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Editor: Krystal Tomei, MD, MPH

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Stacey Quintero Wolfe, MD, FAANS

The Evolution of Neurosurgery "Innovation occurs when

you take what you know and meld it with new ideas."- Steven Johnson

It is undeniable that neurosurgery has evolved, arising from a specialty in which the mortality was so high that most would

not even considering operating, to become a multifaceted specialty in which we have a myriad of multimodality treatments. How did this evolution occur? What is the role of the young neurosurgeon in the evolution of neurosurgery?

I was inspired by speakers at the past Congress of Neurological Surgeons (CNS) annual meeting to seize the opportunity to continue the improvement of our specialty. Evolution occurs due to innovation and the courage to apply innovative ideas. As demonstrated by Harvey Cushing, it builds on failure and grows over a lifetime. Innovation does not happen as a single "Ah-hah" moment to only the most brilliant minds, but transpires as a result of hard work, thoughtful attention, and the assimilation of ideas. We each have the opportunity to innovate, if we rise to the challenge.

Innovation first requires careful consideration of the problems around us. We can best address what we know and are passionate about as it affects our daily lives. Innovation has to occur within the context of our world. Stuart Kauffman speaks of this as the "adjacent possible." An out of context moment of inspiration requires maturation before it can reach its potential. For example, advanced microchip technology in the 1600s could not succeed. Steven Johnson, an American science and technology author, points to success when innovating from that already in existence — giving the example of the creation of a neonatal incubator made out of car parts in sub-Saharan Africa — as those were elements that were known and could be maintained by the local population.

Innovation takes time, and every idea is built off a network of existing ideas. Johnson calls this the liquid network — ideas flowing from mind to mind. This underscores the importance of embracing knowledge, reading both classic and contemporary texts and literature, as well as mentorship. Surround yourself with people and new ideas — other specialties, other leaders, varied industry, technology, business, and arts. Their ideas will rub off on you, giving you a new way to think. Look outside of our neurosurgical silos to build bridges and collaborate, borrowing ideas from our colleagues. As Johnson says, "Chance favors the connected mind."

But evolution does not occur just because of an idea. That idea must be honed by time, refinement and hard work. Itzhak Perlman, an Israeli-American violinist and conductor, inspires us as a musical virtuoso, which he defines as one who excels, an artist, a skilled technician. When asked how he attained this, he replied, "Trust your practicing." He then poignantly asked of neurosurgery, "How do you practice?" That question has stuck with me, and I hope that as young neurosurgeons we strive to answer that we are always practicing, improving, learning, innovating, and evolving.

Stacey Quintero Wolfe, MD, FAANS Assistant Professor, Neurosurgery and Interventional Radiology Wake Forest University School of Medicine

Secretary's Message

by Krystal Tomei, MD, MPH

The Evolution of Neurosurgery and the Young Neurosurgeon

This past Congress of Neurological Surgeons (CNS) annual meeting focused on the "Evolution of Neurosurgery." It is true that our specialty is constantly evolving; new technology, landmark discoveries in science, and innovative individuals all strive to bring us to the next level and all contribute to the excellence in our field. We saw examples in honored guests such as L. Nelson Hopkins, considered the father of endovascular neurosurgery. He has not only changed the field dramatically, but also founded the Toshiba Stroke Research Center, a collaborative effort among scientists and physicians in treatment of neurovascular diseases. We heard updates on the National Neurosurgery Quality and Outcomes Database (N²QOD), an attempt to gather multi-institution data on outcomes to improve neurosurgical care and outcomes.

We as neurosurgeons are not alone in this evolution. Changes surround us — advances in prenatal diagnosis and intervention change the pediatric landscape; improvements in multidisciplinary care and collaboration enhance communication among all health-care providers; and changes to the health-care system at large will inevitably impact us all. What is the role of the young neurosurgeon in this process? Are we the innovators? Are we merely bystanders? How do we play a role in this ever-changing field? We are the next generation of neurosurgery and I would suggest that our role is evolving



as well. We contribute by becoming physician-scientists, by taking a role in shaping health policy, by creating multi-institution and multidisciplinary collaborative efforts to improve our data collection, and by continuing our leadership on the Young Neurosurgeons Committee to ensure that all generations of neurosurgeons are represented in these processes.

I applaud those who continue to strive and innovate, and challenge all of you to do the same. As the future of neurosurgery, our evolution lies in our hands.

Washington Committee Fellowship by Maya Babu, MD, MBA

The American Association of Neurological Surgeons (AANS)/Congress of Neurological Surgeons (CNS) Washington Committee develops organized neurosurgery's positions on issues affecting practice, education and patient care. Through advocacy, policy development and public relations, the Washington Committee and the Washington Office advocate for the ability of neurosurgeons to practice medicine freely. With the regulations under development to implement health-care reform, the work of the Washington Committee is especially critical.

Organized neurosurgery continues to take a vocal stance on health-care policy issues, and is at the forefront of legislative debates. Our advocacy team helps make it clear to policymakers in our nation's capital that our specialty is dedicated to promoting the highest quality of patient care.

Our field has been especially progressive when it comes to our work to advance patient registries and develop repositories for outcomes and clinical data to help practicing neurosurgeons engage in quality improvement. We have also advocated for patient access through our support of out-of-network insurance access. Organized neurosurgery has been a tireless advocate for meaningful liability reform.

Through the generous support of the Council of State Neurological Societies (CSNS), a trainee has an opportunity to serve on the Washington Committee as the CSNS Fellow. This year-long fellowship allows one to participate in the two annual business meetings of the Washington Committee held in Washington, D.C. The briefings that Katie Orrico, JD, and her staff put together are superb, and provide a detailed look at pressing policy issues and their impact upon neurosurgery. This fellowship is an excellent opportunity for any trainee interested in health-care policy to develop a deeper understanding of neurosurgery's legislative priority issues. This fellowship also helps to provide valuable perspective on key aspects of health-care reform.

If you have any questions about the CSNS Washington Committee Fellowship, please do not hesitate to contact me via email at mayababu@gmail.com.

Integrating Research and Clinical Practice

by Edjah Nduom, MD

Many of us were drawn to the field of neurosurgery not just for the challenge and complexity of neurosurgical practice, but also for the largely unchartered world of neuroscience. The National Institute of Neurological Disorders and Stroke is actively pursuing the development of more neurosurgeon-scientists, as evidenced by the development of the R25 Research Education Grant and the K12 Neurosurgeon Research Career Development Program.

But how is it that one goes about establishing such a research career? Is it possible to continue to have a robust and fulfilling clinical practice while doing serious bench research?

I certainly hope so. As many of us have, I spent time during my still young (in neurosurgery years) career attempting to build the foundation for a career as a physician-scientist. I have been lucky enough to encounter many neurosurgical mentors who are true physician-scientists. A few of these mentors have taken the time to share some brief words of advice with us. While by no means comprehensive, hopefully this will bring to light a few of the key issues for budding neurosurgeon-scientists.

Nicholas Boulis, MD, FAANS, Functional Neurosurgeon: "First, Choose the Right Job"

Academic careers are as varied as they come, and so are the programs that support them (or fail to). That said, there is no onesize-fits-all academic job that will suit all aspiring clinicians. Some physician-scientists are purely clinically/epidemiologically based, and they may only need a little bit of time set aside from their working day, a statistician, and access to computers for a database. These needs are completely different from the bench oncology researcher who requires multiple culture hoods and incubators, access to core facilities and hundreds of square feet of actual bench space.

While hardcore negotiating for academic jobs is often discouraged, there are certain aspects of a potential tenure-track job that should be in writing. It is relatively rare to be able to obtain grant funding that will be available to you on day one of your new job, so funding from your new institution is vital. You should know the amount and contents of your "startup package," and the resources the institution will be granting you to start your research effort, consisting of money to buy materials, lab space, access to shared facilities or equipment you will be inheriting for exclusive use of your lab. It is also important to know if your funding is "use it or lose it" on a year-to-year basis, and whether this institutional funding will be taken back when you do obtain your own grant funding.

Further, it is of paramount importance that your prospective chairman <u>guarantees</u> your protected research time in writing. This can be done in several ways: in many specialties, clinician-scientists are "on service" for limited portions of the year, but then spend the rest of the year solely in their lab. Given our clinical demands, this is not often an available situation for neurosurgeons, but such set-ups do exist and may be necessary for certain types of research. Many neurosurgeons develop schedules that are divided between their lab and clinical responsibilities, with any combination of half-day clinics, operating days and research days giving time for academic pursuits. In addition, while the scheduled research time as written is important, the case load expectation should reflect this balance — it is unrealistic, for example, to expect a researcher to be able to establish a lab, particularly early on, while setting a goal of performing more than 300 cases a year. If a prospective chair cannot show in your contract that they put a strong monetary value on your research effort, that institution may not be the right place to start a robust research effort.

Costas Hadjipanayis, MD, PhD, FAANS: "Choose Your Collaborators Carefully"

Given the time restraints of a neurosurgeon's schedule — typically supplying no more than 50 percent dedicated time for research — collaborations with colleagues in other fields who require the keen clinical knowledge of a neurosurgeon can be very fruitful. Dr. Hadjipanayis has established multiple working relationships with bioengineers that help develop nanoparticles that are targeted for the diagnosis and treatment of glioblastoma. These engineers know relatively little about gliomas, so the access that Dr. Hadjipanayis gives them to clinical understanding, potential targets and animal models for treatment help make this a strong symbiotic relationship.

These relationships can also sour quickly if expectations are not set up front. Who will be the senior author on a resulting manuscript? How much effort is each investigator devoting to a given grant application, and how will the award be split up? The complexity grows if multiple separate institutions are involved. The best way to address concerns such as these is to put an agreement together, up front, on paper that addresses all of the above concerns and others. As in any relationship, communication is important, and regular meetings between collaborating laboratories can further the research efforts of both. If possible, it is also helpful to establish a lab that is physically located adjacent to the labs of other researchers in related fields. This helps create a fertile ground for cross-collaboration between research teams, and new projects can spring forth at any given time. Finally, requesting an office that is near your lab and near the offices of your collaborators makes it easy to check in on your lab in the midst of a clinical day and also allows for easier impromptu and scheduled meetings with other PIs.

Russell Lonser, MD, FAANS: "Never Forget You are a Neurosurgeon First"

Matching your research efforts with your clinical specialty ensures that your time is spent most productively. While Dr. Lonser's research spans sub-disciplines, many of his projects focus on his extensive clinical experience in the treatment of functional pituitary adenomas, patients with neoplasia syndromes (von Hippel-Lindau

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disease) and spinal cord tumors. In this way, time spent taking care of those patients also contributes to his research efforts.

Another way to use your unique expertise to further your research is to engage in research that requires neurosurgical development, insights and intervention. For example, convectiveenhanced delivery (CED) of therapeutics to the nervous system is a bulk flow-driven that requires neurosurgeons to strategically place infusion cannulae into the brain, both for research and treatment. This research requires the expertise of a neurosurgeon well-versed in neuroanatomy, pharmacology and fluid biomechanics.

Similarly, no other specialty can provide tissue for the study of tumors/other pathology of the nervous system, nor can they place stimulators to manipulate abnormal circuitry or recording electrodes to assess brain activity. These areas of research and others will always rely on the involvement of a neurosurgeonscientist, creating opportunities for leading investigative efforts with collaborators in academia or industry. These opportunities will continue to expand and will be exceptionally rewarding in the future.

Amy Heimberger, MD, FAANS: "Write Daily"

It is easy to forget about putting together a manuscript while one is excited about the ideas they have and the experiments that they're running. At the end of the day, however, none of it matters if none of the data and ideas that you have are communicated to the scientific community at large. At some point, we have probably all had the experience of trying to assemble a manuscript, sometimes at the last minute, after amassing a mountain of data. To avoid this, Dr. Heimberger employs an approach that is quite simple but very effective. Typically, before any project is started in her lab, the introduction for that project's manuscript is written and the study hypothesis is articulated. This makes sense, of course, as the background science is part of the reason that one embarks on a given study, and will not change significantly over the course of the study. This information may already be partially contained in grants written before the start of the project. From there, the paper is written as data is obtained — the methods section is updated as experiments are conducted while the technical details are fresh. Results are written and figures developed with each new set of experimental data. Placeholders are left for experiments that are pending, and conclusions modified and updated as the data evolves and the impact of the research becomes more evident.

This method not only makes the writing process less onerous, but by breaking it up into small one-hour or even five-minute update sessions, it greatly improves the discussion between the PI and members of the lab. Manuscripts are maintained on a central password-protected, shared drive in which all members of the research team can review the source data, make changes, exchange comments, view the evolution of the work and maintain the research focus. This can spark new experiments and refine focus in between formal meetings between the PI and the rest of the staff.

I hope you have all found these tips helpful. Good luck to all of you who choose this path for your careers!

Book Reviews

"Anatomy: An Essential Textbook" – Anne M. Gilroy

This is a comprehensive general anatomy textbook, best used if you are interested in a general anatomy reference. The neurologic system section has some basics, helpful for a medical student or junior resident. Though this is not comprehensive enough to stand alone as a neuroanatomy reference, this would make a good general reference to any library.

"Minimally Invasive Spine Surgery: Techniques, Evidence, and Controversies" – Roger Hartl and Andreas Korge

Hartl and Korge present a comprehensive overview of minimally invasive (MIS) spine surgery. Beginning with an overview of fundamentals, the authors discuss principles, evidence base, navigation, biologics and anesthesia concerns of MIS spine surgery. Each chapter is well organized, comprehensive yet concise, and includes illustrations, charts, and diagrams to help with organization and understanding. The subsequent sections are divided by location (cervical, thoracic and lumbar) and subsequent chapters cover the individual approaches. Each chapter discusses patient selection criteria, indications/contraindications and benefits/risks of each approach, followed by pre-op, intra-op and post-op considerations, followed after by the evidence base of each approach. This is a great resource for anyone interested in minimally invasive surgery of the spine.

"Microsurgery of Skull Base Paragangliomas" – Mario Sanna, Paolo Piazza, Seung-Ho Shin, Sean Flanagan and Fernando Mancini

Sanna et al. provide a detailed reference for the skull base surgeon which focuses on paragangliomas. They introduce paragangliomas and describe the basics of the pathology and subsequently detail all aspects of their workup and treatment; from radiographic imaging to anatomy, decision making to various treatment options, in addition to surgical consideration of the different classes of paragangliomas. The reference includes excellent illustrations, treatment algorithms and detailed surgical planning for this pathology. Finally, the latter chapters discuss management of specific aspects of treatment, including the facial nerve, intradural extension, associated vasculature and specifics for tumors originating from various locations. It is a truly comprehensive and detailed reference for those neurosurgeons who have an interest in skull-base surgery.

"Endoscopic Sinus Surgery: Anatomy, Three-Dimensional Reconstruction, and Surgical Technique" – Peter-John Wormald

This endoscopic surgery reference is largely geared towards otolaryngologists pursuing training in endoscopic surgery, but may be a useful reference for neurosurgeons who work in conjunction with endoscopic otolaryngologists. Though most of the book focuses on extracranial sinus surgery, a select few chapters discuss intracranial uses for endoscopic surgery, including pituitary tumors, anterior cranial fossa tumors, optic nerve decompression, and clival and craniocervical tumors. The chapters include both illustrations as well as intraoperative photographs, and the book includes access to intraoperative videos. A great resource for otolaryngologists, those neurosurgeons partnering with these specialists on endoscopic skull base cases may find this a useful reference.

"Rhinology and Skull Base Surgery: From the Lab to the Operating Room: An Evidence-based Approach" – Ghristos Georgalas and Wytske Fokkens

Georgalas and Fokkens present another reference for the endoscopic otolaryngologist or neurosurgeon that holds an interest in skull base surgery. The first five chapters are largely geared towards otolaryngologists with an interest in rhinology, and largely only the final chapter is of particular interest towards neurosurgeons. Chapters of interest to the skull base surgeon include cerebrospinal fluid leaks, sella and clival region tumors, and reconstruction of the skull base. Although the application for neurosurgeons is limited in the context of the entire book, this may be a useful reference in the setting of a multidisciplinary skull base otolaryngology and neurosurgery team.

"Neurosurgical Infectious Disease, Surgical and Nonsurgical Management" – Walter Hall and Peter Kim

Hall and Kim have created a one-stop-shop for information on neurosurgical infectious diseases. They begin by covering basics of central nervous system (CNS) infections, from CNS immunology to antibiotics and radiographic imaging. Following the basic introduction, they break down CNS infections into viral, fungal, parasitic and bacterial etiologies with a good amount of information on each organism. The third section breaks down infections by their location in the CNS and discusses etiology, causation, presentation, location and treatment for each of these. The final sections discuss issues specific to neurosurgery including antibiotic prophylaxis, postoperative infections, implanted devices, CNS infections in the immuno-compromised, pediatric CNS infections and infections in a neurologic intensive care unit. This would be a great addition to any neurosurgeon's library.

"SMART Approach to Spine Clinical Research" – Michael Lee, Daniel Norvell, Joseph Dettori, Andrea Skelly and Jens Chapman

If you have ever been interested in clinical research in spine surgery, plan to add this book to your library. From formulating a hypothesis to designing a study, collecting and analyzing data, statistics, resources, bias and confounders, and manuscript preparation, this book covers all aspects of research. Consider this your step-by-step guide to designing, implementing, funding

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and publishing a well-designed clinical study. It is easy to read, and contains illustrative examples, charts and tables to help bring everything into focus. For the clinician-scientist, this is a mustread.

"Tumors of the Pediatric Central Nervous System" – Robert Keating, James Goodrich and Roger Packer

This is a must-have book for anyone treating pediatric tumor patients. Divided into three major sections, this is a comprehensive resource on tumors of the pediatric central nervous system. The first section provides background information about epidemiology, neuroradiology, pathology, molecular biology, and treatment strategies for surgery, adjuvant therapy and postoperative management. The second section is divided into subsections that review tumor subtypes by location — supratentorial, infratentorial, brainstem, skull base and spinal cord. Each of these chapters delineates the beginning to end process for each tumor. The third section addresses outcomes and future directions. This is a great resource for both neuro-oncology surgeons as well as pediatric surgeons

"Changing Patterns of Lifelong Learning – A Study in Surgeon Education" – Piet de Boer and Robert Fox

The decision to become a surgeon is the decision to embark on a journey of lifelong education. Boer and Fox describe the results of an 18-month research project covering surgeons during the learning stages of their career. It delineates the results of their survey and describes how learners utilize various resources during their career. For a residency program director or a surgeon interested in medical education, this presents a unique view into our learning paths.

"Thieme eNeurosurgery" - online book content

Have you ever wanted to have a full library of neurosurgical textbooks at your fingertips? And what if they threw in resources on operative procedures, a library of images, and access to e-journals? Thieme has done just that with their eNeurosurgery website: http://eneurosurgery.thieme.com/

Thieme includes a library of the most popular texts, searchable by subspecialty, title or author. They are continuing to build the platform with procedure descriptions and more images. As new books are added, the website only grows in its utility. It can be accessed from mobile devices, tablets and iPads — as long as you have Internet access — making it a portable resource in most settings. You can receive a free trial on the website. This might easily become the most useful resource for any neurosurgeon.

Call for Contributions & Section Updates

The AANS Neurosurgeon editorial board is seeking submission of articles related to quarterly themes. Ideally, submissions will focus on the resident experience related to the theme. Please reach out to Neil Malhorta, MD, for guidance and submission process (nrm@ uphs.upenn.edu). Articles can fit into the general submission category or peer review. Please go to http://www.aansneurosurgeon. org for examples articles.

Upcoming issues include:

Icons, Innovations and Inventions (August 2014) Health-care Reform (November 2014)

Section Updates: Spine

The Spine Section is interested in increasing the attendance of neurosurgeons to their annual meeting in particular young neurosurgeons. The annual meeting features a cadaver course for both spine and peripheral nerve. These stations will likely include: lateral XLIF/DLIF approaches, MIS TLIF, endoscopic, percutaneous screws, and deformity correction stations. Pain – A large focus of the Pain Section meeting will be the creation of a webpage, which currently does not exist, with a goal of having an online site by the end of the calendar year. The biennial pain meeting will be in April prior to the AANS Annual Scientific Meeting. A session on neuroablative techniques including didactic sessions is planned for an upcoming meeting.

Cerebrovascular

There was significant discussion regarding the establishment of baseline numbers to be certified as a hemorrhagic stroke center. This has implications for individual practitioners, institutions and referral patterns. In addition, the CV Section is interested in directly involving members of the YNC with CV Section committees, if anyone is interested, please contact Stacey Quintero.

Stereotactic and Functional

To assist in updating the ASSFN website and make it more user friendly to young neurosurgeons, the section plans to create a database of stereotactic and functional, pain and epilepsy fellowships and solicit program descriptions from fellowship coordinators. These will be linked under the "education" tab of the website. The section will also assist in creating a research database on the website of currently funded research to promote collaboration and provide opportunities for young neurosurgeons to get involved.

Pediatrics - The Peds Section meeting was held in Toronto in December.

Tumor - During this year's Congress of Neurological Surgeons (CNS) held in San Francisco, California, an executive meeting for the tumor section was held. Various aspects were discussed that

ranged from clinical trials evaluations to funding of organizations and receptions to selection of award prizes. Most pertinent to the Young Neurosurgeons Committee is the goal to have a YNC/ Tumor section reception at each of the annual conferences both at the CNS and AANS. This past year, Dr. Linda Liau, MD, PhD, FAANS, from the University of California, Los Angeles, spoke about pursuing research funding in the day and age where grant resources are scarce in New Orleans at the AANS. The goal of these receptions is to have residents, medical students, and attending neurosurgeons interact with senior members in the neurooncological field. A need for these receptions, as well as awards and fellowships, is to secure funding from various avenues including corporate sponsors.

Trauma

The Trauma Section discussed several updates to recently reviewed guidelines. Of late, a position statement on the use of mid-levels in the assessment and management of neurosurgical trauma was discussed by the Section.

Softball Tournament

The Annual Neurosurgery Charity Softball tournament was held in June 2013 in New York City's Central Park, hosted by Columbia University. The Barrow Neurological Institute placed first out of 32 teams. \$100,000 is expected to be raised for NREF this year.

For the 10th consecutive year, the Steinbrenner family and the New York Yankees sponsored the tournament which was also supported by Mayor Michael Bloomberg. The day was declared "Neurosurgery Charity Softball Tournament Day" in New York City. Check out the pictures from the event!



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Education Division

The Education and Practice Management (EPM) Committee would like to highlight its many courses for young neurosurgeons, including coding courses, offered quarterly; the biannual Goodman Oral Board Review course; online courses (which can be found Education and Meetings at aans.org); and resident courses. The online courses are free, and the resident courses are all-expenses paid. Upcoming resident course topics include vascular, spinal, skull base, and peripheral nerve surgery. Residents are selected for these courses based on nominations from their program director, so check with yours for more information. There are a variety of ways in which the EPM Committee is seeking help from young neurosurgeons. If anyone has any ideas for online course topics, or would like to volunteer to help Aaron Cohen-Gadol, MD, FAANS with the AANS Operative Grand Rounds series (download the Android or IPad/Iphone app today!) please feel free to email Khoi Than, MD at khoi@med.umich.edu. The Scientific Planning Committee would like to thank all of you who submitted abstracts by the deadline on November 4th. They have a great scientific agenda planned for San Francisco, and we are looking forward to seeing you all there!