

Technology Advances in Neurosurgery Reshaping the Practice Environment

Developments in Every Corner of Neurosurgery Portend Opportunities—and Challenges—for Neurosurgeons Leaving Training

By Bonnie Darves

Technology-driven advances in neurosurgery are occurring at such a rapid clip that even neurosurgeons who follow developments as a matter of course in their professional lives have trouble keeping up these days. Lawrence, Chin, MD, chair of neurosurgery of SUNY Upstate in Rochester, N.Y., and chair of the American Association of Neurosurgical Surgeons IT Committee, admits that it's not a bad problem to have.

"There's so much going on, in so many different areas of neurosurgery, that it's hard to decide where to focus right now. But it's all exciting for our field," said Dr. Chin, who for more than a decade has performed technology grant reviews for the National Institutes of Health. "The rate of acceleration in technology advances isn't surprising in itself—that's the nature of science and technology development. What we're seeing now, though, is really exponential development

advances, many attended by a boost from imaging technology, is an area that holds considerable potential for changing the field, in Dr. Chin's view.

"There are now more powerful ways of being able to see where you are exactly, either in the brain or the spine," he said, which promise to improve both diagnostic accuracy and intraoperative techniques. Further, simulation technology advances will soon enable neurosurgeons to "rehearse" a surgery or augment the actual procedure. "There are both virtual-reality and authentic-reality aspects of simulation technology—by either superimposing information or obtaining information about the location of key structures or tumors—that can allow neurosurgeons to improve what they're seeing in the OR," said Dr. Chin, who specializes in neuro-oncology and spine disorders.

"There's so much going on, in so many different areas of neurosurgery, that it's hard to decide where to focus right now. But it's all exciting for our field."

— Lawrence Chin, MD, SUNY Upstate



because of the increases in computing power and the use of robotics—and all of these things are synergistic."

Pointing to the key areas where technology advances are changing neurosurgeons' daily practice lives—or likely soon will—Dr. Chin cites four main categories: simulation technology, imaging advances, functional neurosurgery developments and robotics. Neurosimulation

"There are commercially available simulations, but they're still at a less refined level," Dr. Chin said.

"This area is progressing so quickly, however, that I think we'll see important developments in neurosurgery in the near future."

In imaging, advances in magnetic resonance imaging and computed tomography, with the advent of "superfast" MRIs and CTs, are already demonstrating potential for streamlining surgical

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Technology Advances in Neurosurgery

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procedures, Dr. Chin said. In a similar manner, endoscopy advances, particularly the move toward combining powerful 3D endoscopes and advanced imaging, promise to facilitate developments in minimally invasive procedures. “It’s the equivalent of a surgical microscope, or imaging through a lens that puts you right into a deep area of the brain, but has 3D-like features so that you can work through a small space or around corners,” Dr. Chin said.

Collaboration: a key technology driver

In neurosurgery, interdisciplinary approaches have long played a role in propelling technological advances in the field. Some neurosurgeons think, however, that collaboration is reaching a whole new level now, involving a broader range of disciplines and allowing for more real-time interaction than the field has seen historically.

That’s a development that will expand neurosurgeons’ career-path options in the future. California spine surgeon Scott Berta, MD, an assistant clinical professor of neurologic surgery at UC-San Francisco who has a background in bioengineering and drug discovery, credits collaboration with the current “fast track” pace of technology advances in neurosurgery.

“I think we’re seeing technology-driven advances accelerating almost exponentially, largely because of the collaborative effort among basic science and the clinical sciences, and IT and engineering,” Dr. Berta said, who is medical director of neurosurgery at Queen of the Valley medical center in Napa, Calif. “What’s happening in neurosurgery is that everything is becoming synergistic, so the result is really multiplicative—especially in the last five years.” He cites the technological advances in imaging, such as the nascent ability to merge CT and MRI scans intraoperatively; and the developments in functional neurosurgery in neurostimulation, as examples of collaboration-fueled advances that will soon change daily neurosurgery practice.

Evaluating Practice Opportunities’ Technology ‘Temperament’

As neurosurgery practice changes with technology-driven advances, neurosurgeons entering the job market should look for not only a good professional and cultural fit but also for an organization’s commitment to providing up-to-date technology and an innovation-friendly environment. Neurosurgeons who contributed to this article acknowledged that although it’s sometimes difficult for young neurosurgeons to make such an assessment, doing research and asking the right questions is a good start.

They offered these tips:

Ask the right questions.

To assess an organization’s commitment to bringing in new technology, press for details, advises Jeremiah Johnson, MD, assistant professor of neurosurgery at Baylor College of Medicine. “If you’re told that the organization plans to build a new suite or bring in new equipment, you need to ask about the timeline—whether the technology is budgeted for, for example, or whether the bids are in,” he said. “It takes a year or two to implement something like brain-lab navigation.”

Check the organization’s track record—and gauge innovation-involvement potential.

Neurosurgeons who want to pursue technology-dependent research interests and clinical work should determine how successful others have been in achieving that combination. “Try to get as much information as possible before going onsite. If people have gone there with the best of intentions and haven’t been able to obtain the needed support or grants, usually there’s a roadblock that might be difficult to overcome,” said Nir Lipsman, MD, PhD, a neuromodulation researcher at Sunnybrook Health Sciences Centre in Toronto.

“In this environment where many places are creating hubs for innovation—where physicians, engineers and scientists can come together—I think it’s important to also ask about the access you would have to different specialties,” Dr. Lipsman said, “because there are many opportunities for collaboration that neurosurgeons can pursue now.”

Assess technology ‘aptitude’ and commitment.

Because of how the health services marketplace is shifting, with more hospitals and healthcare organizations moving ‘in-house’ neuroscience services, neurosurgeons need to ensure that technology investments will be timely. “More and more neurosurgeons are going to hospital employment now, so they should know that they’re joining an organization that’s interested in providing the most up-to-date equipment,” said Lawrence Chin, MD, chair of neurosurgery at SUNY Upstate in Rochester, N.Y.

Given the pace of technological developments occurring and anticipated, neurosurgeons nearing the end of training should evaluate opportunities with an eye to how well positioned organizations are to incorporate advanced technology in a collaborative setting, Dr. Chin and other sources concurred. “I think it’s important, when you are finishing your training and looking for a job, that the places you consider are interested in bringing in the newest technological developments,” Dr. Chin said. (See sidebar.)

Functional neurosurgery’s new frontiers

The career progression of Nir Lipsman, MD, PhD, exemplifies the net result of interdisciplinary collaboration in a cutting-edge environment. A scientist and neurosurgeon at Sunnybrook Health Sciences Centre in Toronto, Dr. Lipsman is working at the forefront of novel neurostimulation strategies. A leading researcher in deep brain stimulation and the nascent field of MR-guided high-frequency ultrasound in neurosurgery, a noninvasive alternative treatment for approved indications such as essential tremor and expected future use in Alzheimer’s disease and Parkinson’s, and intractable psychiatric disorders, Dr. Lipsman is positioned to witness technology’s impact on neurosurgery practice.

“I think we’ll see more real-time research and collaboration on the ground now, and that the evolutionary time scale from bench to bedside will decrease in some ways, as the integration between the disciplines gets closer.”

– Nir Lipsman, MD, PhD, Sunnybrook Health Sciences Centre

“It’s a fascinating area to be in now, because I think what we have here is really the marriage of the latest technology, engineering, medical physics, clinical neurosurgery and clinical neuroscience,” Dr. Lipsman said. “And neuromodulation really occupies a unique space at the border between disciplines. That’s what drew me to functional neurosurgery.”

Focused ultrasound is also starting to make its way into brain-cancer treatment, as both a way of destroying or ablating tumors and, potentially, delivering cancer therapies in

“Focused ultrasound is a long shot, but it’s essentially a game-changing approach, and I think that in five years it will be a mainstream therapy and another quiver in neurosurgeons’ treatment arrow,” Dr. Kassell said. “The idea is that there are new drugs for treating things like Alzheimer’s disease, but they don’t get in the brain because they don’t pass the blood-brain barrier.” Focused ultrasound has the potential, Dr. Kassell explained, to open that barrier and effectively “pull the drugs through.”

This approach would involve using lower-frequency focused ultrasound in a “reversible”

“In endovascular neurosurgery, we’re 100% technology dependent, and technology advances have driven many of the exciting changes we’ve seen in the field.”

– Jeremiah Johnson, MD, Baylor College of Medicine



higher doses or drugs for Alzheimer’s disease, for example. Neal Kassell, MD, a professor of neurosurgery and former department co-chair at the University of Virginia, and founder of the Focused Ultrasound Foundation, predicts that the emerging technology will see practice-changing advances in the next several years.

manner, Dr. Lipsman points out, to facilitate delivery of therapeutic compounds to the brain. “In many disorders of the brain—such as tumors, Parkinson’s, Alzheimer’s and Huntington’s—the blood-brain barrier is a fundamental obstacle because the vast majority—98% of therapeutic compounds, cannot pass the barrier,” Dr. Lipsman said.

What’s beyond the cutting edge for neurosurgeons

For Jeremiah Johnson, MD, an endovascular neurosurgeon who recently completed a fellowship in open cerebrovascular neurosurgery and work in biodesign innovation at Stanford University, the field’s inherently tool-dependent nature make neurosurgery a prime candidate for future technology advances.

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Negotiation Pearls for the Neurosurgeon

By Deborah L. Benzil, MD, FACS, FAANS

"Everything is negotiable. Whether or not the negotiation is easy is another thing."

—Carrie Fisher

Negotiations are key to success in all of business and life. Every day, we are involved in a myriad of negotiations, some with the potential for tremendous impact on our careers and life satisfaction. Just a few examples of common negotiations neurosurgeons face are:

- Employment contracts
- Department resources
- Quality and value programs within hospital
- Promotions, appointments and elections
- Auto purchase
- With your family, on any number of subjects

Despite the importance of negotiation, most physicians receive little or no teaching on this subject. Some individuals are "naturals" at negotiating, but for everyone, negotiation skills are a learned art that requires instruction and practice.

The primary focus of negotiations is to resolve, manage or prevent conflict. Becoming a facile negotiator is beyond the scope of this article, but through a brief case study, negotiation pearls that every neurosurgeon can use will be highlighted.

Case study

A highly skilled, well-trained neurosurgeon accepts a hospital-employed position with a great two-year compensation package. Toward the end of the contract, the hospital merges with a larger health system, and the new administration had no history with this neurosurgeon. New contract negotiations finally start just six weeks before the physician's contract expires, and the starting terms include compensation that is more than 25% less, additional performance requirements and reduced practice support.

Lessons learned

What lessons does this case teach us? First, one must always recognize when negotiations

start. It is our experience that neurosurgeons fail to recognize that negotiations for their long-term employment contracts actually begin when that first "golden contract" is signed. Thus, having a sense of how to best position oneself for future potential negotiations is critical.

The essential "Ps" of negotiations are:

- Prepare
- Plan
- People
- Practice

All of these were problematic for this neurosurgeon; there was inadequate preparation and no forward planning. A

neurosurgeon entered the meeting with a PowerPoint presentation that included:

- Graphs of clinical growth (meeting or exceeding anticipated growth)
- Highlights of outstanding patient satisfaction performance, such as quotes from nurses, and commendations and thank-you messages from patients and families
- Details of participation in important department and hospital functions
- Evidence of work to address any challenges encountered
- A two-, five- and 10-year plan for career and practice development

"It is our experience that neurosurgeons fail to recognize that negotiations for their long-term employment contracts actually begin when that first 'golden contract' is signed."

— Deborah L. Benzil, MD, FACS, FAANS



critical issue such as an employment contract should not be left to chance or the last minute. Scheduling regular meetings with the appropriate administrator should begin immediately after hiring, and should continue throughout the initial contractual period.

Prepare

At least six months in advance of contract expiration, the neurosurgeon should introduce the specific topic of the new contract and set a timeframe for realization. Through such meetings, the neurosurgeon should ascertain the performance criteria that will be used and determine whether those thresholds are being met. Developing the right strategies to reach specified goals is essential. Consider how it might go if a

By being so well prepared, the neurosurgeon will be in a superior negotiation position with any administrator. Developing the right components of this kind of presentation would require an understanding of the administration's expectations—and that is not always obvious to neurosurgeons who are trained to think about patients and their care, not necessarily the business components.

Solid preparation requires that the neurosurgeon:

- Know the players and recognize they often are "repeaters"
- Be aware of the hierarchy of decision makers and where the real power resides
- Understand the short- and long-term needs of your negotiation counterparts, and
- Delineate any "hot-button issues"

Plan

Planning continues the process of preparation and requires a few key elements. The first, which is too often overlooked, is defining key terms. For example, as neurosurgeons, we may define productivity in terms of numbers of surgeries we perform, while administrators may be equally concerned about inpatient days and clinic capacity. Similarly, a seemingly simple matter such as detailing the goal threshold for patient satisfaction helps both sides enormously. Asking questions helps neurosurgeons to better understand the administration's key issues: their interests, their unmet needs, and their frustrations and challenges. Then use creativity to find the best solutions.

"The best move you can make in negotiation is to think of an incentive the other person hasn't even thought of—and then meet it."

—Eli Broad

People

At the core of all negotiations are the people involved. All people arrive with preconceptions (think: that administrator knows nothing about being a neurosurgeon **OR** that neurosurgeon is a bit too aggressive), and understanding these preconceptions better allows the parties to overcome them. Perceptions become important in confirming that negative preconceptions

are wrong. Be sure to be an active listener, and be acutely aware of both verbal and nonverbal communications. Attending to your smartphone while the other party is talking will not be well received.

In our case study, the neurosurgeon was faced with negotiating with unknown people who had little understanding of the "history" of the neurosurgeon's practice and performance. While this represents a challenge, it is also an opportunity. Neurosurgeons in this position could easily position themselves in the role of bringing the new team "up to speed" on the growth and development of neurosurgical services, and help create a vision for the future as well.

No neurosurgeons acquire their clinical and surgical skills without lots of practice through graded supervision. It would be arrogant to assume that becoming an expert negotiator requires any less time and commitment. There are various ways to gain skill and expertise, including reading a book (see recommendations below), taking an online course or attending seminars during the annual neurosurgery meetings. For highly critical negotiations, neurosurgeons can tap professionals to help with various aspects of the process including:

- Understanding key issues
- Knowing crucial benchmarks
- Developing and shaping presentations

- Preparing for pitfalls and challenges
- Practicing the actual negotiation
- Analysis of progress and roadblocks
- Strategy to achieve final goals

In this regard, it is important to recognize that most lawyers who review contracts assess them purely from a legal standpoint and do not provide the same level of support in addressing the numerous non-legal issues that neurosurgeons will encounter in these career-critical negotiations.

Resources:

- The Physician's Guide to Comprehensive Negotiating
- Career Advancement to Health System Leadership (Dinner Symposium, AANS Annual Meeting 2017)
- Negotiation Mastery (Harvard Business School)
- Successful Negotiation: Essential Strategy and Skills (University of Michigan)

Dr. Benzil is associate professor of neurosurgery at Columbia School of Physicians and Surgeons and a practicing neurosurgeon at CareMount Medical, a large, multi-specialty practice in New York. She is also founding partner of Benzil Zusman, LLC, a consulting company focusing on clinical neuroscience negotiations and strategic planning.

CONTRIBUTORS WANTED!

Neurosurgery Market Watch welcomes submissions of articles of potential interest to practicing neurosurgeons. We are particularly interested in opinion articles about how trends occurring in the neurosurgery marketplace or in the health policy arena might affect the practice environment.

To discuss a potential idea, please contact Bonnie Darves at **425-822-7409** or **bonnie@darves.net**

IN BRIEF

Neurosurgery Health Reform Guide Out

In light of healthcare reform and the continued push to reduce costs, neurosurgery practices must prepare strategically to succeed in a rapidly evolving environment, urged Dong Kim, MD, director of the Memorial Hermann Mischer Neuroscience Institute at the Texas Medical Center, in a special publication in the April issue of the journal *Neurosurgery*.

The supplement, "The Coming Changes to Neurosurgical Practice," provides practical guidance for newly graduated neurosurgeons in navigating federally mandated patient care standards, and the changing reimbursement arena with episode-based and bundled payments and pay-for-performance incentives. The guide also explores the potential role of neurosurgeons in accountable care organizations in formation and in emerging population health initiatives.

To view the supplement, go to <https://academic.oup.com/neurosurgery/issue/80/4S>.

Kogent Surgical & Medtronic Ink Deal

The bioscience company Kogent Surgical LLC, a major supplier of numerous devices and instruments used in neurosurgical and other microsurgical procedures, has entered an agreement with Medtronic Surgical Technologies in which Medtronic will take on worldwide distribution activities for Missouri-based Kogent, under Kogent's brand name.

Gregg Scheller, Kogent's co-founder, previously founded three other medical device companies, including Synergetics USA, Inc., which manufactures devices and surgical equipment for the neurosurgery and ophthalmology markets.

The Medtronic neurosurgery division manufactures FDA-approved deep brain stimulation products and hydrocephalus-shunting systems and surgical navigation solutions, among other neurosurgical-related products.

UPCOMING U.S. NEUROSURGERY EVENTS/CMES

ISASS 17

☐ April 12-15
Boca Raton, Florida

14th Annual World Congress of Society for World Brain Mapping and Therapeutics

☐ April 18-20
Los Angeles, California
Meet us there!

2017 NERVES Annual Meeting

☐ April 20-22
Los Angeles, California

2017 American Association of Neurological Surgeons (AANS) Annual Scientific Meeting

☐ April 22-26
Los Angeles, California

SNIS: Society of Neuro-Interventional Surgery Annual Meeting & Fellows Course

☐ July 24-28
Colorado Springs, Colorado

Mayo Clinic 9th Annual Stroke and Cerebrovascular Disease Review 2017

☐ September 14-16
Amelia Island, Florida

UPCOMING INTERNATIONAL CMES

Global Spine Conference

☐ May 3-6
Milan, Italy

The Cervical Spine Research Society 33rd Annual Meeting

☐ May 24-26
Salzburg, Austria

INS: International Neuromodulation Society World Congress

☐ May 27-June 1
Edinburgh, Scotland

Sixth Annual World Course in Advanced Brain Tumor Surgery

☐ June 7-11
London, England

LINNC: Live Interventional Neuroradiology & Neurosurgery Course

☐ June 13-15
Paris, France

8th Spine Deformity Solutions

☐ June 29-30
Nijmegen, Netherlands

ESMINT: European Society of Minimally Invasive Neurological Therapy Annual Meeting

☐ September 7-9
Nice, France

LEGAL CORNER



Understanding Liquidated-Damages Clauses and Productivity-Bonus Pitfalls

In this series, Neurosurgery Market Watch speaks with health law specialists about contractual issues and trends related to neurosurgery compensation and performance. In this article, physician and attorney Andrew Knoll, MD, JD, a partner with the Syracuse, N.Y., firm Cohen Compagni Beckman Appler & Knoll, PLLC, who specializes in physician contracts, elucidates pitfalls in employment contract liquidated-damages clauses and productivity-bonus structures.

Q: Young neurosurgeons seeking a first practice opportunity and evaluating contracts that prospective employers are offering usually aren't thinking ahead to what might happen, financially, if there's a less-than-amicable parting of ways—something that liquidated-damages contract clauses attempt to address. Because such clauses can be confusing and might vary considerably from one contract to another, what should neurosurgeons look for to make sure they don't end up in an unfair arrangement?

A: Liquidated damages clauses are generally seen in two scenarios: the employee terminates without giving the amount of notice specified in the contract, or the employee violates the restrictive covenant. They aren't intended to be a penalty, and by law they're not supposed to be a penalty—which is unenforceable. Instead, the damages are intended to represent the financial cost to the employer in the above scenarios and are treated as an agreement that, should this happen, this is what the parties have agreed to in advance as to the costs.

The liquidated damages amount tends to be the same as a buyout, the argument being that if I violate this term and we agree the damages are "X", I should be able to pay you X to be released from that term. The sum is normally set high enough—usually in the six figures—that the physician wouldn't want to pay it.

The damages payment is intended to "reimburse" the employer for the costs of securing a replacement physician and disruption to the practice in terms of coverage or loss of services. It must be reasonable. A rule of thumb for a restrictive covenant violation is about one year's salary, and for failure to give notice, about \$1,000 to \$2,000 per day. These figures may seem very high, but consider that these violations are entirely within the neurosurgeon's control. He or she should give adequate notice and should not violate the restrictive covenant.

Lastly, a liquidated damages provision is only enforceable if the employer sues. Given the expense of litigation, that opens the door to negotiation at the time of departure, depending on the circumstances. For example, if the neurosurgeon needs to leave the practice as soon as possible because of family issues, the employer may be willing to waive liquidated damages for failure to give X days' notice provided the neurosurgeon works Y days.

Q: Even with the continual movement toward incorporating quality and satisfaction metrics in physician compensation structures, it appears productivity-pegged incentives and associated bonus payments are still very common in employment contracts. How can neurosurgeons help ensure that the productivity-bonus arrangements that end up in their employment contracts are workable, reasonable and equitable?

A: If a neurosurgeon's total annual compensation will be determined to any extent by productivity performance, it's important to have access to good national and regional data so that you can figure out whether the threshold productivity a contract cites—usually in terms of total work RVUs

for year—for determining potential bonus/incentive payments, is reasonable and, more important, achievable. Organizations such as MGMA, AMGA and Sullivan Cotter publish this data in their annual physician compensation survey reports, but that data is not the be all and end all. Just because the median RVUs for a geographic region under consideration come in at 9,000 annually, that doesn't mean the practice's or hospital's volume, or even the local area will support that level of productivity.

There are a few potentially problematic things to look for in contracts' productivity-bonus clauses. For one, neurosurgeons should avoid "step-wise" structures, those in which the bonus applies to "blocks" of RVUs above a certain amount—for instance, for

"To be fair, the contract should specify a per-RVU bonus payment for any RVUs accrued over the threshold number."

every 100 RVUs above a threshold number (but no bonus if the surgeon only logs 99 additional RVUs). Ideally, and to be fair, the contract should specify a per-RVU bonus payment for any RVUs accrued over the threshold number.

Bonus payment timing and distribution is another area where things can get sticky. One of my pet peeves is contracts that specify that the surgeon "must be employed [by the group] at the end of the year" to receive the productivity bonus. Barring a contract breach, the physician should receive the bonus if earned.

Technology Advances in Neurosurgery

(continued from Page 3)

“In endovascular neurosurgery, we’re 100% technology dependent, and technology advances have driven many of the exciting changes we’ve seen in the field—and I witnessed many practice-changing developments in my own training,” said Dr. Johnson, who is an assistant professor of neurosurgery at Baylor College of Medicine in Houston, Texas, and oversees AANS Young Neurosurgeons Committee social media activities and is a liaison to the organization’s IT Committee. “I literally would see patients who would have had poor outcomes a few months earlier be saved because of a new device.”

AI to play growing role

Going forward, Dr. Johnson expects that automation via robotics in endovascular procedures, and artificial intelligence (AI) generally, will emerge as practice-changers for neurosurgeons. “There’s a lot of research being done in robotics, and I think we’re getting close to some major developments,” he said. He also thinks that AI advances—training computer algorithms to read medical images, for instance—have potentially significant implications for both radiology and neurosurgery. “I do think AI will touch neurosurgery practice in the next five years,” he said.

In Dr. Chin’s view, neurosurgery will see technology-driven advances across the board within the subspecialties, occurring incrementally over the next five to 10 years. “I

would say we’re really on the edge of it. I don’t know that in next year or two neurosurgery practice will look that much different, because these technology advances are coming in on the periphery,” he said. “I will say that neurosurgery practice in 10 years will definitely benefit from this new technology—and every field in neurosurgery is seeing this effect.” He points to new endovascular devices on one end of the spectrum, and emerging new devices in spine that will

abreast of technology advances in the field, Dr. Berta noted. The good news, he said, is that neurosurgeons have more ways than ever to tap in to educational resources.

“It’s comforting to know that with all the technology advances in neurosurgery, there’s been an equal advancement in the venues of learning,” Dr. Berta said. “We used to have just a few national conferences. Now, there’s a conference every week, and we have dedicated subsections where thought

“What’s happening in neurosurgery is that everything is becoming synergistic, so the result is really multiplicative—especially in the last five years.”

— Scott Berta, MD, UC-San Francisco

promote bone fusion and stabilization with stronger materials, using advances in biotissue technology.

Dr. Chin and all other sources in this article cite interdisciplinary developments in translational medicine in treating tumors, and imaging and other advances in diagnosing tumors, as areas that will change neurosurgery practice over the medium term.

Young neurosurgeons might be understandably daunted by the prospect of staying

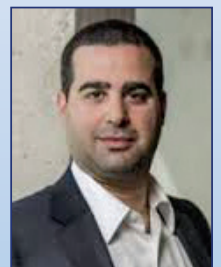
leaders keep us abreast of advancements. And you could take virtual update courses daily, if you wanted.”

The technology-driven advances throughout neurosurgery will likely pick up speed, Dr. Lipsman predicts, as the trend toward continuous interdisciplinary collaboration—in his view, one of the most exciting developments in the field—increases.

“I think we’ll see more real-time research and collaboration on the ground now, and

“It’s a fascinating area to be in now, because I think what we have here [in neuromodulation] is really the marriage of the latest technology, engineering, medical physics, clinical neurosurgery and clinical neuroscience.”

— Nil Lipsman, MD, PhD, Sunnybrook Health Sciences Centre



Surgical Simulator Earns AANS Technology Grant

One of the perennial challenges in neurosurgery training is ensuring that residents have enough hands-on opportunities to perform complex procedures before they leave the program—a quandary exacerbated by duty-hours restrictions. Neurosurgeon Vivek Bodani, MD, PhD, a fourth-year resident at the University of Toronto who is in the Surgeon Scientist Training Program, has developed a novel technology-facilitated tool that squarely addresses that experience-constraint dilemma: an advanced surgical simulator for use in the training environment.

The simulator enables neurosurgeons in training to perform minimally invasive endoscopic procedures on high-fidelity, patient-specific brain and skull models—generated using state-of-the-art 3D printers—that incorporate realistic tissue properties and key anatomy, including blood vessels and nerves. Surgeons use real endoscopic tools to perform high-complexity procedures such as third ventriculostomy, colloid cyst resection, pineal region tumor biopsy, choroid plexus cauterization, and repair of sagittal and metopic craniosynostosis.

“The concept is that by incorporating very detailed anatomy and creating the most realistic environment we can, trainees can use the simulators at all critical steps of a high-learning-curve procedure and ultimately become proficient with those techniques, in a stress-free environment and without risk to real patients,” said Dr. Bodani, “so that they’re much better prepared for actual operating experience.”

The “hands-on” simulation system, being developed at the Center for Image Guided Innovation and Therapeutic Intervention at The Hospital for Sick Children in Toronto, recently garnered Dr. Bodani the American Association of Neurosurgical Surgeons Technology Development Grant. The grant is part of a new program to support young neurosurgeons’ research efforts to incorporate cutting-edge technology that addresses a need or issue in neurosurgery training or promises to improve patient outcomes.

To date, the training simulator has been piloted in residency programs at the University of Toronto and Weill Cornell Medical Center in New York City, and has generated considerable interest within the academic community. “Our goal is to expand this beyond a training workshop to become an established aspect of the neurosurgery training curriculum,” Dr. Bodani said.

Endovascular neurosurgeon Jeremiah Johnson, MD, a member of the AANS Young Neurosurgeons Committee and IT section who evaluated the technology grant applications, noted that Dr. Bodani’s simulator concept exemplifies the key objectives of the new grant program. “AANS developed the program to encourage young neurosurgeons to pursue technology advances that fix something with ‘holes in it’ and, ultimately, make our field better,” Dr. Johnson said. “The simulator promises to do both. It was a tough selection process, however, because the majority of the applications we received were absolutely outstanding.”

“The concept is that by incorporating very detailed anatomy and creating the most realistic environment we can, trainees can use the simulators at all critical steps of a high-learning-curve procedure and ultimately become proficient with those techniques, in a stress-free environment ...”

— Vivek Bodani, MD, PhD, University of Toronto



that the evolutionary time scale from bench to bedside will decrease in some ways, as the integration between the disciplines gets closer,” Dr. Lipsman said. “It will be key for neurosurgeons to have the feedback of those other people in the room with you. You can’t exist in a vacuum in neurosurgery

anymore—that’s really the message. And I think for young neurosurgeons, it’s important to choose a practice environment where you’ll have access to a mentor, in your own field and in administration.”

Resources: For more information about the AANS Technology Development Grant, go

to: <http://www.aans.org/en/Grants%20and%20Fellowships/AANS%20Neurosurgery%20Technology%20Development%20Grant.aspx>

Ms. Darves, a Seattle-area independent healthcare writer and communications consultant, is editor of Neurosurgery Market Watch.

Surgical Neuro-Oncology, Skull Base and Open Vascular Neurosurgery Fellowship opportunity at Lenox Hill Hospital



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To apply for a fellowship, please send your current curriculum vitae (CV) and cover letter to Dr. David Langer at dlanger@northwell.edu or Dr. John Boockvar at jboockvar@northwell.edu.



NEUROSURGERY POSITIONS

HOSPITAL EMPLOYED

Trenton, NJ (*Endovascular*)
Knoxville, TN
Salisbury, MD (*Vascular*)
Tampa, FL (*Pediatric*)
Fresno, CA (*Spine*)
Charlottesville, VA (*Endovascular*)
Gastonia, NC
Greenville, NC (*Spine*)
Rocky Mountains, Colorado (*Spine*)
Farmington, NM

Lake Havasu, AZ
Edison, NJ (*Spine*)
Billings, MT
Rockford, IL
Greenville, NC (*Neuro-Oncology*)
Tampa, FL (*Endovascular*)

PRIVACY-DEMIC

Trenton, NJ (*Endovascular*)
Fresno, CA (*Endovascular*)
Reading, PA (*Spine*)
Fresno, CA (*Trauma*)

Dayton, OH (*Spine*)
Erie, PA (*Endovascular*)
Reading, PA (*Endovascular*)

ACADEMIC

Greenville, NC (*Spine*)
Morgantown, WV (*Functional*)
Albuquerque, NM (*Spine*)

PRIVATE PRACTICE

Dallas, TX (*Spine*)
Long Island, NY (*Spine*)

Houston, TX (*Spine*)
Cincinnati, OH
Macon, GA (*Neuro-Oncology*)
Macon, GA (*Pediatric*)
Los Angeles, CA (*Endovascular*)
Bakersfield, CA
Reno, NV (*Deformity Spine*)
Albany, NY (*Neuro-Oncology*)
Baltimore, MD
Jackson, MS
Macon, GA (*General Neurosurgery*)

NEUROSURGERY PHYSICIAN ASSISTANT OPPORTUNITIES

Eugene, OR: *Private Practice, Spine Neurosurgery PA*
Salisbury, MD: *Hospital Employed, General Neurosurgery PA or NP*
Stuart, FL: *Hospital Employed, Neuro-ICU PA or NP*
Reno, NV: *Private Practice, Spine, Neurosurgery PA or NP*
Springfield, MA: *Hospital Employed, Neurosurgery PA*
Modesto, CA: *Hospital Employed, General/Trauma Neurosurgery PA*
Greenville, NC: *Hospital Employed, Functional Neurosurgery PA*
Fresno, CA: *Hospital Employed/Privatized, General Neurosurgery PA or NP*

Greenville, NC: *Hospital Employed, Inpatient PA or NP*
Reno, NV: *Private Practice, PM&R PA*
Macon, GA: *Private Practice, General Neurosurgery PA or NP*
Billings, MT: *Private Practice, Spine PA*
Trenton, NJ: *Hospital Employed, Neuro-Critical Care PA*
Bozeman, MT: *Private Practice, Orthopedic PA*
Stuart, FL: *Hospital Employed, Neurosurgery PA*

- ▶ For more information on these positions, or if you are interested in hiring a neurosurgeon for a permanent position, please contact info@harlequinna.com.
- ▶ If you have locums assignments available, or if you are interested in locums positions, please contact Aaron Risen at The Surgeons Link at aaron@thesurgeonslink.com.



NEUROLOGICAL SURGERY – SPINE

UC Davis Health Department of Neurological Surgery

The Department of Neurological Surgery at UC Davis is seeking applicants for a faculty position at the Assistant or Associate level in the Professor of Clinical Neurological Surgery or Health Sciences Clinical Professor series. Successful candidates will have the foundation, preparation and vision to pursue a productive career in academic neurosurgery. The candidate must possess their MD, MD/PhD or DO, board certified/eligible in neurosurgery and have completed a spine fellowship. Responsibilities include teaching residents and fellows, maintaining an active neurosurgical clinical practice, and conducting clinical and/or basic science research. Competency in general neurosurgery is preferred. The successful candidate will be part of a multidisciplinary team at the UC Davis Spine Center which includes Orthopaedics, PM&R, Pain, and Radiology. Additionally, there is potential for a joint appointment with the VA Northern California Health Care System.

Candidates must possess the ability to work cooperatively and collegially within a diverse environment that fosters team science and multidisciplinary patient care. All candidates must have or be able to obtain a California medical license.

This recruitment is conducted at the assistant/associate rank. The resulting hire will be at the assistant/associate rank, regardless of the proposed appointee's qualifications.

UC Davis Health is an affirmative action employer, and welcomes applications from women and under-represented minorities. The university has a strong institutional commitment to the achievement of diversity among its faculty and staff.

Sacramento is ideally situated near San Francisco, Napa Valley and Lake Tahoe with an ideal Mediterranean climate and is one of the top ten sunniest cities in the U.S. Also, housing is affordable.

For full consideration, application must be received by May 30, 2017. However, the position will remain open until filled through June 30, 2017. The following information is required: Cover Letter, Curriculum Vitae, contact information for 3 references and the Statement of Contributions to Diversity. Qualified candidates should apply on-line at <https://recruit.ucdavis.edu/apply/JPF01495>.

We are currently accepting applications for one-year fellowship positions beginning July 2018 and July 2019. Applicants must have successfully completed orthopedic or neurosurgery residency training program and be eligible for a Massachusetts medical license.

- For additional information:
Kee D. Kim, M.D.
Professor and Vice-Chair of Neurological Surgery
kdkim@ucdavis.edu

UC DAVIS
HEALTH

Harlequin Recruiting
PO Box 102166
Denver, CO 80250

FEATURED OPPORTUNITY

Academic Spine Neurosurgeon Opportunity in the Southwest

The University of New Mexico seeks a spine neurosurgeon for a department position. They prefer an experienced academic spine neurosurgeon, and academic rank will be based on experience and qualifications. Department leadership opportunities are available based on candidate's experience.

The department operates active spine pain management and rehab programs, and is building a mainly spine service at the university's VA. Surgeons also work with endoscopic spine surgery at an off-campus hospital. The joining faculty member will have an academic position through the university's School of Medicine, and will be employed by the UNM Medical Group, the largest integrated health care system in the state. The ideal candidate will be both highly skilled and

experienced in spine, and will have excellent teaching skills.

The University of New Mexico is the only academic center in the state and is considered a first-class research university. UNM is also renowned for operating a major, fully comprehensive center for state-of-the-art neurosurgery care. The department currently has 11 neurosurgery residents in training, and maintains active clinical and laboratory research efforts. As part of a long-term commitment, the incoming neurosurgeon will have an opportunity to take a major administrative role in the department.

Basic salary structure is consistent, with 50% or better than ACGME norms and a flexible incentive structure related to productivity. This position involves significant medical

student and resident education, and provides dedicated research time and resources.

Nestled at the base of the Sandia and Manzano mountain ranges in the Land of Enchantment, Albuquerque is the largest city in the state. Besides enjoying 300 days annually of great weather and a beautiful landscape, Albuquerque is also home to the world's largest Balloon Fiesta and the Gathering of Nations. Excellent skiing is only 50 minutes away from the nearby historic city of Santa Fe. The favorable cost of living, good educational resources and plentiful natural resources—as well as all amenities expected in a major urban area—make Albuquerque a desirable location for families.