



The Montlake Cut

A Publication of the Department of Neurological Surgery
UW Medicine Health Care



Richard G. Ellenbogen
M.D., F.A.C.S.

A View From Puget Sound

Welcome to the Summer, 2014 issue of “The Montlake Cut,” featuring a report describing Dr. David Pitkethly’s global health work in Africa. We all extend a warm welcome to former resident Andrew Ko who will rejoin us as a faculty member. Simultaneously, we bid a fond farewell to former resident, faculty member and friend Anthony Avellino who will become CEO of a major healthcare system in the Midwest. In addition, we want to share news of promising research involving our faculty in the treatment of Glioblastoma. There are exciting new developments in our program at the VA Medical Center to also report. We are proud to have graduated three of our outstanding residents, Jason Chang, Mike Levitt and Josh Osburn, in a well-attended and enjoyable ceremony on June 21st, and to share the news of their plans.

Our extended faculty accomplishments now reach into literature. Valerie Trueblood, wife of Dr. Richard Rapport, is a well known short story writer. Her collection, *Search Party: Stories of Rescue* (Counterpoint Press) was a finalist for this year’s Pen/Faulkner Prize for Fiction. The collection plumbs the nature of loss and need with 13 stories that surprise in their perspectives on what it means to search and who is in need of rescue. Trueblood is the author of a previous collection of short stories, *Marry or Burn*, a novel, (a finalist two years ago for the Frank O’Connor Prize given in Cork, Ireland), a novel, *Seven Loves*, (selected for Barnes & Noble’s Discover Great New Writers program), as well as numerous essays and works of journalism. She is a cotrustee of the Denise Levertov Literary Trust and is a contributing editor of the *American Poetry Review*.

Finally, we bring you another of Dr. Minku Chowdhary’s ingenious and challenging Puzzlers. As always, we welcome your feedback and thank you for your support.

Sincerely,

Richard G. Ellenbogen, MD, FACS
Professor & Chairman, Department of Neurological Surgery

In This Issue

<i>Our 2014 Graduates</i>	1	<i>New Residents, Up Close</i>	6-7
<i>Dr. Andrew Ko Re-Joins the Faculty</i>	2	<i>The VA Ready to Move & WSANS Meeting</i>	8
<i>Neurosurgery in Tanzania</i>	3-4	<i>Dr. Anthony Avellino: A Farewell</i>	9
<i>Kiem Lab: Glioblastomas</i>	5	<i>Announcements</i>	10
		<i>Puzzler</i>	11

Our 2014 Graduates

In June, the Department of Neurological produced three new graduates: **Jason Chang**, **Mike Levitt**, and **Josh Osbun**. The faculty is extremely proud of their accomplishments, and expects them all to have splendid careers.

Jason will be heading to Washington University in St. Louis for a spine fellowship. His wife, Katey (Boyd) Chang a HMC Neuro-ICU nurse just delivered twins, Maylee and Henry. For Katey and Jason, the foreseeable future includes diapers and practicing swaddling, shushing, swinging, pacifying, and side positions.

Mike is moving to Phoenix, AZ to the renowned Barrow Neurological Institute to complete a one-year endovascular fellowship under Drs. McDougall and Albuquerque. He hopes to continue his NIH funded research at Harborview while he's away. His wife and dog are staying, however, so he will be visiting Seattle often throughout the year.

Josh will be moving to Atlanta, GA for a two-year combined open cerebrovascular and interventional neuroradiology fellowship at Emory University under the Chair, Daniel Barrow, Michael Cawley and Jacques Dion. After that, the ever-philosophical Josh hopes for an academic cerebrovascular surgeon in the Pacific Northwest to die or retire so that he may take their job and return to the area.



Jason Chang, MD

Michael Levitt, MD

Rich Ellenbogen, MD

Joshua Osbun, MD

Congratulations! We wish you all the best!

Andrew Ko Re-Joins the Faculty

After seven years of residency and one year attending at the University of Washington, Andrew Ko left Seattle to complete a fellowship in Functional Neurosurgery with Dr. Kim Burchiel at OHSU. He is enthusiastically returning to UW this summer.

Andrew benefited from having some of the foremost surgeons in the field as mentors at UW to include the entire current faculty under Dr. Ellenbogen's direction. In the subspecialty of his choosing of functional neurological surgery, pain and brain mapping he was very fortunate. He enjoyed his education in the surgical treatment of epilepsy and brain mapping of the eloquent cortex by Drs. Jeff Ojemann and Dan Silbergeld. He learned from two of the world thought leaders in the field of the surgical management of pain, Dr. John D. Loeser at the UW and Chair Dr. Kim Burchiel at OHSU. Dr. Burchiel is also one of the most productive academic forces in Deep Brain Stimulation (DBS) for movement disorders and other diseases.

In the coming years, he'll work with the multidisciplinary teams necessary to establish UWMC as a leader in functional and restorative neurosurgery. This goal will require collaboration with neurologists, psychiatrists, bioengineers, as well as physical therapists, psychologists, and others.

Andrew wants to ensure that technical advances continue to put the patients first. For example, he plans to institute new patient-friendly techniques for implanting deep brain stimulation electrodes. Such an operation can require an hours-long procedure in an awake (and uncomfortable) patient to ensure accurate placement of the device. Advances in intraoperative imaging now allow the same accuracy of electrode placement in anesthetized patients, reducing operative time and discomfort. While this technique is not yet in widespread use, it will now be introduced at UWMC.

Concomitantly, a research program will be established here to make responsive, "closed-loop" neuro-modulation a reality. A new DBS system that employs external sensors to adjust stimulation levels based on patient requirements is being tested. This research will lead to a more efficient system that will use signals from the brain itself to more effectively treat essential tremor and Parkinson's disease. Eventually, these methods might be applied to the abnormal brain circuitry underlying conditions such as epilepsy, obsessive-compulsive disorder, Tourette's, depression, PTSD, Alzheimer's disease - even obesity.

At the same time, Andrew's team aims to continue the tradition of excellence present at the UW in the fields of epilepsy and surgery for pain. This institution has a well-deserved reputation for providing outstanding patient care, pursuing cutting edge research, and educating the next generation of doctors and researchers. Andrew's goal is to integrate these advances and contribute to the community that provided so much opportunity for him during his training, as well as to offer patient-centered care for the city, state, and WWAMI Region he has grown to love.

Dr. Ellenbogen has admired the manner in which Andrew has grown from resident to surgeon/scientist/educator in such a creative and positive manner. We enthusiastically welcome him back to our Department.



Neurosurgery in Tanzania, by David Pitkethly

The Neurosurgery Department in Dar es Salaam is located at the Muhimbili Orthopedic Institute, a misnomer because this hospital is home to both neurosurgery and orthopedics. The MOI bed count is listed at 450, but is actually many more because a large percentage of patients occupy mattresses on the floors. In the pediatric wards, there are two and sometimes three patients per bed. A large seven-story hospital is nearing completion adjacent to the existing one. This modern facility will include new operating rooms, an emergency room, CT, MRI, CyberKnife, fully equipped ICU, Telemedicine, as well as patient beds. To complete the picture, it should be understood that MOI is but a small part of a huge campus that also includes additional hospitals with a total of 1500 beds for all medical specialties, plus the schools of medicine, dentistry, and nursing.

The Neurosurgery Department is ably chaired by Professor Joseph Ka-hamba, and includes 4 other residency trained faculty members, one schooled in Japan and the others in South Africa. There are presently 6 other Tanzanian physicians in neurosurgery residency programs outside the country.

The MOI day begins at 7:30 in the Conference Room with the presentation of new admissions by registrars and medical students, followed by discussion. By 9:00 the faculty members and registrars attend clinics or head to the operating theater. On Thursday, one of the junior faculty leads every available registrar and medical student on formal patient teaching rounds. This ordeal is a more than 3-hour exhausting process during which the team sees between 80 and 100 patients. The beds are in large open wards, but about half of the patients occupy mattresses on the floor in hallways or between beds. The unfortunate reality is that many of them have waited months to have surgery. I counted 5 children and young adults with huge craniopharyngiomas, blindness, and large ventricles. The pediatric ward had at least 15 children with hydrocephalus and/or meningomyeloceles. One problem is that there are only 5 operating rooms in the hospital for elective surgery, and neurosurgery has only 1 dedicated room. Orthopedics, which has long dominated this hospital, has the other 4.



This young girl has a brain tumor (craniopharyngioma) and is blind in one eye. Hopefully she will have surgery soon.



In making rounds, doctors and staff must sometimes step on mattresses. Patients often stay for months to hold their place in line for surgery.

Operations begin at 9 am and finish at 3 pm. This translates to one craniotomy, two laminectomies, or three operations for hydrocephalus per operating day. And they lack equipment. For example, there are power drills in the storeroom, but none of them work. All craniotomies are done a la Harvey Cushing, using a Hudson brace and Gigli saws. Current younger residents would likely be lost, unless they had been to England!

During my two weeks at the MOI I operated almost every day as the first assistant. We did a variety of benign brain tumors, three spine cases for degenerative disc disease, and one ACoA aneurysm. I assisted on two extreme vascular meningiomas. Neither angiography nor embolization are yet available, and after two units of blood had been transfused in each case, the anesthesiologist called a halt to the operation. These patients were subsequently transferred to the Apollo Hospitals in India under a funding agreement between those centers and the Tanzanian government.

Despite these challenges, the neurosurgeons as a whole are well trained, competent, and take good care of their patients. Professor Kahamba is in negotiations to start a neurosurgery residency program at MOI. A new hospital is scheduled to have an MR scanner, endovascular services, modern ICU beds with monitoring, and technologically advanced equipment that will transform their department in a few years.



Saying goodbye: Sharon, Moses, Kelvin, Grandma Jane, Veronicah. Many thanks to family and friends who help us support this deserving family. Your donations really make a difference. - read about the Pitkethly's entire adventure at www.pitkethly2014.blogspot.com.



Kiem Lab Finds New Approach to Treating Glioblastoma Patients

A team of UW scientists working at The Fred Hutchinson Cancer Research Center has published data demonstrating that it may be possible to protect glioblastoma patients undergoing chemotherapy from the side effects of treatment. Professor of Medicine (Oncology) **Hans-Peter Kiem** and his team have shown that bone marrow protection in patients treated by chemotherapy with alkylating agents were defended by gene therapy using mutant methylguanine methyltransferase (P140K) gene-modified hematopoietic stem and progenitor cells. This novel approach may circumvent the side-effects problem by abrogating the toxicity of chemotherapy on hematopoietic cells.

As reported by the BBC, the study successfully used genetically modified stem cells to defend bone marrow. The study's first author Dr. Jennifer Adair said: "This therapy is analogous to firing at both tumour cells and bone marrow cells, but giving the bone marrow cells protective shields while the tumour cells are unshielded."

Each patient's own bone marrow and stem cells were isolated. A virus was then used to infect the cells with a gene that protected them against the dilatory effects of chemotherapy, and the cells returned to the patient. Gene therapy using mutant P140K gene-modified hematopoietic stem and progenitor cells may circumvent the problem of making patients sicker by abrogating the toxic effects of chemotherapy on hematopoietic cells, notes the study.

The paper, which appeared in *Sci Transl Med* 9 May 2012: Vol. 4, Issue 133, p. 133ra57 is titled "Extended Survival of Glioblastoma Patients After Chemoprotective HSC Gene Therapy" *Sci Transl Med* 9 May 2012: Vol. 4, Issue 133, p. 133ra57 *Sci. Transl. Med.* DOI: 10.1126/scitranslmed.3003425

Other UW authors included **Jennifer Adair, Brian Beard, Grant Trobridge, Tobias Neff, Jason Rockhill, Daniel Silbergeld, and Maciej Mrugala.**

The lead author of the report, Prof. Hans-Peter Kiem, said: "We found that patients were able to tolerate the chemotherapy better, and without negative side effects, after transplantation of the gene-modified stem cells than patients in previous studies who received the same type of chemotherapy without a transplant of gene-modified stem cells."

The researchers said that they have now treated a total of 7 patients and overall survival has remained improved to 20 months compared to an average survival of 12 months expected in GBM. One patient is still alive 60 months after treatment.

This work is ongoing in Professor Kiem's lab: E-mail: hkiem@fhcrc.org

New Residents, Up Close

Ariana Barkley

Ariana Barkley was born in Port of Spain, Trinidad and Tobago, but moved to Ontario, Canada as a toddler while her mother sought to lift her family above their circumstances and attained a PhD in organic chemistry. Halfway through high school her family moved again to Massachusetts. During the transition she home schooled both herself and younger sister for 5 months. Originally focused on playing college basketball, Ariana's priorities shifted to medicine after seeing her sister through a stay in the ICU for a progressive diabetic ketoacidosis. She enrolled at Johns Hopkins University majoring in Molecular Cellular Biology and Psychology with a minor in Philosophy, graduating Phi Beta Kappa.



Before enrolling at the University of Pennsylvania School of Medicine, Ariana took a year to work as a clinical assistant caring for severely autistic children with aggressive behavioral profiles. This experience sparked her fascination with neural pathology manifested as maladaptive behavior, and she cites her relationship with her patients' families as a means of grounding herself during medical school. Ariana's interest in neurosurgery began relatively late in medical school after an elective during her clerkship year. Her exposure aroused a desire to improve patients' functional outcomes, and she subsequently decided to explore neuroregenerative research as a means for developing neurosurgical tools to accomplish this goal.

She took a gap year during medical school and successfully applied for a research grant supplement from the National Institute of Neurological Disorders and Stroke. Ariana teamed up with a neurosurgery resident at the Center for Brain Injury and Repair to help tissue engineer elongated neuronal constructs to build biologic data cables as a tool for CNS functional repair. Manipulating them optogenetically while recording electrically, they created a binary code composed of neural action potentials. She hopes to continue research in neuroregenerative repair with the ultimate goal of creating a new subspecialty focused on delivering these therapies.

Ariana became vice president of the Langfitt Neurological Society at Penn, and built survival guides to help others interested in our specialty. In addition, Ariana is an avid athlete, a lover of the outdoors and animals. She was frequently the sole woman competing in Penn's annual medical school students vs faculty basketball games and, despite standing only 5'4, she is a fierce competitor in her medical school intramural volleyball team and annual Spartan Obstacle Course races. She loves to run with her five-year-old dog.

Sean Emerson



Sam Emerson was born in Charlottesville, VA, to two dangerously over-educated parents. His father earned a PhD in Materials Science and his mother an MD. After residency, she got a PhD in Physics. Their collective addiction to adding letters after their names took him all over the country while they gathered their various degrees, so that he and his four younger siblings were all born in different states. Ultimately they settled in California, where he attended the University of Southern California on an academic scholarship. Amidst the sunshine, smog and gridlock, he did research projects in neural prosthetics and ultimately earned his BS in Biomedical Engineering.

Proving that his parents' nerdiness is heritable, he then moved to Seattle to join the Medical Scientist Training Program at UW. Sam spent his laboratory years under the tutelage of Philip Horner in the department of Neurosurgery. He studied the differentiation of human induced pluripotent stem cells into neural lineages, and evaluated their efficacy in a rodent model of chronic cervical spinal cord injury. This work produced four publications (three as first-author) and a book chapter in *Youman's Neurological Surgery*.

In the Horner lab that he met a former Neurosurgery resident, Eric Peterson, who casually invited Sam to a New Year's Eve party at a friend's house. That friend was Shari Jackson, a neuroradiologist at Northwest Hospital. Sam was one of the first to arrive at her house that night in 2008 and has never left, making him one of the worst party guests on record. Ultimately, Shari accepted her fate and married the lout.

In his spare time, Sam enjoys CrossFit and photography. He also seems to have a predilection for reading the longest books he can find. After spending 49 years in the lab (a conservative estimate) and signing up for a 7-year residency, it's no surprise that he doesn't shy away from a task just because it's time-consuming. After finishing his PhD in 2012, Sam returned to medical school for the clinical years, during which he completed his sub-internship on the UW Neurosurgery service. They haven't been able to get rid of him either.

Jacob 'Jake' Ruzevick

Jacob 'Jake' Ruzevick joins the Department following completion of his medical school training at the Johns Hopkins University School of Medicine. Originally, from Coronado California, Jake was raised appreciating the California sun and loves any activity that allows him to venture outdoors: an avid runner, soccer player, and beach-goer.



His father, a former Navy pilot, flew both domestic and international routes for Northwest Airlines, now Delta Airlines, and is based in Seattle where he is a captain of Boeing 757 and 767 aircraft. His mother worked as a nurse practitioner in a local San Diego oncology office before spending 10 years with Genentech, from which she recently retired.

Jake's undergraduate education was at the Massachusetts Institute of Technology where he continued running, eventually competing in the 2010 NCAA cross-country national championships on a team that won two league titles. Academically, Jake developed an interest in the nervous system that eventually culminated in his majoring in brain & cognitive sciences and working in Dr. Ann Graybiel's lab studying the electrophysiology of rodent brain.

Following his four years at MIT, Jake went to Johns Hopkins medical school where he immediately immersed himself in the neurosurgery labs. After his second year of, he was awarded a Doris Duke Clinical Research Fellowship that gave him twelve months to study the mechanisms of action and efficacy of several immunotherapies against models of brain tumors. Having dedicated himself to a career in Neurosurgery, Jake is thrilled to be joining the Department of Neurosurgery at the University of Washington. While impressed by the departmental commitment to excellence in neurosurgical training, patient care, and research, he also looks forward to exploring the Pacific Northwest searching for the best running, cycling, and skiing spots to explore in his free time.

Four Years at the VA, and Ready to Move

There is some exciting news at the Seattle VA. Dr. Ellenbogen is going to add another neurosurgeon to the staff this summer. At the same time, one of the PAs, Mr. Bruce Williams-Burden, is going to retire after 40 years. Moreover, the neurosurgery offices on the 5th floor will be moved to the 7th floor as a part of an ongoing project of general hospital reconstruction.

Assistant Professor Mikhail Gelfenbeyn, MD, PhD, already has been at the VA for four years and it has never been so busy because of all these changes.

Starting four years ago with very limited OR block time, this has expanded to five full days a month. When the VA began to use the Northwest Hospital OR, another day was added there. Misha has also expanded the variety of procedures being done at the VA. He has added neuromonitoring and Stealth navigation available, enabling a broader ability to operate upon cranial tumors. Residents Rob Oxford, Ali Ravanpay and Michelle Choudhary have gone to the VA to assist on some of these bigger cases.

Dr. Gelfenbeyn, a native Russian speaker, has also become involved in International Podcasts for Neurosurgery.



Left to right: Mikhail Gelfenbeyn, Lee Sims, Bruce Williams-Burden, Paul Knopf

WSANS Annual Meeting

The Washington State Association of Neurological Surgeons offers membership to neurosurgeons and neurosurgical allied health professionals throughout the state. Its mission is to promote scientific, educational, and socioeconomic issues related to Neurological Surgery and the Neurosciences in the The Evergreen State.

The WSANS held its annual meeting this year at Suncadia Resort in Cle Elum. Highlights included Dr. Laligam Sekhar's thoughtful insights titled "Transitions in Neurosurgery," a journey that made him one of the most eminent neurosurgeons in the world. Dr. David Pitkethly discussed "Volunteerism in Neurosurgery," including his recent travel to bring neurosurgical care to the needy of Kenya. Dave was presented with the First Annual WSANS Lifetime Achievement award for his contributions to neurological surgery in our state. Dr. Dan Silbergeld gave an update on current recommendations for the treatment of Brain metastasis. And former resident and current Group Health attending Chong Lee gave an update on the Washington State Spine SCOAP.

To join the WSANS, go to: <http://wsans.org> and click on the membership tab. Belonging to the group gives you access to the annual meeting as well as a voice in our changing socioeconomic climate. Next years annual meeting will be announced shortly, so register early to confirm your spot!



Anthony Avellino is Leaving the Department of Neurological Surgery

Longtime Department mainstay in many roles, Prof. **Tony Avellino, MD, MBA** has announced that he will be leaving UW on August 17 of this year. Tony has accepted the Chief Executive Officer position of the OSF HealthCare System Neuroscience Service Line and Illinois Neurological Institute.

OSF HealthCare, owned and operated by The Sisters of the Third Order of St. Francis, Peoria, Illinois, includes nine hospitals and medical centers, one long-term care facility, and two colleges of nursing. Additionally, OSF Medical Group is a physician network consisting of more than 600 primary care, specialist physicians, and advanced practice providers. This opportunity proved too good for Dr. Avellino to pass up.

Tony was born in the Bronx, and you can still tell that. In 1988, he received his B.S. in Microbiology and Biochemistry from Cornell University, and four years later he graduated from Columbia University College of Physicians & Surgeons. He was a resident in neurological surgery at UW, and also a fellow both in complex spine and pediatric neurosurgery here. More recently, he completed a Certificate Program in Medical Management at the UW Department of Health Services, and in 2008 earned an M.B.A. from The George Washington University School of Business.

Dr. Avellino has been instrumental in clinical care, resident education, and the administration of our department. He has been the Chief of Neurosurgery at Seattle Children's Hospital and the department's Residency Training Director. For the past 3 years, he has been the Chief of Neurological Surgery at UWMC.

For over five years, he served as the founding Director of the UW Medicine Neurosciences Institute, a position that required organizing cooperation among the leadership from all the clinical neurosciences departments. These UW Medicine entities included the Medical Centers, community hospitals, UWP, Airlift Northwest and the SCCA. He was the driving force behind the telestroke partnership program, the recent launch of the UW Medicine Multiple Sclerosis clinic at Northwest Hospital, the implementation of the UW Medicine Memory and Brain Wellness Center and UW Medicine Adult Autism Clinic, and opening of the "Patients are First" multi-disciplinary pituitary brain tumor clinic at HMC.

As Chairman Rich Ellenbogen wrote when he broke the news, "Tony's departure is a loss for UW Medicine, our department and me personally. [His] last day with the department will be in August, giving us plenty of time to congratulate him and celebrate his work and accomplishments at the UW. Although it is bittersweet, please join me congratulating and in wishing Tony success and happiness as he takes this next step in his career."

We are losing a wonderful colleague, an excellent clinician and surgeon, a fine teacher, and a dear friend to us all.

UW Department of Neurological Surgery Celebrates the Career and Achievements of Dr. George A. Ojemann



As part of the celebration, we will be hosting a day of scientific talks.

Dr. Richard G. Ellenbogen, Chairman, would like to invite you to attend this day-long commemoration.

Date:

Friday, September 26, 2014

Where:

UW South Lake Union
850 Republican Street, Seattle, WA 98109
Orin Smith Auditorium

Schedule:

7:30 - 8:00 am: Continental Breakfast Served
8:00 - 3:30 pm - 20 minute talks by guest lecturers
12:00- 1:00 pm: Light Catered lunch
4:00 - 6:00 pm: Reception

Dr. Chang Welcomes Twins

On Tuesday, June 3rd, Chief Resident Jason Chang and his wife, NCCU nurse Katey (Boyd) Chang, became the parents of fraternal twins, **Henry and Maylee**. Mother and babies are doing well, and Dr. Chang is both relieved and ecstatic. Grandparents are on the way to celebrate the graduation and help them all get ready for the move to St. Louis.



Neurohospitalist Team Welcomes Ben Diaz

Chris and Amy Diaz are excited to announce the birth of their sweet baby boy: **Benjamin Cruz Diaz** born on Tuesday June 10th, 2014 after many hours of labor. Benjamin was delivered at 8:45 pm. He weighed in at 8lbs 4.5 oz, and measured 19 inches. He has been gaining weight and doing many cute baby things like smiling in his sleep, munching on his fingers and inquisitively looking around at his new world.

Puzzler



Dr. Minku Chowdhary
Chief, Neurosurgery
Overlake Hospital



Puzzler: What is the common condition that links a concept discovered by Watson and Crick with the work of one of the most famous psychoanalysts?

Previous Puzzler: What was the original occupation of the handyman who indirectly inspired Dr. Ivan Pavlov to famously state that classical conditioning could make a dog salivate on cue?

Answer: Fur Trader

Congratulations to Kate Amlie-Lefond, Associate Professor of Neurology, Seattle Children's Hospital for getting the correct answer!

<http://news.yahoo.com/man-hole-stomach-revolutionized-medicine-131912890.html>

We remain eager to publish stories and photos about all aspects and activities of the Department. Please share your memories, ideas and suggestions for stories and news items that expand our common ground. Please contact us at these email addresses:

Editor-in-Chief

Editor

Associate Editor

Director

Publications Specialist

Richard G. Ellenbogen, M.D.

Richard Rapport, M.D.

James Pridgeon, MHA

Jana Pettit, MBA

Christina Buckman

rge@uw.edu

rapport@uw.edu

pridgeon@uw.edu

jmpettit@uw.edu

cbuckman@uw.edu



We invite you to visit our Facebook page at [facebook.com/uwneurosurgery](https://www.facebook.com/uwneurosurgery).
Share a story, tell us about your experience.
We'd love to hear from you!



New! The UW Department of Neurological Surgery now has a Twitter and YouTube page.

Follow us. You'll be glad you did.

<https://twitter.com/UWNeurosurgery>

<https://www.youtube.com/UWNeurosurgery>