotic and narcotic oral medications.

A lack of improvement in back pain (VAS-BP), leg pain (VAS-LP), low-back disability (ODI), physical QOL (SF12-PCS), mental QOL (SF12-MCS), and depression (ZUNG) was observed after comprehensive medical management (physical therapy, epidural injections, anti-inflammatory, muscle relaxant, and opioid medications), Table 1. Two-year costs average $8,236. Despite costs nearing ten thousand dollars per patient, there was no appreciable health benefit, suggesting that medical management of surgically relevant pathology may be of minimal value when prolonged after failing an initial six weeks medical trial.

In a healthcare reform era embracing value-based purchasing and patient-centeredness, the Institute of Medicine (IOM), the Agency for Health research and Quality (AHRQ), and the Patient Protection and Affordable Care Act (PPACA) have called for evidence from every day practice to guide policy and purchasing decision via registries. At the heart of this evidence driven reform process is safety and effectiveness (Quality) and cost of care, driving the value equation (Quality/Cost). Critical to assessing the value of lumbar surgery in the elderly or any patient population is a meaningful and accurate comparison to a gold standard treatment option. To date, medical management of surgically relevant pathologies such as lumbar disc herniation, stenosis, and spondylolisthesis has been assumed to be the gold standard for which higher cost therapies should compare to. However, evidence unequivocally supporting multimodality medical therapy as an effective and valuable treatment option for these structural and surgically relevant spine pathologies remains debated. High quality evidence is particularly lacking in the elderly. The authors here challenge the notion that long-term medical therapy for three common surgical low-back pathologies are effective and valuable treatment options at the time point when surgery is considered; that is when lack of medical response has already been demonstrated.

Generating accurate and meaningful evidence from medically managed cohorts that allows for an “apples to apples” comparison to surgery patients has historically been a challenge. To make a meaningful comparison for value analysis, one must minimize confounding that is inherent to the shared decision to undergo surgery (selection bias), limiting the use of non-randomized prospective cohort studies. However, ethical constraints of randomized controlled trials (RCTs) mandating the allowance of treatment group cross-over also results in confounded medical treatment cohorts. In non-randomized studies, medically

<table>
<thead>
<tr>
<th>Patient Demographics</th>
<th>N=50</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables</td>
<td>Age</td>
<td>Male</td>
<td>Diagnosis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>69.4±4.8</td>
<td>26 (52.0%)</td>
<td>Disc Herniation 15 (30.0%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.2±2.8</td>
<td>7.5±2.5</td>
<td>SF-12 PCS 30.2±7.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>58.7±18.1</td>
<td>6.5±3.3</td>
<td>SF-12 MCS 50.2±12.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>34.9±11.8</td>
<td>52.0±20.5</td>
<td>Zung Depression 33.5±11.6</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Baseline characteristics and patient reported outcomes of fifty patients undergoing comprehensive medical management for degenerative lumbar spondylolisthesis, stenosis or disc herniation.
managed patients tend to represent those patients most satisfied with or responsive to medical treatment, whereas surgical cohorts represent those patients not responsive and least satisfied with their initial trial at medical therapy. In RCTs such as SPORT, an intent-to-treat analysis generates a medical cohort confounded by inclusion of surgically treated patients, and the “as treated” analysis by definition generates a medical cohort of patients that remain only after non-responders to medical treatment have crossed over to surgery, artificially elevating the group mean measure of effectiveness. Neither study design can answer the question: Is prolonged medical treatment effective? Hence, comparison studies to date provide a cloudy assessment of the effectiveness and value of medical therapy; evidence specific to the elderly even more so.

The authors feel that prospective longitudinal registries offer unique advantages to assessing single treatment cohorts in everyday care. In accordance with the IOM, AHRQ, and the PPACA, careful case definitions within a prospective registry can allow for a measured and homogenous patient population that is most similar to those patients whom surgery is offered to, without artificially affecting measurement to do research study constraints.

Our findings demonstrate lack of improvement in every validated, patient-centered outcomes instrument employed. Even if powered appropriately so that the observed, non-significant, small health gains did reach statistical significance, none of them would have reached clinical significance (MCID). The cost of medical therapy observed in our practice was almost entirely direct medical cost, as occupational losses of patients and caregivers (indirect cost) were minimal. While the observed costs here were only a third of costs previously reported for surgical cohorts, our results suggest that there was no sustained benefit to justify these costs, questioning the value of continued medical treatment in patients failing to show improvement in the first 6-8 weeks of therapy. There are a few reasons why our findings challenge previous reports. Medical management outcomes studies that include patients 1) without well defined surgically relevant structural pathology, 2) that have not fully engaged in an initial trial of the medical therapy to be studied, 3) that demonstrate even modest improvements with initial trial of medical management, or 4) exclude patients that subsequently choose to undergo surgery do to their poor outcomes with medical treatment will inevitably demonstrate greater effectiveness of medical treatment in those measured populations. However, based on current evidence-based guidelines, those patient populations are not who surgery should be offered to in the first place.9

It is important to highlight the fact that comprehensive medical management is very effective in managing the “sea” of low back and leg pain patients, and should be considered as first option. This is particularly true in the elderly, where increased age is associated with greater morbidity and cost.1,2,10 The vast majority of lumbar pathologies and symptoms will respond to medical therapies. It is only in the small subset of patients with documented structural spine pathology, with symptoms corresponding to those structural pathologies, and that demonstrate no improvement after fully engaging in multi-modality medical treatment that continued medical treatment may be of least value. It is this subset of elderly patients where surgery, despite its cost and risks, is likely the most valuable treatment option, from both a value-based and patient-centered perspective. Loosing sight and grasp of an appropriate “apples to apples” medical comparison group most relevant to surgical subsets of the elderly population will create an artificial headwind against the true value of surgical treatment options for the growing elderly population in America.

From a short-term cost-based purchasing and risk perspective, prolonged medical management appears favorable in the elderly population. From a value-based purchasing and patient-centered effectiveness perspective, prolonged medical management may be an inferior treatment option in the elderly population with surgical degenerative lumbar disorders. Patient age alone should not drive caregivers away from considering surgical management of lumbar spine disorders.

References
As physicians, as well as members of society as a whole, it is apparent that our population is increasingly aging. Whether we are seeing patients in clinic or reading an article in the newspaper, there are constant reminders that the “baby boomers” are getting older. However, not only is the population demographic shifting; there are also aspects of the baby boomer generation which create unique spine care requirements. For example, this group of individuals is very committed and focused on their quality of life and independence. As a generation, they maintain their physical attributes extremely well by keeping active and are unwilling to become labeled as “elderly.” Unfortunately, this intense physical activity puts unique stresses on their spines, and concurrently, as one ages, the spine has a higher incidence of osteoporosis, other metabolic bone loss, and degeneration.

Fortunately, with this increase in prevalence of age-related spinal deformities and degenerative scoliosis, there has been a concurrent improvement of our knowledge of spinal sagittal alignment and pelvic parameters (See Michael Wang’s article on page 11). Operations for these deformities are associated with a high morbidity and are particularly difficult on elderly individuals. The potential benefits for surgical treatment are very high but must be weighed against the cost of these operations. Use of long constructs with numerous spinal implants is quite expensive. These costs need to be calculated not only by the individual, but for society in general. This enacts a difficult debate on cost versus function, particularly in an elderly population and what society’s overall goals are.

Although the aging population impacts numerous aspects of spine care, this article reviews its effect on spinal cord injury (SCI). The SCI population has significantly changed over the last 10 to 25 years. At Thomas Jefferson University Hospital and Delaware Valley SCI Center, approximately 200 SCI individuals are cared for each year. It is interesting that over the last 25 years, there has been a 600% increase in the mean age of individuals that received care. In the 1970s, the mean patient age was 28.7 years, increasing to 31 years, 35 years, and 39 years in the 1980s, 1990s, and 2000s, respectively. Recently, from 2010 to 2012, the mean patient age was 42.6 years. While the overall means do not seem to be high, we must remember that SCI occurs in a bimodal distribution; one group being younger patients and the other being elderly patients. Younger patients are typically affected by high-energy traumatic injuries, and SCI in elderly patients is due to lower energy injuries, such as falls from height.

This bimodal observation is supported when analyzing the statistics of types of injuries. Paraplegic SCI occurs from a very high mechanism of injury which fractures the thoracic spine and ribcage. Thus, aging would not be expected to change the incidence. This is supported by the data where the paraplegic population has minimally changed with complete paraplegics dropping from 27.7% to 18% and incomplete paraplegics slightly increasing from 17.6% to 18.3%. The occurrence of tetraplegic (complete loss of all motor and sensation) SCI has significantly declined from 25% in the 1970s, to presently only accounting for 11.6% of SCI.

However, incomplete tetraplegic SCI patients have increased from 28.1% to over 40%, presently. So, why is this happening? Unfortunately, as patients age, their spines tend to stiffen due to degenerative changes, and the result is that the spine becomes more ankylosed, in addition to loss of disc height. Elderly patients also tend to concurrently develop neurologic decline due to length dependent neuropathies, as well as the possibility of unknown cervical myelopathies. The result is loss of coordination and difficulty with gait. The synergistic loss of visual clues predisposes these patients to higher risks of falls and lower mechanism injuries. Thus, stiff spine and repetitive lower energy falls makes these patients extremely susceptible to cervical spine injuries and particularly central cord SCI and/or incomplete tetraplegic injuries. Therefore, as we move forward, it is important to not only concentrate on treatment of SCI, but also preventative mechanisms. Examples include screening our elderly patients in terms of home safety, as well as assessments for neuropathies, visual loss, and myelopathies.
SPINAL DEFORMITIES IN AN AGING POPULATION

Epidemiological Context
Advances in health care, safety, nutrition, and sanitation have resulted in an unprecedented prolongation of the lifespan for citizens of the “developed world.” The current life expectancy for a U.S. citizen who has survived to the age of 65 is now 82; 84.89 years for men and 94 years for women. In fact, it is now predicted that by the year 2050, there will be over 4.2 million Centenarians in the U.S. (Figure 1). This is despite a relatively stable national population size overall.

The aging of the American population poses specific challenges for the spinal neurosurgeon. Degeneration of the vertebral column continues to progress with age, and disc disease, facet joint arthropathy, and spinal stenosis are well-known entities that may require surgical treatment. The surgical and anesthetic management of these increasingly older individuals poses challenges to the neurosurgeon.

Surgical Management of the Elderly Spine
Spinal neurosurgery in the elderly is intrinsically complex. A myriad of disease entities as well as diverse treatment options render decision-making for the surgeon and patient ever more complex. In particular, the following issues can be more involved in the elderly spinal population:

- **Anesthetic management**—The risk of anesthetic complications increases with age. Compromised cardiopulmonary function, as well as increasing medical co-morbidities necessitates limiting the amount of time elderly patients remain under general anesthesia. In addition, there is an increasing recognition that memory and cognitive processes are susceptible to prolonged general anesthesia.

- **Multi-level disease**—In the past, it was often felt that patients with a radiculopathy or neurogenic claudication typically harbored primarily single-level disease. However, with increasing age, the degree of degenerative change increases frequently at several levels. This poses not only the problem of accurately diagnosing the offending spinal level, but also introduces the very distinct possibility that several spinal levels may be responsible for the patient’s presenting symptoms, even in cases of primarily neurological symptoms. An increasing reliance on anesthetic test injections has resulted from the complex process of discerning which of several abnormal levels may be causing a patient’s symptoms. In addition, a reasonable alternative strategy is to treat the patient at multiple levels.

- **Imaging considerations**—A proliferation of implantable electronic devices (cardiac defibrillators and pacers, nerve stimulators, etc.) has made it impossible for an increasing population of patients to receive magnetic resonance imaging. CT myelography testing reveals different anatomic features and is the best alternative to magnetic resonance, but poses some risks due to its invasive nature and administration of contrast agents. A younger generation of spinal surgeons has now begun to re-learn the art of interpreting myelographic imaging.

- **Osteoporotic bone**—Internal fixation has revolutionized spinal surgery. In the setting of osteoporosis, surgeons are forced to manage the patient with weaker skeletal anchor points using cement augmentation, longer fusion constructs, alternative screw designs, or avoiding instrumentation altogether. However, even for patients undergoing decompression alone, a greater respect for the limited integrity of the spinal column is needed in the setting of osteoporosis. In either case it behooves the surgeon to

---

*Figure 1. Number of U.S. centenarians*
become knowledgeable about the rapid advances in medical management of osteoporosis.

- **CSF leakage**—As patients age, the Dura mater becomes progressively thinned. This is coupled with an increasing use of epidural steroid injections. The end result is a greater risk of spinal fluid leakage in general. For the elderly, the consequences of Dural breaches are more significant, as prolonged bed rest increases perioperative morbidity. This patient population is also at greater risk for intracranial subdural collections from iatrogenic or therapeutic reductions in CSF pressure.

- **Post-operative care**—The elderly population also poses increased risks of complications in the post-operative period. Older patients are more susceptible to “sundowning” and slower to mobilize in general, and hyponatremia is a common finding. Concomitant arthritides in the hip and knee joints can also impair postoperative mobilization.

### Spinal Deformity & Aging

Scoliosis and kyphosis are increasing in prevalence with the aging population. Data from the National Health and Nutrition Examination Survey (NHANES) study estimates the prevalence rate of scoliosis at 8.3% in adults (defined as greater than 10° curves). Furthermore, as patients age, they are at risk for progressive deformity progression. With more severe curves, the surgical enterprise must often be expanded to include more spinal fusion levels, more osteotomies, or combined approaches from the anterior or lateral approach. Independent of the magnitude of the surgery, more severe deformities also carry a higher risk of complications. With adult deformities, it is necessary to first destabilize the spine, actively correct the deformity, and then stabilize it through internal fixation and fusion. Thus, larger deformity corrections require more destabilization, a greater degree of neural manipulation during curve correction, and stronger fixation (Figure 2).

### Complications in Spinal Deformity Surgery

Surgical complications are common with adult spinal deformity surgery. Charosky reviewed prospective data from six French spine centers. Their study population included 306 patients older than 50 years of age with a mean curve of 50°. 10% of patients had anterior surgery only, 18% had double anteroposte-

---

*Figure 2. A & B) AP and C & D) lateral 36-inch films showing correction of a severe kyphoscoliotic spinal deformity in an 79-year-old female.*
rior approach, and 72% had posterior surgery only. There were no cases of death or blindness. However, common complications that occurred were infection (5.2%), neurological complications (7%), reoperations (26%), and mechanical complications (24%). This resulted in an overall complication rate of 39%.4

Acosta, et al. reviewed data on a somewhat older population, including only those over the age of 75, undergoing deformity surgery of at least six spinal levels. Of their 21 patients, the mean patient age was 77, and 71% had at least one major medical co-morbidity. 62% had at least one peri-operative complication and 38% had at least one major complication. Revision surgery was necessary in 14% of patients, and long-term complications occurred in 52%. There were no peri-operative deaths. Increasing age was predictive of any peri-operative complication (p = 0.03), but major complications were not predicted by age or co-morbidities.5

Furthermore, even patients recovering well from the surgery are at risk for delayed complications. Under-correction of deformities, proximal junctional kyphosis, pseudarthrosis, and hardware failure are potential late complications of these extensive surgeries. For example, Smith, et al. found in a study of 442 patients that 6.8% of spinal deformity patients suffered a rod fracture, and 15.8% of PSO patients had a fracture.6 The majority of these patients required a subsequent revision operation. Some surgeons attempt to limit the number of levels treated as a strategy to reduce the magnitude of the surgical enterprise. This strategy reduces anesthetic time, blood loss, recovery periods, and the likelihood of pseudarthrosis. However, it is also critical to correct the patient’s deformity to a degree that will result in adequate long term outcomes. Kasliwal, et al. demonstrated this with their finding that 40% of their studied deformity patients had previously undergone a short segment surgical fusion which later needed to be revised due to inadequate deformity treatment.7

The Importance of Sagittal Balance
There is an increasing recognition that proper maintenance and/or restoration of sagittal balance is critical to the success of adult spinal deformity surgeries. This often requires more complex operations designed to destabilize and re-align the spine. Lafage, et al. studied a population of patients undergoing 3-column osteotomy to fix rigid adult deformities, investigating the measures of lumbar lordosis, sagittal vertical axis, and pelvic tilt on clinical outcomes. In their study of 41 patients, a greater degree of pelvic tilt and longer sagittal vertical axis predicted poor spinal-pelvic alignment, and this correlated with poor clinical outcomes.8

Thus, for surgeons planning adult deformity operations, particular attention should be paid to obtaining adequate sagittal alignment by matching the degree of desired lumbar lordosis to the pelvic incidence. Failure to achieve the optimal result is typically the result of planning an operation which does not provide the needed degree of correction in the sagittal plane. This is more likely in the elderly population given concerns over the magnitude of the surgical enterprise in patients who are more susceptible to the consequences of prolonged anesthesia, significant blood loss, and immobilization. Staging the operation over two or three sessions is one option for managing this risk in the elderly.

Healthcare Economics
The increasingly aging population with its greater prevalence of spinal deformities will have to be managed in a coming era of economic restrictions. Spinal deformity surgeries carry significant costs. Prolonged surgeries with a heavy reliance on adjuncts for bony fusion, numerous spinal implants, long hospitalizations, high rates of complications, and the need for inpatient rehabilitation all add to the costs for caring for this patient population. However, evidence is emerging that the value of these surgeries as determined by quality adjusted life years (QALY) is reasonable, given the severely limiting nature of these pathologies compared to other orthopedic surgical procedures.9

REFERENCES
TRAUMATIC BRAIN INJURY IN THE ELDERLY

The Problem
Whether you work in a major academic center or a community hospital, the midnight emergency room telephone call for an elderly patient with a chronic subdural hematoma is almost routine in every neurosurgical practice. With over 10 million traumatic brain injuries (TBI) worldwide per year, over 1.5 million TBI cases per year in the United States, and an aging population, the problem promises to increase. 1

Based on anecdotal and published data, most of us would agree that older patients generally have worse outcomes after TBI. Specifically, older patients are more likely to have multiple medical co-morbidities, to take anti-coagulation or anti-platelet medication, and to have more severe injuries compared to their younger counterparts. Many neurosurgeons would have serious reservations about taking warfarin or Plavix themselves, and we speculate that few would consent to having a craniotomy for a subdural hematoma after the age of 80. However, it is important to make decisions for our patients based on objective data.

Outcomes
In TBI, age has long been recognized as a predictor of poor outcome. Older TBI patients have two times higher mortality, more complications, longer hospitalizations, and six times higher unfavorable outcomes when compared to younger individuals. Elderly patients are also more likely to die in the months that follow their intensive care unit stay when compared to younger patients and are more likely to have poor functional outcomes. 2-4 Obviously, these general findings should make us all think very carefully about taking an elderly patient for surgery, but what age should be considered “elderly”? 6

The general trauma community teaches that anyone older than 40 years old has a worse outcome, but a recent study showed that overall mortality increases for patients greater than 56 years old independent of injury severity. For TBI specifically, the mortality steadily increased with age to a peak at 75 years old. 5 However, other authors have shown that although the risk of death from TBI is higher for patients over the age of 65, the proportion of severe TBI is higher as well and therefore, age may not be the only factor causing a higher mortality. Additionally, one study showed that patients who survive to 6 months after injury will be expected to live a normal life span for their age. 6 Like everything else in our specialty, it’s all about the individual patient and a careful assessment of risk. While “70 is the new 50,” an individual of any age may be extremely fit or have severe co-morbidities such as alcoholism or coronary artery disease.

Special Considerations
One of the most commonly encountered conditions in the elderly is the chronic subdural hematoma (SDH). Above the age of 65, the incidence is 8 to 58 per 100,000 individuals, and the recurrence rate after evacuation ranges from 2% to 28%. 7 Every neurosurgeon carries memories of disastrous SDH patients, and yet our treatment approaches are highly varied and include craniostomy with subdural drain or vacuum drainage, burr hole(s), craniotomies, and craniectomies. However, the only surgical maneuver that is supported by Level I data is the use of subdural drains after burr holes. 8

Based on our own literature review, we favor burr holes as the primary procedure for chronic SDH. We attempt two burr holes, leave a subdural drain, and keep the head of bed flat for 24 hours. We initiate thromboprophylaxis with subcutaneous heparin at 36 to 48 hours after surgery depending on the postoperative imaging and generally repeat burr holes once for recurrence prior to proceeding with craniotomy. 9 On the other hand, in cases of severe medical co-morbidities or the presence of dense membranes we favor bedside craniostomy or mini-craniotomy, respectively.

Anticoagulants and antiplatelet agents are also frequently used in the elderly for coronary artery disease, cerebrovascular ischemia, and thromboembolic conditions and are worth special consideration. Antiplatelet agents such as aspirin and Plavix are almost ubiquitous in this patient population, but it has been demonstrated that in TBI, patients taking Plavix have a higher mortality and are more likely to be discharged to long-term inpatient facilities after their initial hospitalization. 10 Currently, the only treatments for these agents are platelet transfusions and desmopressin. Interestingly, some TBI studies have shown that no statistically significant difference exists between the antiplatelet treated patient groups who did and did not receive a platelet transfusion despite similar Glasgow Coma Scale scores and Injury Severity Scale scores. 11 However, in the absence of better therapy, platelet transfusion seems to be the most logical option for these difficult and increasingly more common patients.
Similar to aspirin and Plavix, TBI patients who take warfarin demonstrate worse outcomes. More specifically, longer Intensive Care Unit (ICU) stays and hospitalizations have been found. Unlike using platelet transfusions to reverse aspirin and Plavix use, studies have shown that the rapid correction of warfarin induced coagulopathy does improve outcome in patients with intracerebral hemorrhage. Reduced coagulopathy does improve outcome in patients with intracerebral hemorrhage.12 Reversal of warfarin induced anticoagulation is not a quick process, and when there is insufficient time to use fresh frozen plasma (FFP) or vitamin K. In our practice, we use Recombinant factor VII when patients need emergent cranial surgery or when the risk of deterioration is very high. Whenever factor VII is used, FFP should also be given and coagulation studies should be followed for 48 hours due to the risk of “rebound anticoagulation.” Further complicating this issue is the fact that new anticoagulants, which do not have safe or effective means of reversal, are being released into the market. These new medications include dabigatran and rivaroxaban.

Mild TBI in the elderly is worth mentioning. Mild TBI accounts for up to 80% of TBI in the United States. Although only 1% of mild TBI patients required an operative intervention, 64% of these interventions were performed on patients greater than 65 with a mortality rate of 28%. Thus, elderly patients may warrant admission to the hospital more frequently to monitor for neurologic worsening or to prevent medical complications such as pneumonia or deep vein thrombosis.

Moderate and severe TBI are also more significant in the elderly. Mortality rates over 50% have been reported in elderly patients with moderate and severe TBI, and the only surgical option for elevated intracranial pressure, decompressive craniectomy (DC) is associated with a worse outcome. In one study of elderly patients who had a DC, the ICU mortality was 48%, the in-hospital mortality was 57%, and poor outcomes occurred in 82% of patients at hospital discharge.14

**Conclusion**

TBI in the elderly is a worldwide problem that will continue to increase in frequency. Their medical problems are more complex, their relative injuries are worse, and their physiologic reserve is less. Little data exists to help us in treating these patients, and therefore sound judgment and experience are the best guides. Clearly more research studies are needed to answer some of these questions.

**References**

MANAGEMENT OF CEREBRAL ANEURYSMS IN THE ELDERLY

The elderly population has grown significantly since 1950. This is in part due to increased life expectancies and improved overall healthcare. With the expansion of this population, there will be an increase in the number of patients with cerebral aneurysms. The increase in non-invasive imaging will also contribute to the diagnosis of unruptured aneurysms in asymptomatic elderly patients. Current, the elderly and females comprise the largest demographic groups amongst patients with subarachnoid hemorrhage (SAH). Older age and an increased incidence of medical comorbidities places these patients at increased risk of poor outcome following treatment and increase the chances for associated medical complications.

Unruptured Aneurysms
Currently, the management of patients with unruptured aneurysms is controversial and this area is even less clear in the elderly. At some centers, both endovascular and microsurgery have been carried out on patients into the ninth decade. In a number of countries, patients with unruptured aneurysms and advanced age are not offered intervention, but with the improvements in endovascular options, treatment has been offered to a greater percent of elderly patients. The algorithm of whether to treat or observe an unruptured aneurysm in an elderly patient requires a careful estimation of life expectancy, an honest assessment of procedural risks, and a clear estimation of the natural history.

Unfortunately, the natural history of unruptured intracranial aneurysms is not entirely clear. The International Study of Unruptured Intracranial Aneurysms and the Unruptured Cerebral Aneurysm Study did not find age to be a significant risk factor for rupture, but younger age may be a risk factor for rupture due to the potentially increased life-years at risk. Size, location, symptomatic presentation, and presence of a daughter sac have been associated with the risk of rupture and these factors must be carefully balanced against patient and procedural risks. All factors must be carefully assessed in each patient to provide the optimal management.

Ruptured Aneurysms
Trials concerning ruptured cerebral aneurysms have found age to be a major predictor of outcome. Additionally, neurological condition following rupture is a significant independent risk prognostic factor in overall outcome. The reported number of elderly patients achieving favorable outcomes following treatment of aneurysmal SAH varies significantly due to patient, aneurysm, and treatment related factors but has been reported to be between 50-90% for overall cohorts, but 15-50% for treated poor grade patients. Due to the high rates of rebleeding and associated complications, treatment is indicated in the majority of patients; however, an honest conversation must be made with the patient’s family, and when possible, the patient.

Endovascular versus Microsurgical Clipping
The optimal treatment of cerebral aneurysms in elderly patients remains unclear. These patients tend to have higher complications rates related to surgical therapy, but endovascular therapy is complicated by more difficult access, vessel tortuosity, and atheromatous alterations. In the International Subarachnoid Aneurysm Trial (ISAT) lower rates of morbidity and mortality were associated with endovascular coiling as compared to microsurgical clipping for the overall population. With longer follow-up overall outcome in the microsurgical cohort approached the endovascular cohort. Episodes of rebleeding and retreatment were higher in the endovascular cohort, and the incidence of seizures was higher in the microsurgical cohort. Rates of rebleeding in elderly patients (0.3%) along with retreatment rates (5.17%) have also been similar as compared to the general population, but direct comparisons are difficult due to differences in overall patient and aneurysm characteristics. For elderly patients with fewer potential years of both rebleeding and retreatment and increased risk of upfront complications following microsurgery, endovascular therapy may be the optimal therapeutic modality even if it is less durable. In a subgroup analysis of the ISAT, for patients older than 70 years of age there was no significant difference in outcome between the 83 of 138 patients (60.1%) treated with endovascular coiling versus 78 of 140 (56.1%) in the microsurgical cohort. Patients with internal carotid and posterior communicating artery aneurysms had better outcomes when treated with endovascular therapy (72%) versus microsurgery (52%), but patients with middle cerebral artery aneurysms had better outcomes when treated with microsurgery (86.7%) versus endovascular (45.5%). With potential improvements in endovascular therapies, a number of studies have found improved outcomes in elderly patients treated with endovascular therapies. With the increase in endovascular technology including the use of balloon remodeling, stents, and flow diversion, the number of elderly patients that can be safely treated with endovascular therapies is increasing (Figure 1 and 2).

Conclusion
The numbers of both ruptured and unruptured cerebral aneurysms detected will continue to increase coinciding with a rise in the elderly population as life expectancy increases. In patients with unruptured aneurysms, a careful estimation of life expectancy, procedural risks, and estimation of the natural history must be made for each patient to balance the risks of...
observation and intervention. For large symptomatic and giant cavernous aneurysms in patients greater than 70 years of age, endovascular therapy is likely the best therapeutic option if feasible (particularly with flow diversion technology). For elderly patients with ruptured intracranial aneurysms, the majority of good grade patients may still achieve a favorable outcome. Although both microsurgical and endovascular therapies are both reasonable treatment options of ruptured intracranial aneurysms, lower associated complications with endovascular therapy make this an attractive treatment option particularly in patients with advanced age with lesions appropriate for endovascular treatment. Continued advances in endovascular therapy and safer treatment options for difficult aneurysms, in particular, will potentially improve the outcomes of elderly patients with aneurysms requiring treatment.  

REFERENCES

Figure 1: Anterior-posterior and lateral cerebral angiogram in an 82 year old patient presenting with diplopia and CN III palsy demonstrate a 20mm cavernous sinus aneurysm.

Figure 2: Anterior-posterior and lateral cerebral angiogram on 8 month follow up after placement of a pipeline embolization device demonstrate near complete aneurysmal occlusion. The third nerve palsy also resolved.
IS IT CAS OR CEA THAT IS NOT COST-EFFECTIVE?

The CREST trial leveled the playing field between carotid artery stenting (CAS) and carotid endarterectomy (CEA) for carotid stenosis, showing that the primary outcome measures of stroke, MI, and death did not differ significantly between the two groups. Although there was a higher peri-procedural risk of stroke for CAS, and MI with CEA. These outcomes have led a broad range of experts to conclude that both CEA and CAS are comparable options for treating carotid stenosis.1

However, there has been a debate about the cost-effectiveness of CAS because of the many studies that show higher costs of CAS compared to CEA. Based on the CREST data, Khan et al. showed that CAS is more than 35% more expensive than CEA, for similar outcomes.2 Similarly, a European study showed that CAS is more than 35% more expensive than CAS and points out multiple observational studies the vast majority of which agree that CAS is not cost-effective.3 Even if CAS and CEA have similar outcomes, the cost-effectiveness of CAS is in doubt.

When looking at why CAS is more expensive than CEA, it is clear that in these studies it is the price of the devices that drives the costs of the procedure higher. For example, in the European study mentioned before, the costs of the hospital stay and the personnel costs are actually higher in CEA. But while the materials cost for CEA is just over 10% of the entire cost, in CAS it represents over 50% of the entire cost. Similarly, in the Khan et al study, CAS was more expensive because of the procedural costs and not because of the costs occurring after the procedure, such as stroke, MI, or death. The trend for higher CAS costs persists even in countries whose governments closely regulates prices. For example, in Japan, where fees are set by the government, a small study showed that CAS was more than 70% more costly than CEA, for similar outcomes.4 Based on the studies, it would be easy to conclude that either the price of the stent needs to come down dramatically or CAS will no longer be a viable alternative to CEA.

On the other hand, even if the stent itself is the major driver of costs in CAS, it is still possible that CAS is cost-effective depending on how one calculates the inpatient CEA and CAS costs. Using resource allocation methodology instead of hospital accounting systems, Vilain et al. and the CREST investigators show little difference between the costs for CEA and CAS. While in their study the materials still account for a large majority of CAS cost (over 65%), the overhead and resource utilization for CEA is more than double that of CAS. CEA and CAS are almost identically cost-effective in their model.5

It is clear that the price of stents and other materials for CAS will need to come down because their costs represent such a disproportionate amount of the total cost for the procedure. But it is possible that if they do come down, and with the lower hospital costs associated with CAS, we may be asking ourselves in the future if CEA—not CAS—is cost-effective.

> IT IS STILL POSSIBLE THAT CAS IS COST-EFFECTIVE DEPENDING ON HOW ONE CALCULATES THE INPATIENT CEA AND CAS COSTS. <

REFERENCES
BRAIN TUMOR MANAGEMENT IN THE ELDERLY – TOO OLD TO TREAT?

Conventionally, “elderly” has been defined as persons exceeding 65 years of age; however, in this era of improved medical care and increasing average lifespan, a purely chronological definition seems conspicuously oversimplified. While determining who is “old” will always remain a matter of perspective, the fact of the matter is the incidence of most benign and malignant intracranial tumors increases with advancing age. Nearly half of patients diagnosed with glioblastoma (GBM) are 65 years of age or older and the number of new cases in the elderly is expected to at least double over the next two decades as a result of the population aging phenomenon. As we prepare for this swelling of baby boomers, sometimes referred to as the “Silver Tsunami”, we take on the contemporary challenge of brain tumor management in the elderly focusing on the existing data and unresolved questions.

When compared to younger patients, elderly brain tumor patients have a disproportionately increased incidence of medical comorbidities and ancillary variables that make their care more complex including reduced access to caregivers and practical transportation impediments. Unfortunately, in this population for whom careful patient selection is perhaps most important, there is a lack of high-quality data due to the deliberate exclusion of elderly patients from most clinical trials leaving the treating neurosurgeon with relatively little information upon which to base treatment recommendations, including the extent of surgery that is most appropriate and the efficacy and toxicity of adjuvant therapies. Glioblastoma represents the most common form of brain tumor in the elderly and population-based studies unmistakably demonstrate that this group is not managed in the same way as younger patients. Patients over the age of 65 are more likely to undergo surgical biopsy and palliative care alone and only about 10-20% of patients receive adjuvant chemotherapy. This variance in care suggests that elderly patients must also overcome physician prejudice against more aggressive therapies, a common observation amongst systemic cancers. While a series of retrospective studies demonstrated survival benefits in the elderly more closely approaching those observed in younger patients following multimodal treatment of GBM, the generalizability of these results is limited as these studies have typically only included patients with excellent performance status and reduced comorbidity. Simple extrapolation of treatment practices that are effective in younger patients may not be appropriate. A tailored approach incorporating the relative benefits and risks of surgery, radiotherapy and chemotherapy, combined with an improved assessment of operative risk and physiologic reserve seems most appropriate in the treatment of elderly patients.

Radiotherapy is considered a critical component of GBM treatment; however, advanced age has been associated with increased radiation-toxicity including brain atrophy and dementia, possibly as a result of pre-existent vascular compromise in the elderly. While the incidence of these events is correlated with
the volume of irradiated tissue, earlier studies for patients with malignant glioma were performed using whole-brain radiation therapy as opposed to the more conformal regimens used currently. In 2007, Kieme-Guibert et al. convincingly demonstrated that survival is lengthened using postoperative conformal radiation for GBM compared to supportive care alone in elderly patients with good Karnofsky performance status. Importantly, no differences in quality of life or cognitive function were observed. Given the shortened expected length of survival for elderly patients, there has been considerable effort to determine whether a shortened course of radiotherapy may achieve similar results while reducing the burden of treatment. The Nordic trial compared standard 6 week (60Gy) radiation to a hypofractionated radiation schedule (34Gy over 2 weeks) and found a survival advantage for elderly patients treated with short course RT, possibly as a result of more patients completing the shorter prescribed radiation course. While standard radiation may be appropriate for extremely high-performing elderly patients with GBM, a shortened radiation course certainly seems reasonable and better tolerated in more vulnerable and frail patients.

Many chemotherapeutics, including bevacizumab, have been associated with increased serious Grade 3-4 toxicity in elderly patients, possibly as a result of differences in drug metabolism and bioavailability. The Nordic trial, along with the German Cancer Society NOA-08 trial, attempted to determine the efficacy and toxicity of temozolomide chemotherapy in elderly patients with GBM. These prospective randomized trials demonstrated that treatment with temozolomide alone following surgical intervention is well-tolerated and achieves survival times similar to those observed with radiotherapy. The question remains whether the approach toward adjuvant treatment of GBM in the elderly can be further personalized on the basis of tumor biomarker analysis. The methylation status of the MGMT gene promoter has been shown to be a positive predictor of temozolomide response, and elderly patients have similar rates of MGMT promoter methylation compared to younger cohorts. This suggests that elderly patients with poorer performance status may be candidates for short course RT or chemotherapy alone based on their MGMT status.

Surgery for malignant gliomas remains somewhat contentious for any cohort. The potential survival advantages of an increased extent of resection in the elderly must be weighed against the likelihood of surgical morbidity and prolonged recovery period. Several small studies have demonstrated that in carefully selected patients, aggressive surgical intervention with complete resection achieves improved survival with low rates of adverse events. However, increased surgical morbidity with advancing age has been consistently demonstrated for major surgical procedures. Performance status provides some measure of physiologic reserve, however, it likely represents an insufficient measure of operative risk. The Multidimensional Geriatric Assessment (MGA) and Comprehensive Geriatric Assessment Questionnaire (CGA) have been frequently implemented in the care of elderly cancer patients and used to guide therapy administration. While the ability of these instruments to stratify operative risk in elderly patients with brain tumors has yet to be validated, they clearly add significant information and may be beneficial in better determining which subpopulations are likely to benefit from complete surgical resection in terms of survival, reduced surgical morbidity, and retained quality of life.

The incidence of benign intracranial tumors also increases with age and even less quality evidence is available to guide neurosurgeons as to the best management strategy. Perhaps the most attention to this issue has been focused on meningiomas where their incidence is 3.5 times higher in patients older than 70 years than in younger patients. While the options may be limited in those suffering from debilitating mass effect, for many of these, lesions expectant management, radiosurgery, and surgical resection may represent reason-
able alternatives. There has been considerable interest in determining the operative risks associated with meningioma resection in the elderly with the results in the literature varying widely, including perioperative mortality rates ranging from 1.8-45%.17 Several recent large database analyses have revealed a more likely accurate reflection of the general risks associated with meningioma resection in the elderly. Bateman et al. reported that elderly patients were three times as likely to die in the hospital (4%) after meningioma resection compared to the non-elderly and five times as likely to have an adverse outcome (death or discharge to a facility).17 Using the Veterans Affairs’ (VA) National Surgical Quality Improvement Program (NSQIP) database, Patil et al. reported increased 30-day mortality rates in the elderly of 12% compared to 4.6% in younger patients and an overall complication rate of 29%.20 Even after controlling for tumor location, preoperative comorbidities and American Society of Anesthesiologists (ASA) class, the elderly had a threefold increase in perioperative mortality. Despite their limitations, these studies clearly show that the risks of meningioma resection are increased in the elderly and the decision to pursue elective surgical treatment should be carefully deliberated. Fortunately, the risks of alternative therapies such as stereotactic radiosurgery do not seem to be significantly increased in the elderly.21 Although tumor volume and location are associated with increased complication rates, age does not appear to be a significant determinant of radiosurgery-induced complications. For elderly patients, radiosurgery may represent the preferred treatment strategy for actively growing tumors without debilitating mass effect.

The management of intracranial tumors in the elderly remains complex but the literature supports the commonsense perception that there exist subpopulations among the elderly who may benefit from aggressive surgical intervention and adjuvant therapies, both in terms of survival and quality of life. With the older segment of the population growing faster than any other age group, the inevitable “Silver Tsunami” demands we more rapidly define these subgroups to provide our patients the best care.

REFERENCES
Idiopathic Normal Pressure Hydrocephalus (iNPH) was first described in 1965 by Adams and Hakim as a syndrome affecting older people with ventriculomegaly. These people have a triad of symptoms: gait apraxia, dementia, and urinary incontinence.

It has since been recognized that not all patients with iNPH have the full triad (although all seem to have gait abnormalities). In spite of the fact that the pressure seems to be normal on spinal tap, these symptoms get better (or at least stop getting worse) with diversion of the spinal fluid with a shunt.

The diagnosis of iNPH is difficult. There is no gold standard in determining if the syndrome is a cause for the symptoms, other than response to shunting. If someone does not respond to shunting, it is often unclear whether this is because they never had the syndrome in the first place, they have other conditions which are the cause of their symptoms, the shunt was placed too late to help, or there is a malfunction of the shunt system. In addition, there is significant concern about placebo effect, as evidenced by the example of a patient demonstrating improvement of gait after a sham lumbar puncture. There is no consistent pathology on autopsy studies of patients who respond to shunting.

The diagnosis of iNPH is difficult. There is no gold standard in determining if the syndrome is a cause for the symptoms, other than response to shunting. If someone does not respond to shunting, it is often unclear whether this is because they never had the syndrome in the first place, they have other conditions which are the cause of their symptoms, the shunt was placed too late to help, or there is a malfunction of the shunt system. In addition, there is significant concern about placebo effect, as evidenced by the example of a patient demonstrating improvement of gait after a sham lumbar puncture. There is no consistent pathology on autopsy studies of patients who respond to shunting.

About 40% of our patients referred to us for evaluation are found to have alternative causes for their symptoms, many of which can respond to treatment. Usually the culprit is inappropriate medications with anticholinergic side effects, but we also have patients who have done quite well after we treat their sleep apnea, hypoparathyroidism, hypovitaminosis D, excessive alcohol intake or cervical spondylitic myelopathy.

Cast a wide net. Because the diagnosis of dementia is associated with such poor outcomes, some have advocated shunting all patients with ventriculomegaly who have typical gait symptoms prior to cognitive and/or urinary symptoms. Although this has a better positive predictive value than high volume lumbar puncture, not performing extensive analysis on urine, blood, and CSF can lead one astray. We have two patients who were found to have paraneoplastic syndromes as the cause of their symptoms on the basis of their CSF analysis.

Finding an alternative diagnosis does not mean that the patient doesn’t also have NPH. Sometimes, after optimization of other issues, the patient still has symptoms that respond to high volume lumbar puncture or extended lumbar drainage. We still give such patients the opportunity to have a shunt placed. In fact, one of our most thankful families is that of a gentleman with longstanding Alzheimer’s Disease (AD) who subsequently developed a typical gait apraxia. He has had about three years of benefit in his gait and improved cognitive interactions with his family. On the other hand, one should be conscious of the potential outcomes of shunting such patients. We know of one patient with AD who became an escape risk once his gait improved after shunting, much to the chagrin of his caregivers.

We tend to be liberal in offering surgery to patients coming to us with symptoms consistent with iNPH, once we have optimally treated other conditions that can cause the triad of symptoms. In spite of the considerable complication rate associated with shunting (15-20% with programmable valves), we are far more concerned about missing patients who might benefit from shunting than in obtaining the highest response rates. While this multidisciplinary approach is labor intensive, we feel it results in the best care for these complex patients.

References


Imagine the following (or any of a millions similar) scenarios:

Your aging parents have decided to take an adventurous cross-country trip to see all the wonders of their dreams such as the Grand Canyon and Old Faithful. Just out of Denver, your father develops a gripping epigastric/chest pain and your mother drives him to the nearest hospital. While his EKG is wildly abnormal (he has had 7 prior stents) it can easily be compared with and found unchanged compared to several prior accessed through EHR and he is shortly sent on his healthy way. The culprit, easily cured with Maalox, is most likely the roadside greasy spoon where your parents stopped for lunch. Soon they reach the Canyon and post their glorious photographs for all the children and grandchildren to see.

Is there any inherent value, in terms of cost or quality of care, of an EHR? For those neurosurgeons who have been relatively early adopters of this technology, I think the answer would be an unequivocal yes. At present, the advantages are many, including legibility, consistency, accessibility and more. The age of digital medicine is here to stay. Unfortunately, too much of the development of this technology has sidestepped physician input and the full promise of EHR cannot be achieved without it. This applies not just to software and applications but also to the CMS EHR incentive program. The purpose of this article is to set a critical framework of ideal requirements that we feel EHR should be required to offer in the near future.

1. Privacy
2. Universal interoperability
3. Portability (across computer platforms and devices)
4. Queriability
5. Speed
6. Flexibility
7. Decision/Management Support
8. Universal Final Chart

Let us consider each of these individually.

Privacy
There is perhaps no more important concept for EHRs of the future than privacy. This is not just the simple confidentiality that has become an overused mantra of HIPAA, but also the confidence that individual data will not be used (abused) by insurance companies, employers and the like. It ensures that relevant data – nothing more and nothing less – is available to each of the relevant parties participating in healthcare delivery and monitoring.

Universal Interoperability
It is critical that for each patient, their labs, reports, and imaging be fully interchangeable across locations, practices, and settings. For example, a diabetic may have glucose and A1C readings done at home, PMD and endocrine offices, the ER, and also the hospital. It must be possible for all of these to be “dumped” into a common results folder, not unlike we can upload photographs of all places, dates, and photographers into an on-line site such as Picasa. This is particularly critical when a patient is transferred in the acute setting where critical data obtained at Hospital #1 is repeated – at expense and time – at Hospital #2.

Unlike countries such as the United Kingdom who have solved this problem by choosing a single EHR that all facilities (even those outside the HHS) must use, the US health care system demands this be arbitrated in the court of free market competition. The two need not be mutually exclusive. In the world of electrical appliances, many companies compete to sell you their hairdryers,
televisions, food processors, and more. And yet each of these devices must function (in the US) using a standard 2 or 3 prong AC power plug. The DICOM standard was developed to address interoperability between imaging devices so that all radiographic images are formatted in the same fashion regardless of vendor or imaging modality. The same not only can but must apply to our future EHRs.

**Portability**
One of the great values of even the current EHR systems is the rapid access to data from a variety of locations. Most of us have utilized the advantages of writing hospital progress notes from our office or homes, accessing emergency images from remote locations, detailing and documenting phone call backs done at night or on weekends, or reviewing history/medications/allergies on new patients. However, current systems remain significantly flawed in these and other applications. For example, some systems remain stubbornly incompatible with Apple operating systems or require enormous investment to overcome this hurdle (this is especially true with PACS systems). This is unacceptable and the burden for compatibility must rest with the manufacturers and not the individual users.

**Queriability**
One critical value of electronic data should be the ability to utilize that data for approved, clinical research projects. Most current EHRs have little or no ability to search and extract data based on diagnosis, medication, and laboratory value or similar. These systems should make conducting research easier, not harder. Designs that are sensitive to this requirement will facilitate uniform collection of outcome measures that are diagnosis-specific.

**Speed**
Clearly for all of us, including our patients, time is money. While privacy precautions are essential and checks need be in place to prevent errors, speed of use must be a high priority. Easy and secure access, multi-modality data-entry, built-in document generation and rich interfaces will enable rapid, secure and more meaningful aggregation and creation of medical content.

**Flexibility**
Care for a single patient is often delivered by a variegated group of participants - specialists, physician-extenders, and residents – all playing a different role in the composition of care. The interfaces by which each agent participates in care cannot be “one-size-fits-all”. Each user is interested in seeing different information and makes specific contributions. The medical record for a single patient needs to be imagined as a multi-dimensional, rich canvas on which many agents contribute different but predictable pieces. Interfaces need to be flexible enough to allow customization for each user to facilitate efficient acquisition of these predictable pieces. Cardiologists may routinely need access to EKGs, specific labs and vital sign values. They will need a different interface design than a neurosurgeon to maximize efficiency. One could argue that different neurosurgeons might prefer different interface designs and even that a single neurosurgeon may want a different interface in the inpatient setting than he/she would use in the outpatient setting.

**Decision/Management Support**
With the proliferation of clinical guidelines and pathways, it is increasingly challenging to verify compliance with these ever-changing standards. EHRs offer the capacity to maintain pathway-compliant care. As institutional policies are developed, logic can be embedded in EHRs to trigger certain actions or reminders. A few simple examples highlight the value of this feature:

1. “All admissions will get screening lower extremity ultrasounds within 24 hours of admission and weekly ultrasounds thereafter”
2. “All suspected spine infections will get admission ESR, CRP, ID Consult, biopsy and pain management consultation”

3. “Sodium values less than 132 will trigger entry into the daily progress note of the phrase ‘hyponatremia’ to maintain compliance with complexity coding requirements”
4. “All patients with cervical spondylotic myelopathy will trigger a reminder to inquire about participation in an ongoing trial”
5. PQRI variables will be verified to be complete before a patient can be discharged or a document can be completed.

While EHRs will not supercede clinical decision-making, they can have logic built into them to maintain consistency, compliance and efficiency. In an emerging era of pathway-compliance, this may be one of the most valuable features of an ideal EHR.

**Universal Dynamic Chart**
As we have moved increasingly into the digital era, the need for a “current chart”, often printed, has not disappeared. Such a record may be needed for a variety of reasons and while these need not resemble the traditional paper chart, some standard must be established so that safe and comprehensive transmission of information can be assured.

CMS is working to insure their definition of meaningful use in the world of EHR, we pose these equally important criteria for insuring the world of digital medicine truly brings financial saving, efficiency, and improved quality of care for our patients.
With greater than 200,000 members, the American Medical Association (AMA) is one of the most influential lobbying groups on Capitol Hill. Its efforts provide a voice for the larger medical community in our nation’s capital, and its policies affect how physicians practice on a day-to-day basis. Though small in numbers, the American Association of Neurological Surgeons (AANS) and Congress of Neurological Surgeons (CNS) have found ways to increase the size of their delegation, allowing neurosurgery to exert greater influence on AMA policies and actions. At the recent November AMA meeting, nine neurosurgeons represented the AANS, the CNS, and the interests of neurosurgery. With only nine ambassadors for organized neurosurgery, covering all of the caucuses, committees, and House of Delegates (HOD) floor action, can be chaotic. Delegates often find themselves running between meetings, or juggling to cast a vote, to ensure that the voice of neurosurgery is heard.

Peter W. Carmel, MD, Immediate Past President of the AMA
Dr. Carmel, a pediatric neurosurgeon from Newark, brings a wealth of experience to the neurosurgery delegation. Over the last twenty years, he served as chair of the AMA Specialty and Service Society (SSS), chair of the AMA Council on Long Range Planning and Development, and President of the AMA Foundation. Most recently, Carmel served as the 166th AMA president. Dr. Carmel brings his years of leadership experience in the AMA to help steer the neurosurgery delegation. On behalf of neurosurgery, he brings a well-respected voice to the HOD.

Monica C. Webby, MD, AMA Board of Trustees
Since the Texas Medical Association Medical Student Section elected her chair, Dr. Webby has been active in the AMA HOD. Currently serving on the Board of Trustees, Dr. Webby, a past-president of the Oregon Medical Association, provides organized neurosurgery with a voice within the leadership of the AMA. In addition to working with the AMA, this pediatric neurosurgeon is the Council of State Neurosurgical Societies’ (CSNS) Northwest Quadrant Regional Director and on the AANS Board of Directors.
Mark J. Kubala, MD, AANS Delegate
Dr. Kubala, a Texan, has been highly active in organized medicine for nearly 50 years. At the November meeting, the AMA recognized Dr. Kubala’s lifetime of service by bestowing upon him the Distinguished Service Award. During the presentation, AMA president Dr. Jeremy Lazarus stated, “Dr. Kubala embodies the essence of what it means to be a physician.” Go to the following link: http://www.ama-assn.org/ama/pub/about-ama/our-people/the-federation-medicine/specialty-society-ballot.page to view the award presentation.

Krystal L. Tomei, MD, MPH, PGY-7, AANS Delegate (Resident and Fellow Section)
Dr. Tomei is an AANS-endorsed delegate from the Resident and Fellow Section. Currently residing in New Jersey, Dr. Tomei is a budding leader in neurosurgery and provides a young, powerful voice in the AMA, where she serves on the AMA’s Council of Medical Education. Representing the future of neurosurgery, Dr. Tomei is demonstrating herself to be a strong leader and advocate for neurosurgeons.

John K. Ratliff, MD, AANS Alternate Delegate
An Associate Professor at Stanford University Medical Center, Dr. Ratliff serves neurosurgery in multiple roles. During his tenure as an alternate delegate to the AMA, he has had the opportunity to serve on the HOD’s legislative reference committee. Away from his AMA responsibilities, Dr. Ratliff has more than 100 publications. He is also the vice chair of the AANS/CNS Quality Improvement Workgroup and the AANS’ Advisor to the AMA-Specialty Society Relative Update Committee.

Phillip W. Tally, MD, CNS Delegate
Dr. Tally, a past-president of the Florida Neurosurgical Society, brings a knowledgeable voice to the HOD. The Alabama-native is currently the chair of neurosurgery’s AMA delegation, and is a past chair of the AMA Specialty and Service Society (SSS). Dr. Tally is a recognized expert on health information technology issues, and serves on the AMA’s Health Information Technology Advisory Panel. He also serves as the CSNS’ parliamentarian, and brings these skills to the AMA.

Maya A. Babu, MD, MBA, PGY-3, Resident and Fellow Section (Minnesota)
A Minnesota-endorsed Resident and Fellow Section delegate, Dr. Babu has worked closely with neurosurgery over the past two years. Like Dr. Tomei, she provides a fresh, energetic voice to the delegation. She is the 2012-2013 Resident and Fellow Section appointee on the AMA Council on Legislation and serves on the Resident Fellow Section Governing Council. In 2013, Dr. Babu is running for the resident-fellow position on the AMA Board of Trustees.

Katie O. Orrico, JD, AMA Staff Liaison
Katie Orrico has spent nearly 28 years advocating on behalf of neurosurgery. As the AANS/CNS Washington Office Director and AMA Staff Liaison, she helps organize and guide the neurological delegation. In addition to directing the Washington office, Ms. Orrico works with the AANS Political Action Committee, NeurosurgeryPAC. With her expertise, the delegation is strongly positioned to represent neurosurgery.
LOCUM TENENS, MY SOLUTION TO PHYSICIAN BURNOUT

In early 2004, I was at the height of my career as a neurosurgeon in solo practice, but I was also well on my way to clinical depression. I was angry and couldn’t relax, and I was always irritated. Even a few days off didn’t help because of the mountain of phone calls and paperwork waiting for me upon return to work. I asked myself, is this burnout?

Coincidentally, I happened to meet a neurosurgeon practicing Locum Tenens that was happy with his work-life balance. I signed up for a weekend trial as a locum neurosurgeon, then a week trial, and then I looked at my wife who was also my office manager, and asked, “Why are we doing this?” A month later we closed the office.

Stress and burnout are often lumped together, but they are distinct processes. Unlike stress which is associated with over engagement, burnout is characterized by disengagement, blunted emotions, depression, and exhaustion, which affects motivation and drive, and demoralization. Stress produces a sense of urgency and hyperactivity, while burnout produces a sense of helplessness and hopelessness.

This country is losing the experience, skill and wisdom of senior physicians because of burnout, yet the problem is not discussed openly among physician peers, and there’s a paucity of relevant psychological services for physicians. My personal solution: Locum Tenens.

I made the adjustment from working full-time to Locum Tenens through support and access to other locum doctors, and now I honestly look forward to my monthly 10-day assignments. Many productive people don’t do well when jerked into full retirement, and I have the best of both worlds: steady, satisfying work, on my terms of time and intensity, predictable income, and freedom from government/insurance company machinations and hospital political intrigues. The agreement (contract) with the hospital is clear and short term, and the supply-demand balance for Locum Tenens doctors in my specialty is currently in my favor. When at home, I have the freedom to not answer the phone, the certainty that the concert, nice restaurant meal, or the weekend away won’t be interrupted, and the security that my income checks will be as expected and on time. The conflict between family and profession is now moot.

Another issue is a sense of financial fairness. My income doesn’t depend on “production units” – euphemism for “you get more income if you see more patients, do more complicated procedures…” My value to the hospital depends on my professional ability, and availability. What used to be uncompensated time talking with patients and their families both in hospital and in the office is now mutually rewarding. Getting up at night to see an emergency room patient often used to be uncompensated time, while taking away from needed rest for the following day’s frenetic activities.

Now, I’m paid for the time spent taking care of folks, rather than for how much I can bill for this or that procedure. It’s a four-way win: families benefit from improved relationships with their doctor, I benefit professionally from the satisfaction of providing excellent care no matter how long it takes, the hospital benefits by providing continuity of care and consistent coverage, and I benefit financially by the time I spend in direct patient contact, whether in the operating room, emergency room, intensive care unit, etc.

In private practice, I had the pervading sense that because of all the distractions and competing agendas I wasn’t able to deliver the best care I was capable of. There was an underlying layer of guilt, and of missed professional opportunity. In speaking with many physicians in many physician lounges, I believe many still have this pessimistic view.

By moving my career into the locum tenens venue, these are issues of the past.

Duane Gainsburg, MD

WWW.CNS.ORG 27
A RETROSPECTIVE STUDY OF A NOVEL OPERATIVE DOCUMENTATION EDUCATION PROGRAM WITH AN EMPHASIS ON CODING: A NEW ADDITION TO MODERN NEUROSURGERY RESIDENCY TRAINING?

INTRODUCTION

Surgical training has changed dramatically over the last few decades, with novel surgical techniques changing surgical training programs. The American Association for Graduate Medical Education (ACGME) implemented six core competencies into all residency programs, and training programs have had to adapt. These core competencies include patient care, interpersonal and communication skills, medical knowledge, professionalism, practice-based learning and improvement, and systems-based practice. The ACGME defines practice-based learning as: investigate and evaluate the care of patients, appraise and assimilate scientific evidence, and continuously improve patient care based on constant self-evaluation and lifelong learning. The ACGME defines systems-based practice as: Residents must demonstrate an awareness of and responsiveness to both the larger context and system of health care as well as the ability to effectively call on system resources to provide care that is of optimal value.

Lack of knowledge about coding, reimbursement, and documentation lead to revenue loss, legal, business, and administrative ramifications. Current resident training does not include a standardized operative documentation educational program with emphasis on coding, which results in lack of resident operative documentation and coding skills after residency with significant loss of reimbursement in practice.

We at the University of New Mexico Medical Center, the only Level I trauma center in the state and surrounding region, attempted to address this issue by analyzing the effect of a standardized monthly coding course over twelve months on one resident’s operative dictations. We studied the effect of this education on resident documentation and whether this can fulfill ACGME requirements of practice-based learning and systems-based practice.

METHODS

Following Institutional Review Board (IRB) approval, sixty operative notes were randomly obtained; thirty before instituting and thirty notes after completing the educational course. The one-hour monthly course with the coding team was taught by one faculty member (senior author, MS), during which we reviewed material on neurosurgery operative procedure dictation according to the American Medical Association CPT Coding Textbook (AMA, 2012). This was followed by an open discussion of errors noted by the coding team and example-case review to apply this learning (Figure 1).

Figure 1. Operative Documentation Errors Before and After

<table>
<thead>
<tr>
<th>Operative Notes (60 notes)</th>
<th>Reviewer 1 Errors</th>
<th>Reviewer 2 Errors</th>
<th>Median Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before Course (30)</td>
<td>32</td>
<td>30</td>
<td>31</td>
</tr>
<tr>
<td>After Course (30)</td>
<td>19</td>
<td>20</td>
<td>19.5</td>
</tr>
<tr>
<td>Stats (ANOVA)</td>
<td>P&lt;0.05</td>
<td>P&lt;0.05</td>
<td>P&lt;0.05</td>
</tr>
</tbody>
</table>

The randomly-selected operative notes from the senior neurosurgery resident were graded by our neurosurgery coder in a standardized blind fashion, with points assigned for each coding error and the results tallied in a blinded fashion by two physicians.

RESULTS:

The median number of note errors before and after were 31 and 19.5, respectively (Table 1), with statistically significant improvement (p<0.05) noted over this time per ANOVA statistical analyses.
DISCUSSION
Current American training programs emphasize the six ACGME core competencies, with programs’ ability to foster these requirements affecting accreditation and subspecialty residency certification. There is growing uncertainty about the business and practice management aspect as graduating residents enter medical practice. Breitwieser et al. surveyed 717 graduating family medicine residents and identified that 87% had no medical school lectures or seminars in the business of medicine. Over 66% of these residents felt unprepared in medical business management. Ridky and Bennett noted that 70% of past general surgery residents at eight academic centers felt unprepared in practice management. A telephone survey of 117 academic centers showed that only 4% of surgery programs offered a formal course in practice management. Fakhry et al. noted that 85% of surgery residents believed they were at a novice level in coding and billing, with 97% of these residents feeling this knowledge to be crucial for practice.

This issue is not as benign as once thought, as Medicare, Medicaid and other auditing facilities are increasingly scrutinizing both academic and private practice programs for errors in documentation and coding.

Jones et al. showed the positive effects of coding education on resident practices in an outpatient clinic through a series of ten lectures focusing on coding requirements, after which residents met with the coding team and program director. Resident response was favorable and coding compliance increased from 36% to 88% over two years. The program director in the process also increased his accuracy from 50% to 90% during this time.

According to the LEAN criteria, by enhancing resident education in operative documentation and coding, operative notes were dictated more accurately. While we have not done a cost analysis on this project, a more accurate operative document will likely result in improved billing. Coding teams, including ours, are often not in the medical field, and omission of a particular procedure done in addition to the major procedure harms billing. More accurate dictation enhances monetary compensation for the hospital and program.

These studies, together with our own, truly demonstrate that these educational programs are beneficial. Simply coding and dictating a note may initially be looked upon as simple, but in reality, it can be quite complex. It is reassuring that it only takes a formal standardized education course to convey this knowledge successfully in a high-volume inpatient neurosurgery hospital. More multi-center studies focusing on educational courses in a variety of different aspects of medical care need to be done across trainees at all levels.

Limitations of our study were that only one resident was followed and studied and we did not examine the improved financial compensation for the hospital and program that resulted. Nevertheless, this pilot study was eye-opening and should be implemented in modern residency training programs.

CONCLUSION
Utilization of our neurosurgery faculty and coder in teaching monthly coding courses with resident involvement was shown to improve resident operative documentation practices and satisfy ACGME required systems-based practice and practice-based learning strategies in residency curriculum. Including this format in residency program is recommended and should be expanded to include education in writing daily notes, history and physicals, clinic notes, and consultations.

REFERENCES
The Physician Quality Reporting System (PQRS) is a federal program with the long-term goal of making more information about physicians’ performance available to patients, while rewarding physicians who provide better care. In 2011 the Centers for Medicare & Medicaid Services (CMS) added an MOC option to PQRS. This was done to encourage physicians to participate in public quality reporting and improvement through ABMS Member Boards MOC programs. Recognizing the additional cost and administrative burden of doing so, Congress made available additional financial support for those who participate in PQRS in combination with MOC activities.

Physicians who successfully meet the criteria for PQRS reporting in 2013 will receive an incentive payment equal to 0.5% of their total estimated Medicare Part B Physician Fee Schedule allowed charges for covered professional services furnished during the reporting period. It should be noted that failure to participate in PQRS in 2013 will result in a penalty in 2015. Through MOC:PQRS eligible physicians who satisfactorily submit data under PQRS have the opportunity to earn an additional 0.5%. They must participate in a CMS-qualified MOC program “more frequently” than required to qualify for or maintain Board Certification.

All neurosurgeons may participate in PQRS. While they may use any approved registry, the ABMS offers a registry specifically for the purpose. The ABMS has worked with CECity to develop a suite of tools that can be utilized separately or as a bundle, depending on the needs of the neurosurgeon. For instance, a CMS qualified registry and a Patient Experience of Care Survey are available there. The data collected is focused on quality measures for a twelve-month reporting period. The registry will tentatively be open soon and a link will be posted on the ABNS website once it is functional.

In addition, ABNS Diplomates are eligible to participate in the MOC:PQRS incentive. The first requirement is to participate in PQRS. All neurosurgeons may participate in PQRS. While they may use any approved registry, the ABMS offers a registry specifically for the purpose. The ABMS has worked with CECity to develop a suite of tools that can be utilized separately or as a bundle, depending on the needs of the neurosurgeon. For instance, a CMS qualified registry and a Patient Experience of Care Survey are available there. The data collected is focused on quality measures for a twelve-month reporting period. The registry will tentatively be open soon and a link will be posted on the ABNS website once it is functional.

Non-Time-Limited Certificate Holders
Participation in regular MOC completing all three-year mini-cycle requirements within three years. A number of the requirements must be completed during each of the three years (all of them by the end of the third), or the ABNS will not certify the individual for PQRS.

Time-Limited Certificate Holders
All requirements of a three-year mini-cycle must be completed within two years. There are no exceptions.

ABNS MOC Fees
The creation and maintenance of the MOC infrastructure is expensive, and there are administrative costs as well. All Diplomates participating in MOC must pay the annual dues of $350, plus the $800 fee for the Cognitive Examination when it is taken at the end of the ten-year time frame. If a participant does not complete a three-year mini-cycle, he or she may enter a grace period that allows another six months to finish. The fee is $500 the first time and $1000 the second; a maximum of two grace periods may be used per a ten-year cycle. If The Diplomate exceeds the grace period or does not participate at all, he or she must pay a Reinstatement Fee of $2500 to continue; this may be done once during a ten-year cycle. It is the responsibility of the Diplomate to remain on track to avoid these penalties. For more information, please visit www.abns.org.
Medicare Physician Pay Cuts
Take Effect on April 1, 2013

Pursuant to the Budget Control Act of 2011 (BCA) (http://1.usa.gov/15euT5s), a two percent reduction in Medicare payments to physicians went into effect on April 1, 2013. While the American Taxpayer Relief Act of 2012 (http://1.usa.gov/UDxOQ7) postponed these sequestration cuts for three months, Congress failed to take further action to prevent the cuts from going into effect. Unless Congress acts, this two percent pay cut will be implemented each year, for the next decade. According to the Centers for Medicare and Medicaid Services (CMS) (http://go.cms.gov/WxeR42), the claims payment adjustment will be applied to all claims after determining coinsurance, any applicable deductible, and any applicable Medicare Secondary Payment adjustments.

Questions regarding the sequestration cuts should be directed to your local Medicare carrier. In the meantime, the AANS and CNS are hopeful that Congress will take action to eliminate the mandatory payment reductions.

AANS and CNS Send Letter to Hill Objecting to Cuts for Stereotactic Radiosurgery

The American Taxpayer Relief Act of 2012 (http://1.usa.gov/UDxOQ7) included a provision equalizing hospital outpatient department payment rates for Cobalt-60 and linear accelerator-based stereotactic radiosurgery. Under section 634 of the “fiscal cliff” legislation, payment rates for Cobalt-60, or Gamma Knife-based radiosurgery, will arbitrarily be reduced to equal those of linear accelerator-based radiosurgery — despite significant cost differentials between the two technologies. Overall, the provision will cut hospital reimbursement by $300 million, decreasing the per-treatment Gamma Knife reimbursement from approximately $8,100 to $3,400 — a 58 percent reduction. Given that this provision arbitrarily decreases Medicare reimbursement for lifesaving treatment for patients with serious brain disorders, including brain tumors, arteriovenous malformations, pituitary adenomas and trigeminal neuralgia — thereby jeopardizing patient access to this important therapy — the AANS and CNS sent a letter (http://bit.ly/16EyKKN) to the House and Senate objecting to these cuts.

AANS/CNS Lead Response to Washington State on Cervical Fusion Coverage

Speaking for the AANS, CNS, and other interested neurosurgical and orthopaedic spine organizations, Joseph Cheng, MD, MS, FAANS, made a presentation to the Washington State Health Care Authority’s Health Technology Clinical Committee (HTCC) on Mar. 22, 2013, regarding coverage for cervical fusion for degenerative disc disease (DDD). On Feb. 14, 2013, AANS and CNS submitted a multi-society letter (http://bit.ly/XW3GPJ) responding to key issues posed in a draft technical assessment on the issue. The letter, spearheaded by the AANS/CNS Rapid Response Team, was signed by the following organizations: Washington State Association of Neurological Surgeons, Washington State Orthopaedic Association, American Association of Neurological Surgeons, American Association of Orthopaedic Surgeons, AOSpine North America, Cervical Spine Research Society, Congress of Neurological Surgeons, AANS/CNS Joint Section on Disorders of the Spine and Peripheral Nerves, and North American Spine Society. In the letter, the groups raise a number of concerns about the technical assessment, such as the imprecise definition of DDD, the questionable choice of papers upon which the report is based, and an inadequate assessment of the risks of alternatives to fusion.

Neurosurgeons who made significant contributions to this effort included John K. Ratliff, MD, FAANS; Karin R. Swartz, MD, FAANS; Matthew J. McGirt, MD; Charles Sansur, MD, MHSc; and Daniel J. Hoh, MD. More information on the cervical fusion consideration is available here (http://1.usa.gov/UUSbWo) and the Mar. 22 meeting materials are available here (http://1.usa.gov/XhHPrf).

Medicare Patient Empowerment Act Introduced in the House; Sign the MPEA Petition

As expected, on March 21, 2013, Rep. Tom Price, MD (R-GA), introduced H.R. 1310, the Medicare Patient Empowerment Act (http://1.usa.gov/10agHqV). This legislation would permit patients and physicians to privately contract for Medicare-covered services without penalty to either party. Under current law, Medicare beneficiaries that choose to see physicians who do not accept Medicare are required to pay the physician’s charge entirely out of personal funds — Medicare does not pay...
any part of the charge. In addition, physicians who choose to provide covered services to Medicare beneficiaries under private contracts must “opt out” of the Medicare program for two years, during which time Medicare does not pay the physician for any covered services provided to Medicare beneficiaries. These discriminating policies are inappropriate and prevent beneficiaries from seeking care from the physician of their choice.

Neurosurgeons are highly encouraged to take a moment to visit My Medicare-My Choice (http://bit.ly/16n0pPo), where you can add your name to a petition supporting the Medicare Patient Empowerment Act.

ONC and CMS Delay Stage 3 Meaningful Use Rulemaking Until 2014

In an effort to further accelerate and advance interoperability and health information exchange beyond what is currently being done through the Office of the National Coordinator (ONC) (http://bit.ly/280nEx) and the Electronic Health Record (EHR) (http://go.cms.gov/ZTc8Rs) Incentive Program, the Center for Medicare and Medicaid Services (CMS) has decided to delay any Stage 3 meaningful use rulemaking until 2014. In the interim, CMS is reaching out to stakeholders, through a request for information (RFI), for advice on how new payment models affect the implementation of electronic health records. The AANS and CNS have repeatedly called for a delay of Stage 3, and plan on responding to this request for more information to voice neurosurgery’s continued concerns with the EHR Incentive Program and its associated timelines.

Bipartisan Legislation Aims to Address U.S. Physician Shortage by Increasing GME Slots

On March 14, 2013, legislation was introduced in the U.S. Senate and House of Representatives to address the U.S. physician shortage. In the House two bills were introduced. Reps. Joe Crowley (D-NY) and Michael Grimm (R-NY) introduced H.R. 1180, the Resident Physicians Shortage Act of 2013 (http://1.usa.gov/14jiiz7). Reps. Aaron Schock (R-IL) and Allyson Schwartz (D-PA) introduced H.R. 1201, the Training Tomorrow’s Doctors Today Act (http://1.usa.gov/16g4uVu). In the Senate, Sens. Bill Nelson (D-FL), Charles Schumer (D-NY) and Harry Reid (D-NV) introduced S. 577, the Resident Physicians Shortage Act of 2013 (http://1.usa.gov/YDqcN). Both bills will help to ensure that there is an adequate physician workforce to meet the health needs of the American population. Specifically, this legislation would provide an increase of 15,000 new Medicare-supported graduate medical education (GME) slots across the country at a rate of 3,000 per year over five years. One-half of these slots are required to be used for shortage specialty residency programs, of which neurosurgery qualifies. The AANS and CNS support all three bills, and joining with the Alliance of Specialty Medicine, sent letters (http://bit.ly/11YqLof) to the cosponsors endorsing the legislation.

The CNS is pleased to congratulate the recipients of the NINDS-funded Neurosurgery K12 Program, “Transitioning Early Career Neurosurgeons to Scientific Independence”.

Sameer Sheth, MD, PhD
Columbia University,
Chair Robert Solomon

Graeme Woodworth, MD
University of Maryland,
Chair Howard Eisenberg

Timothy Lucas, MD, PhD
University of Pennsylvania,
Chair Sean Grady

Additionally, we’d like to congratulate to Dr. Emad Eskandar, Director of the K12 neurosurgery program. More information on this program can be found at the Neurosurgery Research Career Development Program at http://neurocdp.org.
This patient is a 4 year old male child who presents with progressive lower back pain, gait imbalance and urinary incontinence. Lumbosacral xray revealed Currarino triad. MRI revealed an enhancing J-shaped intradural lumbosacral mass with pelvic extension. Gross total resection achieved via dorsal approach including lumbosacral laminetomies and non-instrumented laminoplasty. Pathology was consistent with Anaplastic Ependymoma, WHO grade III.

Submitted by:
Samer Elbabaa, MD, FAANS, FACS
Department of Neurological Surgery
Saint Louis University School of Medicine
Saint Louis, MO

**Figure 1.** AP lumbosacral xray demonstrates a sickle sacrum with suggestion of a soft tissue mass displacing the rectum. The finding is suggestive of Currarino triad.

**Figure 2-3.** Sagittal T1 with contrast and Coronal T2 MRI of lumbar spine showing a J-shaped intradural lumbosacral mass with pelvic extension via S2 foramen.
The CNS Publications represent our global audience. Here are the number of submissions to *Neurosurgery*® from across the globe in 2012!

<table>
<thead>
<tr>
<th>Country</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALBANIA</td>
<td>1</td>
</tr>
<tr>
<td>ARGENTINA</td>
<td>1</td>
</tr>
<tr>
<td>AUSTRALIA</td>
<td>18</td>
</tr>
<tr>
<td>AUSTRIA</td>
<td>7</td>
</tr>
<tr>
<td>BANGLADESH</td>
<td>2</td>
</tr>
<tr>
<td>BELGIUM</td>
<td>11</td>
</tr>
<tr>
<td>BRAZIL</td>
<td>24</td>
</tr>
<tr>
<td>CANADA</td>
<td>55</td>
</tr>
<tr>
<td>CHILE</td>
<td>1</td>
</tr>
<tr>
<td>CHINA</td>
<td>144</td>
</tr>
<tr>
<td>COSTA RICA</td>
<td>1</td>
</tr>
<tr>
<td>CROATIA</td>
<td>1</td>
</tr>
<tr>
<td>CZECH REPUBLIC</td>
<td>2</td>
</tr>
<tr>
<td>DENMARK</td>
<td>5</td>
</tr>
<tr>
<td>EGYPT</td>
<td>5</td>
</tr>
<tr>
<td>FINLAND</td>
<td>9</td>
</tr>
<tr>
<td>FRANCE</td>
<td>43</td>
</tr>
<tr>
<td>GERMANY</td>
<td>97</td>
</tr>
<tr>
<td>GREECE</td>
<td>5</td>
</tr>
<tr>
<td>HONG KONG</td>
<td>4</td>
</tr>
<tr>
<td>HUNGARY</td>
<td>1</td>
</tr>
<tr>
<td>INDIA</td>
<td>32</td>
</tr>
<tr>
<td>IRAN, ISLAMIC REPUBLIC OF</td>
<td>9</td>
</tr>
<tr>
<td>IRELAND</td>
<td>1</td>
</tr>
<tr>
<td>ISRAEL</td>
<td>8</td>
</tr>
<tr>
<td>ITALY</td>
<td>68</td>
</tr>
<tr>
<td>JAPAN</td>
<td>218</td>
</tr>
<tr>
<td>KOREA, REPUBLIC OF</td>
<td>83</td>
</tr>
<tr>
<td>LUXEMBOURG</td>
<td>2</td>
</tr>
<tr>
<td>MALAYSIA</td>
<td>1</td>
</tr>
<tr>
<td>MEXICO</td>
<td>6</td>
</tr>
<tr>
<td>MOROCCO</td>
<td>2</td>
</tr>
<tr>
<td>NETHERLANDS</td>
<td>20</td>
</tr>
<tr>
<td>NEW ZEALAND</td>
<td>2</td>
</tr>
<tr>
<td>NORWAY</td>
<td>13</td>
</tr>
<tr>
<td>PAKISTAN</td>
<td>2</td>
</tr>
<tr>
<td>POLAND</td>
<td>9</td>
</tr>
<tr>
<td>PORTUGAL</td>
<td>4</td>
</tr>
<tr>
<td>PUERTO RICO</td>
<td>1</td>
</tr>
<tr>
<td>RUSSIAN FEDERATION</td>
<td>2</td>
</tr>
<tr>
<td>SAUDI ARABIA</td>
<td>4</td>
</tr>
<tr>
<td>SERBIA AND MONTENEGRO</td>
<td>3</td>
</tr>
<tr>
<td>SINGAPORE</td>
<td>5</td>
</tr>
<tr>
<td>SLOVENIA</td>
<td>1</td>
</tr>
<tr>
<td>SOUTH AFRICA</td>
<td>1</td>
</tr>
<tr>
<td>SPAIN</td>
<td>33</td>
</tr>
<tr>
<td>SUDAN</td>
<td>1</td>
</tr>
<tr>
<td>SWEDEN</td>
<td>7</td>
</tr>
<tr>
<td>SWITZERLAND</td>
<td>17</td>
</tr>
<tr>
<td>TAIWAN</td>
<td>28</td>
</tr>
<tr>
<td>THAILAND</td>
<td>1</td>
</tr>
<tr>
<td>TURKEY</td>
<td>31</td>
</tr>
<tr>
<td>UNITED KINGDOM</td>
<td>40</td>
</tr>
<tr>
<td>UNITED STATES</td>
<td>708</td>
</tr>
</tbody>
</table>

Total 1,800