University of Pittsburgh
Department of Neurological Surgery
2020 Annual Report

This Is Who We Are
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Introduction

This Is Who We Are

In these pages last year, I wrote about ‘what we do.’ I wrote about how our physicians, researchers and staff provide hope and expert, personalized care. I wrote about how we accept the unique challenges of every patient case that is brought before us and how we work to provide a pathway to returning these ‘lives’ to as normal a lifestyle as quickly and as efficiently as possible.

I wrote about how our physicians and scientists—with ingenuity and cutting-edge research—advance neurosurgical care and basic neurosciences. Drawing on our unique and wide-ranging areas of subspecialized expertise, we proudly provide a comprehensive scope of unparalleled neurosurgical care—from the basic to the most complex—for patients in western Pennsylvania and for patients throughout the nation and around the globe. This dedication to personalized and innovative care is woven into the essence of the fabric of our roles as health care providers and innovators.

This is what we do.

More than ever before this dedication was borne out this past year as we all dealt with the unique challenges of working in a COVID-19 world. Isolation, restrictions and uncertainty were new variables that we all needed to deal with.

I’m proud to say our physicians, researchers and staff answered the challenge with remarkable dedication, skill and creativity. Patient care remained a top priority during this most challenging time. As most businesses understandably curtailed operations, our staff continued to find ways to provide expert care in a most uncertain world. We continued to provide hope.

This is who we are.

From the nurses and staff in our clinics, to the physicians developing personalized care plans, to the support personnel in the operating room, we continued our roles as health care providers with a dedicated spirit.

Urban legend has it that an eastern European immigrant couple approached Ronald Reagan after he left his presidency and thanked him for helping bring down the Berlin Wall. Reagan’s response was simply, “Just doing my job ma’am.” In the same sense, we are simply—and proudly—doing our jobs.

This is who we are.

We will continue to strive to move forward in advancing health care for our patients. As the 200+ pages of this report make abundantly clear, our physicians are leaders in their field, pioneering advances in health care, training neurosurgeons of tomorrow and researching innovative new strategies to make neurosurgical care more precise, efficient and beneficial to the lives we deal with every day.

As we move forward, our unifying mission is to provide state-of-the-art care today and to continue to serve as the epicenter for neurosurgical innovation. We are proud of our past, committed to providing the very best care today, and eager to carry the University of Pittsburgh and UPMC spirit of progress to even higher levels tomorrow.

This is who we are.
Faculty and Residents

Faculty

**Full-Time Faculty**

- **Chairman and Professor:**
  Robert M. Friedlander, MD, MA

- **Professors:**
  C. Edward Dixon, PhD  
  (Vice Chairman, Research)
  Paul A. Gardner, MD  
  (Executive Vice Chairman, Surgical Services)
  Peter C. Gerszten, MD, MPH  
  (Vice Chairman, Quality Improvement)
  Jorge A. Gonzalez-Martinez, MD, PhD  
  L. Dade Lunsford, MD
  John J. Moossy, MD
  Ajay Niranjan, MD, MBA
  David O. Okonkwo, MD, PhD  
  (Executive Vice Chairman, Clinic Operations)
  Ian F. Pollack, MD  
  (Vice Chairman, Academic Affairs)
  Mingui Sun, PhD

- **Associate Professors:**
  Jeffrey Balzer, PhD
  Donald J. Crammond, PhD
  Avniel Ghuman, PhD
  Stephanie Greene, MD
  D. Kojo Hamilton, MD
  Adam S. Kanter, MD
  Raymond Sekula Jr, MD, MBA  
  (Vice Chairman, UPMC Central Pa.)
  Nilkantha Sen, PhD
  Parthasarathy D. Thirumala, MD
  Elizabeth Tyler-Kabara, MD, PhD  
  (Left department February 2020)

- **Assistant Professors:**
  Taylor Abel, MD
  Sameer Agnihotri, PhD
  Nduka Amankulor, MD
  Katherine M. Anetakis, MD
  Marco Capogrosso, PhD
  Diane L. Carlisle, PhD
  Bradley Gross, MD

2020 faculty and residents.
Faculty and Residents

Faculty

Luke C. Henry, PhD
Baoli Hu, PhD
Gary Kohanbash, MD
Michael J. Lang, MD
Edward A. Monaco III, MD, PhD
   (Left department June 2020)
Ava Puccio, PhD, RN
Fang-Cheng (Frank) Yeh, MD, PhD
Georgios Zenonos, MD
Pascal O. Zinn, MD, PhD

• Clinical Professors:
  Matt El-Kadi, MD, PhD
   (Vice Chairman, UPMC Passavant)
Joseph C. Maroon, MD
Daniel A. Wecht, MD, MSc
David S. Zorub, MD

• Clinical Associate Professors:
  Vincent J. Miele, MD
  Michael J. Rutigliano, MD, MBA

• Clinical Assistant Professors:
  Robert L. Bailey, MD
  J. Brad Bellotte, MD
  Gregory N. Bowden, MD
   [Left department July 2019]
  Salem El-Zuway, MD
  Chikezie I. Eseonu, MD
  David L. Kaufmann, MD
  Eva F. Pamias-Portalatin, MD
  Rodwan K. Rajjoub, MD
  Robert J. Schlegel Jr, MD

• Research Associate Professors:
  Yue-Fang Chang, PhD
  Hideyuki Kano, MD, PhD

• Research Assistant Professors:
  Shaun W. Carlson, PhD
  Wendy Fellows-Mayle, PhD
  Esther Jane, PhD
  Daniel Premkumar, PhD
  Tanusree Sen, PhD

• Clinical Instructors:
  Jeff Bost, PA-C
   (Retired August 2019)
  Erin Thomson, PA-C

• Research Instructors:
  Daniela Leronn, PhD
  Witold Lipski, PhD

• Physician Assistants:
  Alicia Bergell, PA-C
  Jennifer Blumling, CRNP
  Lauren Carroll, MPAS, PA-C
  Danielle Corson, MMS, PA-C
  Anne Cully, MPAS, PA-C
  Komal Eubanks, DNP, CRNP
  Van Fagert, CRNP
  Courtney Gargasz, MPAS, PA-C
  Nicole Gray, PA-C
  Emily Guerriero, MPAS, PA-C
  Chrisanne Hennicke, MPAS, PA-C
  Danielle Hudak, PA-C
  Alexis Kimes, PA-C
  Sarah Kwiatkowski, CRNP
  Anneline Lauziere, PA-C
  Kathleen Mannion, PA-C
  Lawrence Marcello, PA-C
  Maggie Marcus, PA-C
  Hope Maromonte, MPAS, PA-C
  Sally McGinley, PA-C
  Kristin Mellon, MPAS, PA-C
  Jessica Nguyen, MPAS, PA-C
  Angela Petrosky, MPAS, PA-C
  Rachel Rogers, MPAS, PA-C
  Suzan Semroc, PA-C
  Edward Shaffer, PA-C
  Alyssa Simon, PA-C
  Svetlana Trofimova, MPAS, PA-C

• Physician Assistants:
  Alicia Bergell, PA-C
  Jennifer Blumling, CRNP
  Lauren Carroll, MPAS, PA-C
  Danielle Corson, MMS, PA-C
  Anne Cully, MPAS, PA-C
  Komal Eubanks, DNP, CRNP
  Van Fagert, CRNP
  Courtney Gargasz, MPAS, PA-C
  Nicole Gray, PA-C
  Emily Guerriero, MPAS, PA-C
  Chrisanne Hennicke, MPAS, PA-C
  Danielle Hudak, PA-C
  Alexis Kimes, PA-C
  Sarah Kwiatkowski, CRNP
  Anneline Lauziere, PA-C
  Kathleen Mannion, PA-C
  Lawrence Marcello, PA-C
  Maggie Marcus, PA-C
  Hope Maromonte, MPAS, PA-C
  Sally McGinley, PA-C
  Kristin Mellon, MPAS, PA-C
  Jessica Nguyen, MPAS, PA-C
  Angela Petrosky, MPAS, PA-C
  Rachel Rogers, MPAS, PA-C
  Suzan Semroc, PA-C
  Edward Shaffer, PA-C
  Alyssa Simon, PA-C
  Svetlana Trofimova, MPAS, PA-C
Faculty and Residents

Residents

Chief Residents
Amir H. Faraji, MD, PhD
Medical School: Pittsburgh
Undergraduate School: Florida
Hometown: Clearwater, Fla.

Ezequiel Goldschmidt, MD, PhD
Medical School: Buenos Aires University
Undergraduate School: Buenos Aires University
Hometown: Buenos Aires, Argentina

David J. Salvetti, MD
Medical School: Virginia
Undergraduate School: Vanderbilt

Benjamin M. Zussman, MD
Medical School: Jefferson Medical College
Undergraduate School: Haverford
Hometown: Pittsburgh, Pa.

PGY-6
Nitin Agarwal, MD
Medical School: Rutgers
Undergraduate School: College of New Jersey
Hometown: Flemington, N.J.

Michael McDowell, MD
Med School: Columbia
Undergraduate School: Arizona State

Jeremy Stone, MD
Medical School: Hawaii
Undergraduate School: Case Western Reserve
Hometown: Kaneohe, Hawaii

Daniel Tonetti, MD
Medical School: Pittsburgh
Undergraduate School: Drexel
Hometown: Keedysville, Md.

2020 chief residents Amir Faraji, David Salvetti, Ezequiel Goldschmidt and Benjamin Zussman.
Faculty and Residents

Residents

PGY-5
Nima Alan, MD
Medical School: Case Western
Undergraduate School: British Columbia
Hometown: Vancouver, B.C.

Enyinna Nwachuku, MD
Med School: Pittsburgh
Undergraduate School: Pittsburgh

Alp Ozinpar, MD
Medical School: Oregon
Undergraduate School: California
Hometown: Istanbul, Turkey

Matthew Pease, MD
Medical School: Keck/U.S.C.
Undergraduate School: Duke

PGY-4
Hanna Algattas, MD
Medical School: Rochester
Undergraduate School: Colgate
Hometown: Syracuse, N.Y.

Edward Andrews, MD
Med School: Thomas Jefferson
Undergraduate School: Pennsylvania

Kamil Nowicki, MD, PhD
Medical School: Florida
Undergraduate School: Florida
Hometown: Gainesville, Fla.

Xiaoran Zhang, MD
Medical School: Pittsburgh
Undergraduate School: UCLA
Hometown: Luoyang, China

PGY-3
David Fernandes Cabral, MD
Medical School: Central de Venezuela
Undergraduate School: None
Hometown: Caracas, Venezuela

Zachary C. Gersey, MD
Medical School: Miami
Undergraduate School: Florida
Hometown: Rochester, N.Y.

PGY-2
Hussam Abou-Al-Shaar, MD
Medical School: Alfaisal University
Undergraduate School: None
Hometown: Damascus, Syria

Daryl Fields II, MD, PhD
Medical School: Wisconsin, Madison
Undergraduate School: St. John’s (Minn.)
Hometown: New Hope, Minn.

Arka N. Mallela, MD
Medical School: Pennsylvania
Undergraduate School: Pennsylvania

Gautam Nayar, MD
Medical School: Duke
Undergraduate School: Florida
Hometown: Pittsburgh, Pa.

PGY-1
Ali Alattar, MD
Medical School: California, San Diego
Undergraduate School: Portland State
Hometown: Portland, Ore.

Hansen Deng, MD
Medical School: California, San Francisco
Undergraduate School: California, Berkeley
Hometown: San Francisco, Calif.

Joseph Scott Hudson, MD
Medical School: Iowa
Undergraduate School: Iowa
Hometown: Waterloo, Iowa

Andrew Legarreta, MD
Medical School: Duke
Undergraduate School: Vanderbilt
Hometown: Buffalo, N.Y.
Each year the department hosts the Stuart Rowe Society Lectureship and Research Day, a special day intended to showcase research activities in the field of neurological surgery.

The day is held in honor of Stuart Niles Rowe, widely considered the founding figure of neurosurgery training in Pittsburgh. In 1936, Rowe established the base of what would later become the University of Pittsburgh Department of Neurological Surgery.

During this special day, a series of talks are presented by department residents, each spotlighting a topical research issue relevant in the field of neurosurgery. These talks are followed by discussion, moderated by a prominent visiting professor. The October 2019 guest lecturer was Mika Niemelä, MD, PhD, professor and chair of neurosurgery at Helsinki University Hospital.

Past Stuart Rowe Lecturers

2018
Michael Taylor, MD
University of Toronto

2017
Murat Gunel, MD
Yale University

2016
Andres Lozano, MD, PhD
University of Toronto

2015
Robert E. Harbaugh, MD
Milton S. Hershey Medical Center

2014
Robert L. Martuza, MD
Harvard Medical School

2013
Chris Shaffrey, MD
University of Virginia

2012
James Rutka, MD
University of Toronto

2011
Henry Brem, MD
Johns Hopkins University

2010
Ralph G. Dacey, Jr., MD
Washington University

2009
Edward H. Oldfield, MD
University of Virginia

2008
Patrick J. Kelly, MD
New York University

2007
John A. Jane, Sr, MD, PhD
University of Virginia

2006
M. Sean Grady, MD
University of Pennsylvania

2005
Gary Steinberg, MD, PhD
Stanford University

Mika Niemelä, MD, PhD
The Peter J. Jannetta Lecture is held annually, focusing on innovations in the field of neurosurgery.

The lecture is held in honor of the former chairman of the University of Pittsburgh Department of Neurological Surgery, who was internationally acclaimed for his development of microvascular decompression (MVD), an innovative procedure that moved blood vessels away from the trigeminal nerve, alleviating chronic pain and spasms in facial muscles. The innovative procedure became commonly known as the 'Jannetta Procedure' around the world and brought relief to thousands.

The annual Jannetta Lecture follows the highly successful Jannetta Symposium that was held in Pittsburgh in April of 2017. Unfortunately, the April 2020 lecture was canceled due to COVID-19 concerns.

**Past Jannetta Lecturers**

2019
Elad Levy, MD  
University of Buffalo

2018
Daniel Resnick, MD  
University of Wisconsin
Department Overview

History
Neurological surgery in Pittsburgh began in 1936 with the arrival of Stuart Niles Rowe, MD, a promising young surgeon trained under the auspices of Charles M. Frazier in Philadelphia. Rowe’s arrival marked the birth of a dedicated neurosurgical division that would become a leader in the field. His move here was prompted by a letter from L.H. Landon, Sr., MD, the chief of general surgery at West Penn Hospital, emphasizing the need for a formally trained neurosurgeon in Pittsburgh. It is said that Rowe won a coin toss over William J. Gardner for the opportunity to migrate to the Pittsburgh area and set up practice. Gardner subsequently moved to the Cleveland area and developed his own neurosurgical center.

Rowe, a Michigan native, developed a strong clinical practice based on the loosely affiliated community hospitals in the Pittsburgh area. He focused his research activities at the University of Pittsburgh and wrote several pioneering papers on the neurosurgical treatment of pain, brain abscess and cerebral trauma. An avid sportsman and devoted father, he dedicated at least one day a week to physical fitness and family life. Rowe began the first formal residency program at West Penn Hospital in 1949 and consolidated this program at Presbyterian University Hospital within the University of Pittsburgh in 1952. Another program was also established at Mercy Hospital in 1949 under the direction of Floyd Bragden, MD, who arrived in Pittsburgh three years after Rowe. Dr. Bragden, trained by Jefferson Browder at Kings County Hospital in New York, was a Pittsburgh native and a well-known acoustic tumor surgeon.

The first woman to practice neurosurgery in the area was Dorothy Klinke Nash, MD. Having completed training in both neurology and neurosurgery at Bellevue Hospital under the guidance of Byron Stookey in the late 1920s, Nash moved to the Pittsburgh area in 1936 but did not gain hospital appointment until a chance meeting with Morris Abel Slocum, MD, the chief of general surgery at St. Margaret Hospital. At the time, Nash worked at the blood bank. While drawing Slocum’s blood, he determined Nash’s background in neurosurgery and immediately appointed her to a staff position. This appointment was a landmark in that she became the first woman to practice neurosurgery in the United States and, thereby, pioneered the way for other women in the field. Shortly thereafter, she was appointed to the hospital staff at the university under Rowe. A graduate of Bryn Mawr College and the Columbia College of Physicians and Surgeons, Nash was named Pennsylvania Woman of the Year in 1957.

Rowe volunteered for military service in World War II, served as an Army lieutenant colonel, and treated casualties triaged to a southern England military hospital. Upon return to Pittsburgh at the end of the war, he resumed control of the neurosurgery service at the university, which was then a division of General Surgery. Rowe embarked on a mission to unify the service, which performed operations at many local hospitals. He also began to train residents.

His own training firmly based in academic neurosurgery, Rowe sought to acquire residents with a commitment to research, teaching and independent thought. The conference schedule included joint conferences with the Mercy Hospital neurosurgical program and a monthly journal club that convened after a dinner at Rowe’s home.

Anthony Fredrick Susen, MD, joined the university in 1953 as a clinical instructor after completing his training at both Bowman Gray Medical School and Harvard. The Illinois native graduated from Dartmouth College and Harvard Medical School. Susen held the same belief as Rowe: that residency training programs should be designed to teach not only exceptional surgical technique, but also the critical clinical decision-making skills. Susen supported Rowe’s beliefs in training residents and emphasized the need for thorough literature review and independent research as a means of broadening clinical knowledge.
Rowe and Susen worked together into the 1960s. In 1964, Henry Bahnson, MD, the chair of General Surgery, appointed Sidney Goldring, MD, of St. Louis to be the first chief of the Division of Neurological Surgery. After two years, Dr. Goldring returned to St. Louis as a professor of neurosurgery and subsequently was named chairman at Washington University. In 1966, Susen was named acting chief and, under his direction, other facilities including Children’s Hospital and the Veterans Administration Medical Center, became part of the service.

In 1971, Peter Joseph Jannetta, MD, was appointed professor and chairman of the newly formed Department of Neurological Surgery and served in the post for 25 years. Dr. Jannetta is universally known for his work in the treatment of cranial nerve disorders, developing a microvascular decompression procedure—widely known as the Jannetta Procedure—that offers trigeminal neuralgia patients an effective therapeutic alternative when medications fail. Although Dr. Jannetta’s scientific and leadership contributions are significant, perhaps his greatest achievement is the legacy of outstanding international leaders he trained in neurosurgery. During his tenure, he trained 49 residents—including four future department chairmen—and was honored with an endowed professorship, appropriately named after Walter E. Dandy—considered one of the founding fathers of neurosurgery. In June of 2000, Dr. Jannetta retired from the University of Pittsburgh and, subsequently, took a position with Allegheny General Hospital.

In 1997, L. Dade Lunsford, MD, was selected as the second department chairman. In the ensuing decade, Dr. Lunsford guided the department to an elite position in the academic community. Under his guidance, the department established itself as one of the top academic neurosurgical departments in the country—continuing Dr. Jannetta’s tradition of training strong, well-rounded residents—and developed into one of the most extensive neurological research programs in the nation. Dr. Lunsford also established the department as one of the leading stereotactic radiosurgical programs in the world. In 1987, he was responsible for bringing the Gamma Knife to the University of Pittsburgh, the first center in the United States to offer this state-of-the-art, minimally invasive form of brain surgery. The university now has three such devices and is a world leader in Gamma Knife treatment and education, having treated more than 15,200 patients.

In June of 2006, Dr. Lunsford announced his decision to step down as department chair in order to devote more time to his clinical work, clinical investigation, and resident and fellow training. University of Pittsburgh School of Medicine dean, Arthur S. Levine, MD, appointed Amin Kassam, MD, co-director of the department’s minimally invasive program, interim chair of the department. Dr. Kassam was subsequently appointed chairman by Dr. Levine in May of 2007. In June of 2009, Dr. Kassam resigned as chairman.

On June 1, 2010, Robert M. Friedlander, MD, a noted cerebrovascular and neuro-oncologic surgeon, became the fourth chair in the department’s history. Dr. Friedlander carved a prominent career as a clinician and scientist at Harvard Medical School and Women’s Hospital in Boston before coming to Pittsburgh. His strong leadership in both clinical and research areas has further established the University of Pittsburgh Department of Neurological Surgery as a world-leader in the academic neurosurgical field.

In June of 2011, the University of Pittsburgh Department of Neurological Surgery residency program was ranked as the most productive residency program in the nation in terms of graduates remaining and contributing in academic neurosurgery, according to a study published online in the *Journal of Neurosurgery*.

The study’s authors sought to determine those programs that produce a high number of graduates remaining within academic programs and the contribution of these graduates to...
academic neurosurgery. In the study, 97 academic neurosurgery departments with 986 faculty members were analyzed. All data regarding training program and medical school education were compiled and analyzed according to the center from which each faculty member graduated. The neurosurgery training program at the University of Pittsburgh produced the highest number of academic neurosurgeons in this sample.

In another similar study published in the Journal of Neurosurgery in 2015, the department ranked among the top five neurosurgical residency programs in the country in terms of academic publishing output of faculty. In this comprehensive, five-year study, researchers used bibliometrics—the statistical analysis of written publications—to calculate the objective impact of academic papers. The results showed that the University of Pittsburgh Department of Neurological Surgery had the third highest score of 103 neurological surgery residency programs across the United States for papers published by its faculty from 2009 through 2013.

Goals/Mission
The Department of Neurological Surgery at the University of Pittsburgh began more than 75 years ago with a commitment to patient care, education and research. Today these goals are still paramount in our pursuit of excellence: first, to provide outstanding care to patients with neurological disease; second, to equip neurosurgeons of the future with state-of-the-art techniques and analytical skills to lead the field of neurosurgery; and third, to foster research designed to enhance the treatment of diverse diseases affecting the nervous system. Although the faculty has had a wide variety of interests over the years, their unity of vision has been remarkable in this regard.

Organization
The main offices of the Department of Neurological Surgery at the University of Pittsburgh are housed on the fourth floor of UPMC Presbyterian. The 2019-20 full-time faculty includes 11 professors, 10 associate professors and 16 assistant professors. In addition, there are 17 clinical faculty, nine research faculty and 28 residents at various levels of training. The support staff includes more than 200 physician assistants, clinical coordinators, administrative assistants, nurses, technicians and other personnel.

The department has created a unique environment where “centers of excellence and focused programs” flourish. In this model, neurosurgical subspecialists devote time to research and patient care in focused programs. The use of centers of excellence has strengthened neurosurgery at the University of Pittsburgh and facilitated attainment of our mission.

• Brain and Spine Injury Program
The Brain and Spine Injury Program consists of a number of programs developed to better understand and treat the problems associated with traumatic injury to the central nervous system, brain and spinal cord, in both adults and children.

The department’s adult clinical neurotrauma division, led by David Okonkwo, MD, PhD, remains a world leader in the treatment of and research into traumatic brain injury. The neurotrauma service works closely with integral colleagues from the Trauma Division, Critical Care Medicine, Neuropathology, Neuroradiology, and Physical Medicine and Rehabilitation to provide the most sophisticated treatments available for TBI patients.

The department collaborates with investigators worldwide to advance the evaluation, treatment and outcomes of patients suffering traumatic injuries of the spinal column and spinal cord. The Neurotrauma Clinical Trials Center (NGTC) provides the infrastructure necessary to carry out the large number of active research protocols ongoing within the program. Recent trials launched include the first stem cell trial for chronic spinal cord injury to be conducted in Pennsylvania.

A complete faculty list is available on page 6.

A complete resident list is available on page 8.
Department Overview

Clinical efforts in traumatic brain injury are conducted in collaboration with research carried out through the Brain Trauma Research Center (BTRC) under the direction of C. Edward Dixon, PhD. Research conducted both at the center and at other brain injury research programs clearly demonstrates the potential for improving outcome using therapies designed to treat biochemical derangements that occur following impact to the brain. The BTRC has pioneered efforts using temperature manipulation and cerebral blood flow monitoring in the treatment of severe head injury and has conducted landmark investigations into the mechanisms of induction and recovery of head trauma and secondary injury.

The focus of the Sen Brain Trauma Laboratory, directed by Nilkantha Sen, PhD, at the University of Pittsburgh Department of Neurological Surgery is to elucidate the underlying molecular and cellular mechanisms responsible for numerous secondary mechanisms associated with traumatic brain injury (TBI) which leads to cognitive dysfunction and other long-term post-traumatic disorders including anxiety, depression and visual impairments. Tanusree Sen, PhD, is studying the influence of oncogenic transcription factors on the TBI-pathology; regulation of immune response and its influence on cognitive dysfunction following TBI; studying the role of resident microbial cells on TBI-pathology.

- Cerebrovascular Neurosurgery Center
The Comprehensive Center for Cerebrovascular Neurosurgery at the University of Pittsburgh Medical Center is a subspecialized multidisciplinary clinical unit that evaluates and treats all forms of vascular disorders of the brain and spinal cord. Given the high volume of cases managed by the center, it serves as a national and international resource for the management of patients with complex cerebrovascular disease, including aneurysms, arteriovenous malformations (AVMs), arteriovenous fistulas (AVFs), carotid disease, Moya-Moya, and cavernous malformations. With a group of highly subspecialized physicians, center faculty prospectively assess patients and provide broad state-of-the-art treatment options. Since cerebrovascular disease can often be treated using a spectrum of complementary techniques, experts evaluate cases and provide recommendations with the goal of minimizing risks and maximizing long-term efficacy.

The center is directed by department chairman Robert M. Friedlander, MD. Other members of our team include Bradley Gross, MD, Paul A. Gardner, MD, Michael J. Lang, MD, Daniel A. Wecht, MD, and Georgios Zenonos, MD.

Challenging cases are reviewed prospectively in our weekly multidisciplinary cerebrovascular conference. All the key subspecialists are represented and discuss the individual features of each case. Individual consideration is given to each patient to tailor the most effective therapy taking into consideration a number of important features including patient age, overall health status, and specific anatomical consideration of their vascular abnormality.

The Cerebrovascular Neurosurgery Center works in close collaboration with the UPMC Stroke Institute—staffed by neurologists with additional training in vascular neurology.

- Center for Clinical Neurophysiology
The Center for Clinical Neurophysiology (CCN) at UPMC was organized in 1981 to serve as an interdepartmental resource serving then-Presbyterian University Hospital, Montefiore Hospital and Children’s Hospital of Pittsburgh. At that time, the CCN was composed of just a few clinicians providing diagnostic testing and intraoperative neurophysiological monitoring (IONM) services for only very specific surgeries in the neurosurgical and orthopedic disciplines.
Department Overview

The service has now grown to providing more than 7,000 IONM cases per year at all UPMC pavilions, as well as supporting UPP surgeons at non-UPMC hospitals. The use of IONM at UPMC reaches across many surgical disciplines and has proven to be an invaluable adjunct not only in adult and pediatric neurosurgical procedures but also in orthopedic, ENT, vascular, cardiothoracic and interventional neurological procedures.

The CCN and its highly trained and nationally renowned faculty and technical staff’s primary goal is to provide high-quality service in a cost-efficient manner to the UPMC patient population. The center focuses on interdisciplinary research to improve the understanding and the value of IONM to predict and prevent nerve injury. In addition, CCN faculty have established an IONM course and training program at Carlow University. The first undergraduates in this program, graduated in May of 2020.

Parthasarathy Thirumala, MD, is director of the CCN and is joined by Jeffrey Balzer, PhD; Donald Crammond, PhD; and Katherine Anetakis, MD.

The CCN is the largest and busiest academic IONM program in the country, offering and providing services at all UPMC hospitals including UPMC Hamot, Horizon, Altoona, Somerset and Susquehanna. In addition, the CCN provides professional and technical services at Armstrong Regional Health System, Excela Health System and Indiana Regional Hospital. The CCN faculty is able to achieve this service expansion to community hospitals through the use of telemedicine technology. Patients in community hospitals, more than 100 miles away, can receive the same quality care without having to travel to Pittsburgh.

Intraoperative multimodality monitoring at UPMC includes expertise in somatosensory evoked potentials (SSEP), brainstem auditory evoked potentials (BAEP), transcranial motor evoked potentials (TcMEP), direct cortical motor evoked potentials (dCMEP) electroencephalography (EEG) and electromyography (EMG). Direct peripheral nerve recordings (CNAP and CMAP) are also are performed, as well as single unit micro-electrode recordings (MER) and macrostimulation performed for subcortical mapping during placement of DBS electrodes in various subcortical structures. EEG is used to monitor cerebral function and ischemic risk during cerebral and peripheral vascular procedures, including cerebral aneurysm treatment, carotid endarterectomy and a variety of cardiothoracic procedures.

EEG recorded directly from the pial surface of the brain, or electrocorticography (ECoG), is used to help determine resection margins in epilepsy surgery, and to monitor for seizures during direct electrical stimulation of the brain surface carried out while mapping eloquent cortex in awake patients. In addition to providing IONM services, the CCN also performs diagnostic evoked potential testing, and transcranial Doppler studies.

The CCN is proud to provide a high-quality, high value service at a significantly low cost to patients, which it is able to achieve by constantly evaluating and improving clinical services through its various research initiatives and quality improvement programs. The center’s cutting-edge research efforts—represented by multiple, peer-reviewed publications in high quality journals each year—have demonstrated the value of the application of multimodality intraoperative neurophysiological monitoring to improved patient safety during various peripheral and central nervous system operative procedures.
• Complex Brain Surgery Program
The Complex Brain Surgery Program, under the direction of department chairman Robert Friedlander, MD, is devoted to the surgical treatment of lesions and tumors located in deep, eloquent or difficult-to-reach regions of the brain. The goal of the program is to provide gentle, accurate, and safe surgery for the most complex lesions and locations, often regarded as inaccessible or high-risk.

This program has its foundation on a precise and meticulous knowledge of microsurgical neuroanatomy and neurosurgical approaches, and is built upon extensive surgical experience at UPMC, and intense microsurgical learning and research conducted at the Surgical Neuroanatomy Lab and the Fiber Tractography Lab at the University of Pittsburgh.

Areas of surgical expertise include intrinsic tumors in eloquent brain areas and deep white matter, limbic/paralimbic tumors (insula, medial temporal lobe, cingulum), intraventricular and thalamic lesions, pineal and posterior tentorial incisura tumors, cerebellar and brainstem lesions.

A unique feature of this program is the application of sophisticated presurgical planning techniques, such as surgical simulation with crafted anatomical specimens and High-Definition Fiber Tractography (HDFT), to carefully develop the most effective and less invasive operative plan.

HDFT is an advanced MRI-based non-invasive imaging technique, pioneered by Dr. Friedlander, to study the three-dimensional structure of the fiber tracts of patients with intrinsic brain lesions. HDFT provides a superior presurgical evaluation of the fiber tracts for patients with complex brain lesions, including benign, low grade, and high grade tumors. The combination of HDFT with accurate neuroanatomical knowledge of the white matter tracts is the key to design the less invasive trajectory into a target lesion, and apply more effectively intraoperative electrical mapping techniques for maximal and safe tumor resection in eloquent cortical and subcortical regions.

• Center for Cranial Base Surgery
Cranial base surgery has a long tradition at the University of Pittsburgh. The UPMC Center for Cranial Base Surgery—under the current direction of Paul Gardner, MD, and Georgios Zenonos, MD, in the Department of Neurological Surgery and Carl Snyderman, MD, MBA, in the Department of Otolaryngology—is the first skull base center to be established in North America and has pioneered both transcranial microscopic and endoscopic endonasal approaches to the skull base and brain. Together with Eric Wang, MD, in the Department of Otolaryngology they continue to advance the field through new approach development and refinement as well as molecular strategies for treating skull base disease. They also work in regular collaboration with L. Dade Lunsford, MD, who established the first Gamma Knife center in North America at UPMC in 1987, and was also the first to introduce radiosurgery for the non-operative treatment of skull base tumors.

Experts at the UPMC Center for Cranial Base Surgery continue to lead the field of minimally invasive brain surgery by developing new techniques, tools and approaches that have made it possible to access many tumors, regardless of size. Since 1997, more than 3,900 endonasal surgeries have been performed in adults and children, making UPMC one of the busiest centers in the world for the surgical treatment of tumors of the pituitary region and cranial base. By combining this innovative approach with other minimally invasive approaches, such as transorbital and endoscopic-assisted retromastoid and keyhole approaches, as well as the full complement of standard skull base approaches, the team at UPMC provides a full array
Department Overview

of options for cutting-edge treatment of skull base disease. In addition, the Center for Cranial Base Surgery is being designated a Center of Excellence for pituitary tumors by UPMC.

Drs. Gardner, Snyderman, Zenonos and Wang, along with Tonya Stefko, MD, from the Department of Ophthalmology, and Barry Hirsch, MD, and Andrew McCall, MD, otologic surgeons from the Department of Otolaryngology, comprise a team of experts in cranial base surgery, advancing patient care through clinical outcomes studies, in-depth anatomical study, molecular science and genetics research and an international training program. Supported by expert physician assistants Emily Guerriero and Rachel Rogers, and an experienced subspecialty nursing team, patients are evaluated and guided through even the most complex, multidisciplinary care.

The concept of team surgery allows the center to select the best surgical approach for each tumor, with a surgical plan designed around the particular needs of the individual patient. Treatment is designed to offer the best surgical outcome with the least side effects and maximal preservation of function. A full array of transcranial approaches, minimally invasive keyhole approaches and endoscopic endonasal approaches are routinely applied with proven and studied success. The UPMC Center for Cranial Base Surgery is also a major teaching destination for surgeons and other health care professionals looking to learn more about these techniques. Faculty teach three courses a year at UPMC, featuring live surgery and hands-on laboratory work. They also travel the world teaching these procedures to the next generation of skull base surgeons.

• Center for Cranial Nerve Disorders
The Center for Cranial Nerve Disorders, under the direction of Raymond F. Sekula Jr., MD, joins experts in a variety of medical disciplines, including neurosurgery, neurology, neurophysiology, radiology, anesthesia, neuro-oncology, and neuro-otology with the intent of providing the most advanced care for a variety of brain disorders. The goal of the center is to provide the very best outcomes for patients with a variety of disorders in the most minimally invasive manner.

Building upon pioneering work accomplished by University of Pittsburgh faculty over the past four decades, the Center for Cranial Nerve and Brainstem Disorders is the international leader in the management of trigeminal neuralgia, hemifacial spasm and glossopharyngeal neuralgia. In addition, the center continues to expand and pioneer treatments directed at other abnormalities in and around the brainstem.

The center is driven by outcome-based clinical research and basic science research projects aimed at understanding the biologic mechanisms of diseases within the realm of the center. In recent years, this research has resulted in improved outcomes for patients and new therapies for a variety of disorders.

• Epilepsy and Movement Disorders Program
The Epilepsy and Movement Disorders Program, under the direction of Jorge Gonzalez-Martinez, MD, PhD—with the assistance of Danielle Corson, PA-C—at the University of Pittsburgh encompasses the treatment of movement disorders, psychiatry disorder, and epilepsy. These brain diseases are similar in that successful neurosurgical treatment requires an expert understanding of the involved brain networks and their potential for modulation by functional neurosurgical procedures, as well as multidisciplinary teams that deliver surgical care to these special groups of patients.

UPMC Presbyterian also houses the region’s foremost center for the comprehensive neurosurgical treatment of all types of adult epilepsy, including epilepsy caused by lesions visible
on MRI (sclerosis, dysplasia, brain tumors, cavernous malformations) and epilepsy where the seizure onset location is not obvious and must be localized by intracranial monitoring, including stereo-electroencephalography. Part of the University of Pittsburgh Comprehensive Epilepsy Center, the surgery program is one of the busiest in the nation, offering the latest less invasive and conventional surgical treatments, including responsive neurostimulation, laser thermal ablation, deep brain stimulation and endoscopic resections for patients suffering from multiple types of epilepsy. Dr. Gonzalez-Martinez, co-director of the epilepsy center, has the country’s largest experience in SEEG implantations, SEEG guided resections and neuromodulation surgeries, with more than 3,000 successful surgical procedures performed. In order to promote an optimal safety profile and seizure outcome, procedures are performed under robotic guidance. The University of Pittsburgh has the largest experience in robotic neurosurgery in the country and was one of the first institutions in the country adopting the novel technology.

In addition to clinical activities, the Epilepsy and Movement Disorder Program is considered one the premier programs in the country regarding translational and basic science research, working in collaboration with the University of Pittsburgh Department of Neuroscience and the Carnegie Mellon University Department of Biomedical Engineering. The program’s research activities are conducted through the University of Pittsburgh Cortical Systems Laboratory.

- Human Neural Prosthetics Program

The Human Neural Prosthetics Program is the result of a multidisciplinary effort to explore the utilization of brain computer interfaces for improving the lives of patients with motor disabilities. In 2007, a collaborative group was established—representing expertise in engineering, neuroscience and rehabilitation—to promote clinical trials using brain computer interfaces to control neural prosthetic devices.

Researchers obtained an initial grant to evaluate micro-ECoG grids in patients in the Epilepsy Monitoring Unit. Data from this study demonstrated that patients could utilize a brain computer interface to control a computer cursor. This grant served as the kick-start for two clinical trials.

In the first, quadriplegic patients are implanted with a custom-designed ECoG grid for up to 30 days. The first subject was able to obtain consistent three-dimensional cursor control using a 3D visual environment. He was also able to successfully control a robotic arm. Additional subjects have also successfully achieved cursor control in a 3D virtual environment and control of a robotic arm. The initial work was funded by the Cortical Control of a Dextrous Prosthetic Hand study funded by National Institute of Neurological Disorders and Stroke (NINDS) and Andrew B. Schwartz, PhD (Department of Neurobiology) was the principle investigator.

A second study utilizes microelectrode arrays that penetrate the surface of the brain. This study is funded by the Defense Advanced Research Projects Agency (DARPA) and is part of the Revolutionizing Prosthetics Program, Phase 3 study for which Michael L. Boninger, MD, former chairman of the Department of Physical Medicine & Rehabilitation, is the principle investigator. In the study, two 96-channel electrode arrays were implanted into the brain of a quadriplegic individual. This study participant was able to obtain control of up to 10 degrees of freedom. Using seven degrees of freedom, she has been able to utilize the robotic arm to perform standardized rehabilitation tasks, such as placing objects on a shelf. Once FDA approval was obtained, she was able to interact personally with the robotic arm and was able to grasp a food item and feed herself. As part of the Revolutionizing Prosthetics Program, Phase 3 study, investigators also obtained FDA approval to place stimulating arrays in conjunction with recording arrays in anticipation of adding sensory feedback to the control of the robotic arm. A second subject was implanted with two recording arrays in motor cortex and two stimulating arrays in sensory
cortex. This subject was able to experience a natural-like sense of touch when the fingers of the robotic arm were stimulated by touch. In sensory tests, he was able to correctly identify which finger was touched while blindfolded.

The success of these early studies has led to additional collaborations. The first collaboration is funded by a $7 million NIH grant (Michael Boninger, MD, Physical Medicine and Rehabilitation) to expand our research team to include the University of Chicago. We join Sliman Bensmaia, PhD, and Nicholas Hatsopoulos, PhD, to expand our research efforts with the goal of restoring hand function in patients with paralysis. The second new collaboration is funded by a $1.2 million NIH award (Jennifer Collinger, PhD, Physical Medicine and Rehabilitation) to better understand the underlying neural activity of reaching and grasping. We will be collaborating with University of Pittsburgh researchers, Aaron Batista, PhD, and Patrick Loughlin, PhD, from the Swanson School of Engineering, and Carnegie Mellon researchers Steven Chase, PhD, and Byron Yu, PhD, from the College of Engineering.

In January of 2020, Marco Capogrosso, PhD—an expert in neuroprosthetics and spinal cord stimulation—joined the department. His research efforts in spinal cord injury and motor control will complement the expertise of our current collaborators. We continue to look for opportunities to apply our expertise in brain computer interfaces to help our patients.

• Center for Image-Guided Neurosurgery

The Center for Image-Guided Neurosurgery (CIGNS) led by L. Dade Lunsford, MD, Lars Leksell Distinguished Professor at the University of Pittsburgh, incorporates the expertise of individuals in image-guided stereotactic and functional neurosurgery, brain tumor surgery, Gamma Knife radiosurgery, neuro-oncology, radiation oncology and neuro-radiology. Ajay Niranjan, MD, MBA, is associate director of the center. The goal of the center is to provide quality patient care using minimal access or minimally invasive stereotactic and radiosurgical technology, high resolution neuroimaging and advanced computer systems. In 1981, the center was the first U.S. center to install a dedicated computed tomography (CT) scanner in a unique stereotactic operating room suite.

As the first North American group to initiate a clinical program for Gamma Knife stereotactic radiosurgery in 1987, the Center for Image-Guided Neurosurgery continues to be a leader in this field. Currently, two Gamma Knife units are located at UPMC Presbyterian, one of the few clinical sites in the world with two clinical units. In the fall of 2007, the Leksell Gamma Knife Perfexion™ was installed. This generation Gamma Knife unit incorporates advanced robotics, expands the role of radiosurgery to include extracranial targets, provides greater patient access, and enhances patient safety. In 2016, UPMC installed its sixth Gamma Knife, the newest generation ICON Gamma Knife. The ICON incorporates a cone beam CT imaging system with the Gamma knife in order to facilitate a mask stereotactic fixation system for selected patients.

Gamma Knife technology represents one of the most advanced means available to help patients with brain tumors, arteriovenous malformations (AVMs), and pain or movement disorders. Over 16,400 patients have undergone Gamma Knife stereotactic radiosurgery at UPMC Presbyterian. In addition, spinal radiosurgery using several radiosurgical systems is offered under the direction of Peter Gerszten, MD, who serves as the Peter E. Sheptak Endowed Chair in spinal neurological surgery.

The center also has a dedicated Elekta NeuroMag® magnetoencephalography (MEG) unit that performs brain mapping in patients with structural brain lesions, epilepsy, trauma and degenerative brain disorders. Dr. Niranjan is the operations director of the MEG project. Dr.
Niranjan continues to pursue cutting edge research combining fiber tractography in the care of patients with refractory movement disorders and trigeminal neuralgia. The CIGNS has five committed nurses dedicated to optimal patient care from preoperative consultation to discharge from the outpatient center. They are all especially trained in conscious sedation techniques to provide comfort and attentive care to our patients.

The Center for Image-Guided Neurosurgery is also an international training site for radiosurgery and minimally invasive neurosurgery, holding six week-long training courses per year. Over the last 20 years, more than 2,500 neurosurgeons, neurootologists, radiation oncologists, medical physicists, and nurses have trained at this center. These courses are among the highest rated post-graduate courses offered at the University of Pittsburgh. In 2015, the center opened a new state-of-the-art education and training facility equipped with the latest generation high definition display systems. In July of 2020, the center held the first virtual Gamma Knife training course with participants from around the world attending.

In addition, the center conducts numerous clinical, long-term outcome research projects and is the coordinating center for the International Radiosurgery Research Foundation (IRRF), a multi-institutional international clinical consortium of centers of excellence performing stereotactic radiosurgery. The IRRF currently has members from the US, Canada, China, the Czech republic, Spain, Taiwan, Egypt, Turkey and India. Multiple retrospective clinical trials have been published or are underway. More than 5,000 articles have now been published worldwide in the field of stereotactic radiosurgery. The University of Pittsburgh has the highest number of studies that have been cited more than 100 times. More than 600 peer reviewed articles, several hundred book chapters, and twelve books have been published by individuals affiliated with this center since it opened in 1981.

In May of 2019, the 280-page volume *Leksell Radiosurgery*, coauthored by Drs. Niranjan, Lunsford and Kano, was published by Karger and represented a significant summary of the current role of the Gamma Knife.

More than 100 U.S. or international fellows have received training at this center since 1987. The center provides an opportunity for advanced training in image-guided stereotactic and functional surgery at the fellowship level. Current international research fellows are from China and Japan. The fellowship has two tracks, one for candidates interested in a functional focus (movement disorders, pain, and epilepsy) and one for candidates focusing on neurooncology and radiosurgery. This one-year PGY-7, or post residency, opportunity is approved by the Society of Neurological Surgeons Committee on Advanced Specialty Training (CAST).

This multidisciplinary Center for Image-Guided Neurosurgery includes the clinical and research efforts of neurosurgeon Hideyuki Kano, MD, PhD, and radiation oncologists John Flickinger, MD, Yoshio Arai, MD, and Susan Rakfal, MD. The participating medical physics group consists of Jong Oh Kim, PhD, and Greg Bednarz, PhD. Grace Yum provides assistance in medical informatics.

**Neurosurgical Oncology Program**

The University of Pittsburgh’s Neurosurgical Oncology Program includes leading neurosurgeons, neuro-oncologists, radiation oncologists, neuropathologists, researchers, rehabilitation experts, nurses and support staff. This multidisciplinary team delivers compassionate and sophisticated care and uses the latest technologies to treat patients with tumors of the brain, spine and skull base. Education, support and counseling for family members are important parts of the program.
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The Neurosurgical Oncology Center features two clinical divisions: the Adult Neurosurgical Oncology Program and the Pediatric Neurosurgical Oncology Program. Both operate under the auspices of the comprehensive Brain Tumor Program, centered at the Hillman Cancer Center of the University of Pittsburgh Cancer Institute (UPCI). The Brain Tumor Program supports clinical trials and basic science research for patients with brain tumors and is led by Ian Pollack, MD.

The Adult Neurosurgical Oncology Center, led by Nduka Amankulor, MD (director) and Pascal Zinn, MD, PhD, (associate director), who joined the department in August of 2019, is dedicated to providing the best treatment available for patients with both benign and malignant tumors of the brain and spine. The center is also dedicated to discovering novel and effective therapies for these diseases and is a leading center for surgically-driven clinical trials and translational bench-to-bedside trials based on scientific breakthroughs developed in our laboratories.

The Neurosurgical Oncology Center is one of the most robust and innovative in the world, with one of the largest volumes of patients treated on an annual basis. The center has been a leader in the implementation of cutting-edge technologies such as stereotactic radiosurgery using the Gamma Knife, CyberKnife, and image-guided tumor resection using intraoperative CT and MRI. Other technologies, including minimally invasive techniques for tumor removal using intracranial endoscopic port surgery (NeuroendoportSM) and endoscopic endonasal approaches to the skull base have been pioneered at this center. The use of advanced imaging modalities, such as high definition white matter fiber tract imaging and magnetoencephalography, has also facilitated better outcomes for selected patients with tumors. In addition, awake craniotomy techniques with brain mapping, and fluorescent-guided brain tumor resection are routinely used to maximize safe removal of brain tumors at the cancer center.

As an international referral center for both adult and pediatric brain tumors, the center ranks among the top neuro-oncology programs in the nation. Faculty members provide consultation and guidance for local, national and international referrals. Patients with both primary brain and spine tumors and metastatic tumors are seen in the Hillman Cancer Center multidisciplinary clinics that include representation from neurosurgery, medical neuro-oncology and radiation oncology. A weekly multidisciplinary neuro-oncology tumor board is a forum for a team of specialists to review patient problems and to formulate management recommendations. The tumor board draws from the expertise of the neurosurgery, neurology, pathology and radiation oncology faculty at UPMC. Similarly, there is a weekly skull base tumor board with involvement from otolaryngology/head and neck cancer specialists, neuro-ophthalmology, radiology, and adult and pediatric neurosurgery.

Our team is also actively studying other neurological complications of systemic cancer and its treatment, including stroke, neurobehavioral disorders, neurological complications of chemotherapy and/or radiation therapy, and paraneoplastic neurological syndromes, in collaboration with medical neuro-oncologists Frank Lieberman, MD, and Jan Drappatz, MD, and Megan Mantica, MD.

The University of Pittsburgh is a member of the American Brain Tumor Consortium, which conducts clinical trials to evaluate novel chemotherapy and molecular treatments for adults with malignant primary brain tumors. In addition to membership in this group, the site is one of the few in the country that is also a member of the Pediatric Brain Tumor Consortium and the Collaborative Ependymoma Research Network, highlighting the breadth of the neuro-oncology expertise across the age spectrum. The University of Pittsburgh serves as the coordinating center for the North American Gamma Knife Consortium, which links
18 academic centers of excellence in radiosurgery. Moreover, investigators have been at the forefront of development of innovative biological therapeutic approaches for patients with brain tumors, such as immunotherapy using brain tumor vaccines and radiosurgery coupled with bevacizumab.

The Spine Oncology Radiosurgery Program, led by Peter C. Gerszten, MD, MPH, is the most experienced center in the world in using radiosurgery to treat a wide variety of both malignant and benign spinal and paraspinal tumors. This highly effective therapy is both safe and painless, and avoids many of the risks associated with open surgery.

- **Pediatric Neurosurgery**
  The Pediatric Neurosurgery Division at UPMC Children’s Hospital of Pittsburgh is led by Ian Pollack, MD, and also includes Stephanie Greene, MD, and Taylor Abel, MD. Robert Kellogg, MD, will join the group in September of 2020. The division provides care for children with tumors, spinal and cranial deformities, vascular malformations, spasticity and epilepsy, and peripheral nerve disorders, and has gained international recognition for the treatment of pediatric brain tumors, cerebral palsy and traumatic brain injury.

The center’s neurosurgeons work closely with specialists in pediatrics, surgery, radiation therapy, oncology, physical therapy, orthopedics, plastic surgery, critical care, pediatric neurology and social services. Through its neuro-oncology program, the center provides comprehensive, multi-disciplinary care for patients with brain and spinal cord tumors, in collaboration with the oncology and radiation therapy programs. Patients may be eligible for treatment in one of many innovative research protocols at Children’s Hospital. These protocols—several of which are unique to Children’s or available at only a few centers throughout the country—provide Children’s patients access to new treatments and promising studies.

Dr. Pollack is the institutional principal investigator and chair of the neurosurgery and translational biology committee in the Pediatric Brain Tumor Consortium, supported by the National Cancer Institute to perform cutting-edge clinical trials in children with brain tumors, and serves as the principal investigator on several studies involving vaccine-based immunotherapy for children with challenging brain tumors. The clinical program has been enhanced by the completion of an intraoperative MRI suite, which facilitates the goal of achieving safer and more extensive resections in challenging childhood brain tumors and allowing immediate postoperative imaging without the need for a second anesthetic.

These clinical advances are coupled with a robust and rapidly growing research enterprise, encompassing a state-of-the-art pediatric brain tumor bank that will soon receive specimens from other regional pediatric neurosurgical sites, as well as a series of three NIH R01 funded research projects, two former young investigators, Sameer Agnihotri, PhD, and Gary Kohanbash, PhD. These activities build upon the division’s existing strength in experimental therapeutics and immunobiology, with a goal of developing the next generations of precision-medicine-based clinical trials.

Patients with vascular anomalies such as aneurysms, arteriovenous malformations, cavernous malformations, and moyamoya syndrome are managed by Dr. Greene, the director of vascular neurosurgery at Children’s Hospital. Select patients undergo further evaluation at the department’s Center for Image-Guided Neurosurgery with L. Dade Lunsford, MD, for possible radiosurgical treatment; angiography by an endovascular neurosurgical team, for further definition of anomalies and possible embolization of feeding vessels to reduce blood flow to a malformation; and assessment by a vascular neurologist for management of seizures, dystonia, and coagulopathies that may be identified during the course of the...
evaluation process. Such comprehensive evaluation best identifies those patients who would benefit from surgical intervention. Patients with vascular problems involving more than one organ system, or those with syndromes such as Sturge-Weber or PHACES, are seen in the multidisciplinary Vascular Anomalies Clinic, one of the largest of its kind in the country.

The Pediatric Epilepsy Surgery Program, led by Dr. Abel, is the only center in the region able to provide comprehensive evaluation and surgical treatment options for children with focal or drug-resistant epilepsy. A comprehensive pre-surgical evaluation, using state-of-the-art neuro-imaging and electrophysiology resources, is performed to identify the specific site in the brain causing seizures and to determine its relationship to important functional areas of the brain. Patients with focal epilepsy can be treated with the full range of treatment options including lesionectomy, cortical resection, lobar resection, or hemispheric disconnection—-with or without a period of direct cortical recordings (i.e. SEEG or subdural grid electrodes) to elucidate epileptic cortex. The surgical epilepsy program is equipped with both a ROSA robot and O-Arm intraoperative CT scanner, which enables frameless robot-assisted SEEG implantation. Approaches are tailored to minimize the use of craniotomies when possible. A large proportion of patients are treated with MR-guided laser ablation. Direct cortical modulation with responsive neural stimulation (RNS) is also available when the seizure focus involves eloquent cortex. For children with drug-resistant multi-focal or generalized epilepsy, all available palliative procedures are available including MR-guided laser callostomy, traditional callosotomy, vagal nerve stimulation, and deep brain stimulation.

Dr. Abel also leads the Pediatric Brain Electrophysiology Laboratory, located at UPMC Children’s Hospital of Pittsburgh, that uses neural data from SEEG recordings to elucidate the physiologic mechanisms associated with auditory and visual cortical development. The lab is also investigating new methods for improved and less invasive localization of epileptic foci. Clinical research from this laboratory investigates outcomes of SEEG, subdural grid recordings, and neuromodulation.

The program is also involved in cutting edge clinical and basic research focused on developing and applying new and improved treatments for children with movement disorders. The Spasticity and Movement Disorders Clinic is made up of a team of pediatric medical professionals who specialize in the comprehensive, multidisciplinary evaluation and treatment of children and young adults with spasticity and other movement disorders, such as dystonia, chorea, athetosis and tremor. The purpose of the clinic is to determine whether a patient would benefit from treatment with oral medications, intrathecal baclofen, selective dorsal rhizotomy, intramuscular botox injection, deep brain stimulation or other therapies. With the ROSA robot and O-Arm, asleep frameless stereotactic deep brain stimulation is available for children with dystonia and other movement disorders requiring neuromodulation.

The division is an integral collaborator in the Cleft-Palate and Craniofacial Center in the management of children with craniofacial disorders. Because children with complex craniosynostosis often require a staged approach to the treatment of their cranial, midfacial and lower facial deformities, close multidisciplinary follow-up is maintained throughout childhood and adolescence in order to optimize long-term functional and cosmetic outcome.

The division is actively involved in the Brain Trauma Research Program, the Fetal Diagnosis and Treatment Center, the Vascular Anomalies Center and the Brachial Plexus Program. In conjunction with a team of specialists at UPMC Magee-Womens Hospital, Dr. Greene has established a program to treat babies with myelomeningocele, or spina bifida, with in utero surgery here in Pittsburgh. Babies who are not candidates for in utero surgery undergo
conventional closure of the defect within several days of birth. These children are seen throughout childhood by a multidisciplinary team of medical professionals in the Spina Bifida Clinic at Children’s Hospital, one of the largest such clinics in the country. Expectant mothers are referred by the Fetal Diagnosis and Treatment Center at UPMC Magee-Womens Hospital for counseling in the pediatric neurosurgery clinic if prenatal imaging reveals a potential neurosurgical abnormality.

The Brachial Plexus Birth Injury Clinic—run through the division of pediatric plastic surgery—manages infants with birth injuries to the brachial plexus in a collaborative fashion with specialists from neurosurgery, plastic surgery, orthopedic surgery, and physical and occupational therapy. UPMC Children’s Hospital of Pittsburgh is one of a handful of centers in the country that have a dedicated multidisciplinary clinic for these patients and is the only such program in the region. Older patients with peripheral nerve tumors or injuries are seen by Dr. Greene outside of the Brachial Plexus program.

UPMC Children’s Hospital of Pittsburgh is a member of the Hydrocephalus Clinical Research Network, a group of 11 premier pediatric neurosurgical departments in North America that are dedicated to designing and undertaking field-changing prospective research into pediatric hydrocephalus. In addition, Children’s is also a member institution in the Park-Reeves Syringomyelia Research Consortium, a group dedicated to solving important clinical problems within the realm of Chiari malformation and syringomyelia.

Finally, the clinical team will be expanded with the addition of Dr. Kellogg, a former neurosurgical fellow within the group, who will be focusing on further enhancing the division’s Spasticity and Movement Disorders program, and the many studies conducted within the Hydrocephalus Clinical Research Network, as well as expanding the division’s outreach program to communities beyond our immediate geographic area.

• Spine Services Division

The Neurosurgical Spine Services Division at the University of Pittsburgh is a multidisciplinary organization composed of specialists in the fields of physical therapy, physical medicine and rehabilitation, interventional neuroradiology and neurological spine surgery. Specialists from these fields work together as a unified group to provide the highest quality care for patients and athletes who have spine injuries, painful disc conditions, neck, arm, back or leg pain.

Adam S. Kanter, MD, is chief of neurosurgical spine services and also leads the minimally invasive spine program. David O. Okonkwo, MD, PhD, leads the spinal deformity program and D. Kojo Hamilton, MD, provides specialty care in the treatment of cervical malalignment and spinal deformity. Peter C. Gerszten, MD, MPH, leads the percutaneous and spine radiosurgery programs.

The Neurosurgical Spine Services Division offers comprehensive care for all types of spinal disorders, including degenerative, traumatic, and oncologic conditions. The initial treatment approach is typically non-surgical, with surgical options reserved for patients with recurrent or disabling symptoms and/or progressive deficits. Complete diagnostic testing of all spinal and nerve disorders is available through the center.

The minimally invasive program, led by Dr. Kanter, utilizes state-of-the-art portal techniques and lateral access corridors to minimize trauma and disruption of stabilizing back muscles. The spinal deformity program, led by Dr. Okonkwo, offers full-scale analysis, longitudinal tracking and treatment interventions for patients with scoliosis and thoracolumbar spinal
Department Overview

deformity. Together, they continue to push the surgical envelope and combine their unique skill sets to provide each and every patient with the least invasive yet maximally effective treatment options.

Dr. Hamilton correspondingly treats complex cervical deformity, such as swan neck and chin-on-chest disorders, in addition to thoracolumbar scoliosis, oncologic and degenerative spine conditions. The spine radiosurgery program, led by Dr. Gerszten, is one of the most experienced centers in the world in treating a wide variety of benign and malignant spine and paraspinal tumors that has proven highly effective, safe, and painless, and avoids many of the risks associated with open surgery.

Within the division is the Center for Surgical Pain Management led by John J. Moossy, MD. This program provides a variety of surgical options for the management of medically intractable pain syndromes. The range of treatment varies from neuroaugmentation (i.e., spinal cord stimulation and intrathecal opioids) to surgical decompression (with or without spinal fusion) to ablative neurosurgery.

The Neurosurgical Spine Services Division works together as a unified team, utilizing a multidisciplinary approach to maximize patient care and outcomes. An array of research studies and protocols are employed to deliver unsurpassed treatment strategies, ensuring that patients receive the best state-of-the-art care in the country.
Accomplishments and Highlights of Note in Fiscal Year 2019-20

**July 2019**
- Sixth-year resident Daniel Tonetti, MD, won best poster presentation at the 2019 Pennsylvania Neurosurgery Society meeting. Sixth-year resident Michael McDowell, MD, took second place in oral presentation.
- Georgios Zenonos, MD, joined the department’s Center for Cranial Base Surgery. Dr. Zenonos, a 2018 graduate of the department’s residency program, spent the past year as a complex cranial/cerebrovascular fellow at the University of Miami.
- Over $150,000 in grant money was awarded by the Pittsburgh Foundation through the Walter L. Copeland Fund to support 19 cranial research projects at the University of Pittsburgh Department of Neurological Surgery.

**August 2019**
- The UPMC Center for Image-Guided Neurosurgery marked 32 years of treatment of patients with the Gamma Knife. In those 32 years, the Gamma Knife staff has treated over 16,000 patients, published hundreds of scientific articles in peer reviewed medical literature, received countless awards and established the center as a world-leader in Gamma Knife research and education.
- Fifth-year resident Alp Ozpinar, MD, finished second in his age group—and 17th overall—in the HFP Racing Columbus (Ohio) Olympic triathlon. Joseph Maroon, MD, finished first in his age group.
- The department welcomed Michael Lang, MD—a vascular and endovascular neurosurgeon performing both minimally invasive and traditional skull base surgery—and Pascal Zinn, MD, PhD—a neurosurgical oncology specialist dealing with brain, skull base and spinal cord tumors, to our staff.

**September 2019**
- The University of Pittsburgh Department of Neurological Surgery Spine Services Division hosted the 2019 Midwest Spine Symposium at the Pittsburgh Renaissance Hotel.
- Jorge Gonzalez-Martinez, MD, PhD, a world-renowned neurosurgeon subspecializing in epilepsy and functional neurosurgery, joined the department to direct the Epilepsy & Movement Disorders Program and Cortical Systems Laboratory.
- In what is considered the first such program of its kind in the nation, the University of Pittsburgh Department of Neurological Surgery created a three-month sports medicine fellowship for residents. Fifth-year resident Enyinna Nwachuku, MD, served the first fellowship that included rotations with the Pittsburgh Steelers, the Pittsburgh Penguins and other area sports programs. *(See article on page 46)*

**October 2019**
- Robert Friedlander, MD, was inducted into the prestigious National Academy of Medicine at the organization’s annual meeting in Washington, D.C. Dr. Friedlander was one of 100 new members elected to the academy, originally chartered by Abraham Lincoln to advise the U.S. government on science and other matters. *(See article on page 34)*
• Kamil Nowicki, MD, PhD; Hansen Deng, MD; and Amir Faraji, MD, PhD, each received best oral abstract awards for presentations at the 2019 Congress of Neurological Surgeons annual meeting held in San Francisco.

• Peter Gerszten, MD, presented a talk on the paleopathology and methods used to study the diseases of ancient mummified remains associated with pre-Columbian Andean cultures in Peru and Chile at Pittsburgh’s Carnegie Science Center. The talk was part of the center’s seven-month ‘Mummies of the World Exhibition.’

• Joseph Maroon, MD, was the Charles Drake History of Surgery honored lecturer at the American College of Surgeons 2019 Clinical Congress in San Francisco.

• Department trauma and concussion experts David Okonkwo, MD, PhD; Joseph Maroon, MD; and Vincent Miele, MD; along with Pittsburgh Steeler head athletic trainer John Norwig, wrote a two-part feature article for AANS Neurosurgeon on their experience working with the National Football League’s concussion protocol.

November 2019
• Joseph Maroon, MD, was a guest on the Ministry of Hemp podcast, talking about the anti-aging properties of cannabidiol.

• Ezequiel Goldschmidt, MD, PhD, was as a winner in the Radiosurgery Society’s Members in Training (MiT) Research Challenge for his abstract “Radiosurgery to the Spinal Dorsal Root Ganglion Induces Fibrosis and Inhibits Satellite Glial Cell Activation While Preserving Axonal Neurotransmission.”

December 2019
• A paper co-authored by Robert Friedlander, MD, and Diane Carlisle, PhD, published in the Journal of Huntington’s Disease, evaluated the mouse models used for developing new treatments for mood disorders in HD and recommended which of these models are most relevant to their studies.

• Adam Kanter, MD, was selected as a recipient of UPMC’s Award for Commitment and Excellence in Service (ACES) for 2019. The award honors staff who exemplify UPMC’s five core values — Quality & Safety, Dignity & Respect, Caring & Listening, Responsibility & Integrity, Excellence & Innovation.

January 2020
• David O. Okonkwo, MD, PhD, was a guest on the Neurosurgery Podcast talking about the state of trauma care in the United States. Fifth-year resident Nitin Agarwal, MD, was also a guest on the podcast talking about managing success in the early stages of residency.

• Fifth-year resident Nima Alan, MD, was named winner of 2020 Mayfield Clinical Science Award by the AANS/CNS Section on Disorders of the Spine and Peripheral Nerves for his paper “Load Sharing Classification Score in Patients with TLICS 4 is Predictive of Surgical Intervention.”

• First-year resident Hansen Deng, MD, was named recipient of the 2020 ThinkFirst Injury Prevention Award from the American Association of Neurological Surgeons (AANS) for his abstract “B-cell Lymphoma 2 (BCL2) Single Nucleotide Polymorphism Is Associated with Intracranial Hypertension in a Prospective Cohort of sTBI.”
Department Overview
Accomplishments and Highlights of Note

- Joseph Maroon, MD, was interviewed on KDKA-TV Evening News regarding Apollo, a wearable, watch-like medical device that may help patients rely less on prescription drugs.

- Marco Capogrosso, PhD, an expert in neuroprosthetics and spinal cord injury, joined the department as an assistant professor. Dr. Capogrosso will direct the Spinal Cord Stimulation Laboratory, studying the interactions between electrical stimulation and the dynamics of spinal circuits.

- Second-year resident Hussam Abou-Al-Shaar, MD, was section editor of Neurosurgery Case Review: Questions and Answers, published by Thieme Publishing. Dr. Abou-Al-Shaar served as editor of the book’s “Intracranial Pathology: Tumors” section. Described by Thieme as “a robust study guide for the American Board Neurological Surgery and the Royal College of Physicians and Surgeons of Canada oral board examination,” the book presented almost 150 cases commonly encountered by neurosurgeons.

- Akiyoshi Ogino, MD, a visiting research fellow with the UPMC Center for Image-Guided Neurosurgery, was selected to receive the 2020 Leksell Radiosurgery Award from the American Association of Neurological Surgeons (AANS) for his abstract “Useful Hearing Preservation Is Improved in Vestibular Schwannoma Patients Who Undergo Stereotactic Radiosurgery Before Further Hearing Deterioration Ensues.”

February 2020

- Fifth-year resident Matthew Pease MD, was awarded the Congress of Neurological Surgeons Scholarship in Data Science for 2020-21. This is the inaugural year for the scholarship and is designed to provide residents with structured mentorship in the use of advanced data science techniques, including artificial intelligence, for research and practice improvement in neurosurgery.

- Fifth-year resident Jeremy Stone, MD, was named a winner of the 2020 UPMC Medical Education LEAP Award for Patient Safety and Quality Improvement for his paper “Improved Patient Satisfaction Through Adoption of the Transradial Approach Compared to the Transfemoral Approach for Diagnostic Angiography.”

- Joseph Maroon, MD, was named the recipient of the 2020 UPMC Physician Excellence Award - Clinician of Courage. The award recognizes a physician who is thriving and/or serving as a leader within their community after having faced and overcome adversity.

- Sixth-year residents Nitin Agarwal, MD, and Daniel Tonetti, MD, were awarded travel exchange grants to attend European Association of Neurosurgical Societies (EANS) training courses in 2020. The awards are part of a collaboration among the EANS, the American Association of Neurological Surgeons (AANS) and the Neurosurgery Research & Education Foundation (NREF) to provide AANS residents the opportunity to further their neurosurgical knowledge and forge friendships among their European counterparts.

- The University of Pittsburgh Department of Neurological Surgery welcomed Stacey Lang as our new executive administrator. Stacey joined the department with neuroscience expertise spanning more than 30 years in both pediatric and adult neurosurgery.

March 2020

- Paul A. Gardner, MD, was appointed the Peter J. Jannetta Endowed Chair in Neurosurgery at the University of Pittsburgh. The Peter J. Jannetta Chair in Neurosurgery is one of six endowed neurosurgery-related chairs at the university. (See article on page 33)
Department Overview

Accomplishments and Highlights of Note

April 2020
- Seventeen University of Pittsburgh neurosurgeons were named among this area’s best doctors in their field in a national survey published locally in *Pittsburgh Magazine*. The list included Nduka Amankulor, MD; Robert M. Friedlander, MD; Paul A. Gardner, MD; Peter C. Gerszten, MD; Jorge A. Gonzalez-Martinez, MD, PhD; D. Kojo Hamilton, MD; Adam S. Kanter, MD; L. Dade Lunsford, MD; Joseph C. Maroon, MD; Vincent Miele, MD; Edward A. Monaco, MD, PhD; John J. Moossy, MD; Ajay Niranjan, MD; David O. Okonkwo, MD, PhD; Ian Pollack, MD; Raymond Sekula, Jr., MD; and Daniel Wecht, MD.

- David Okonkwo, MD, PhD, was named chair of the American Association of Neurological Surgeons/Congress of Neurological Surgeons Joint Section on Neurotrauma & Critical Care.

- The department inaugurates *Fridays with Friedlander*, a live weekly webcast hosted by department chairman Robert Friedlander, MD, discussing topical neurosurgical issues and spotlighting faculty members presenting brief talks on their speciality.

- Taylor Abel, MD, was a guest on the UPMC Children’s Hospital of Pittsburgh *That’s Pediatrics* podcast discussing pediatric epilepsy research.

May 2020
- Second-year resident Daryl Fields II, MD, PhD, was voted the most nursing supportive doctor by the 6A nurses at UPMC Children’s Hospital of Pittsburgh. During his rotation, staff praised the difference he made, citing his unmatched ability to effectively communicate with nurses, patients and families.

June 2020
- Third-year resident Zachary Gersey, MD, was named the 2020 recipient of the Neil Peart Neurosurgery Research Award from the Glioblastoma Foundation. The award is presented to an individual performing groundbreaking work in the area of glioblastoma research.
Gardner Appointed As Peter Jannetta Chair

Paul A. Gardner, MD, neurosurgical director of the UPMC Center for Cranial Base Surgery, was appointed as the Peter J. Jannetta Endowed Chair in Neurosurgery at the University of Pittsburgh in March of 2020.

In making the announcement, Department of Neurological Surgery chairman Robert Friedlander, MD, said, “We are very proud of the work and accomplishments that Dr. Gardner has made here at the University of Pittsburgh. This chair acknowledgement is fitting of the impact that Paul has made in the field of minimally invasive brain surgery, ideally keeping with the innovative spirit of Peter Jannetta.”

A 2008 graduate of the Department of Neurological Surgery residency program, Dr. Gardner—along with center otolaryngology director Carl H. Snyderman, MD, MBA—has established the UPMC Center for Cranial Base Surgery as one of the leading skull base centers in North America and has helped pioneer both transcranial microscopic and endoscopic endonasal approaches to the skull base and brain.

“This is an incredible honor,” Dr. Gardner said in acknowledging the appointment. “Dr. Jannetta was one of the key influences in my early decision to become a neurosurgeon, and my pride in this program and the role I have in helping to carry his legacy cannot be overstated. I want to thank my chairman, my partners and my mentors for their help and support which have allowed me this achievement.”

Dr. Gardner and his colleagues have substantially advanced the field of minimally invasive brain surgery by developing new techniques, tools and approaches that have made it possible to access many cranial tumors, regardless of size. These innovative approaches allow the cranial base team to provide a full array of options for the cutting-edge treatment of skull base diseases.

Dr. Gardner has also helped establish UPMC and the University of Pittsburgh as a major teaching destination for surgeons and other health care professionals looking to learn more about minimally invasive brain surgery. The center’s faculty teach three major courses a year, featuring live surgery and hands-on laboratory work, that attract attendees from around the world. Dr. Gardner also lectures extensively, both nationally and internationally, on the minimally invasive techniques advanced here.

Dr. Gardner is also coauthor with Dr. Snyderman of the book Skull Base Surgery. The book offers step-by-step expert instruction on more than 45 procedures, covering both open and minimally invasive approaches to the skull base.

The Peter J. Jannetta Chair is named in honor of the former department chairman, a strong advocate of innovative neurosurgical techniques and developer of microvascular decompression (MVD), an innovative procedure that moved blood vessels away from the trigeminal nerve, alleviating chronic pain and spasms in facial muscles.
Walter E. Dandy Professor and chair of the Department of Neurological Surgery Robert Friedlander, MD, was inducted into the prestigious National Academy of Medicine at the organization’s annual meeting in October 2020. Election to the academy is considered one of the highest honors in the fields of health and medicine and recognizes individuals who have demonstrated outstanding professional achievement and commitment to service. Dr. Friedlander was one of 100 new members elected to the academy.

“These newly elected members represent the most exceptional scholars and leaders whose remarkable work has advanced science, medicine, and health in the U.S. and around the globe,” said National Academy of Medicine President Victor J. Dzau. “Their expertise will be vital to addressing today’s most pressing health and scientific challenges and informing the future of health and medicine for the benefit of us all. I am honored to welcome these esteemed individuals to the National Academy of Medicine.”

New members are elected by current members through a process that recognizes individuals who have made major contributions to the advancement of the medical sciences, health care, and public health. A diversity of talent among NAM’s membership is assured by its Articles of Organization, which stipulate that at least one-quarter of the membership is selected from fields outside the health professions — for example, from such fields as law, engineering, social sciences, and the humanities.

Established originally as the Institute of Medicine in 1970 by the National Academy of Sciences—which can trace its founding to Abraham Lincoln in 1863—the National Academy of Medicine addresses critical issues in health, science, medicine, and related policy and inspires positive actions across sectors.
Education Programs
The Department of Neurological Surgery provides medical education in a wide variety of forums at UPMC and the University of Pittsburgh. The faculty contributes to undergraduate and graduate-level education at many sites and to the continuing education of their professional colleagues.

**Undergraduate Level**
Selected faculty of the Department of Neurological Surgery participate in several undergraduate courses at the University of Pittsburgh. In addition, undergraduate students are offered shadowing opportunities with various faculty members while they evaluate and operate on patients at UPMC. To qualify undergraduate students obtain faculty permission and complete on-line training courses related to patient confidentiality. Medical students often round with the evening-on-call neurosurgery resident at UPMC Presbyterian in order to get real-life observations of the types of clinical problems encountered, as well as insights into the life of a neurosurgery resident.

**Medical Students**
Faculty participate in teaching clinical neuroscience and neuroanatomy to first- and second-year medical students. Several Pitt medical students spend elective time doing clinical research with faculty members from various centers in the department. During their surgery core clerkship, third-year medical students may elect to take a two-week introductory subspecialty experience in neurosurgery.

Selective fourth-year medical students at the University of Pittsburgh, as well as visiting medical students from other schools, may elect to take a four-week clinical subinternship on the neurosurgery services at UPMC, during which they participate in all phases of the training program as well as in supervised patient care services. Typically, each four-week rotation includes experience on cranial, spinal, and pediatric neurosurgery. During the 2020 COVID pandemic—in collaboration with the advice of the Society of Neurological Surgeons—Pitt students will spend eight weeks on the neurosurgery service as fourth year students, with experience in general and trauma neurosurgery, pediatrics, endovascular, and radiosurgery.

**Visiting Medical Students**
The Department of Neurological Surgery at the University of Pittsburgh Medical Center offers a clinical elective that is open to enrolled fourth-year medical students in good academic standing at any U.S. medical school. During the fall of 2020, these visiting rotations have been suspended because of travel restrictions imposed by the Covid pandemic.

When they resume, elective rotations (subinternships) are four weeks in length and must correspond with the School of Medicine’s dates. The application requests will begin in February of each year. Assignments will be made after our fourth-year students finalize their schedules at the end of March. Once the student affairs office verifies each application, they will forward the application to the department. Reviewing of applications will start mid-April.

One-month clerkships offered to senior medical students from other medical schools attract 10-20 students each year. In their senior year selective students may participate in ongoing research projects in the Department of Neurological Surgery under the supervision of an advisor. This experience trains students in basic or clinical neurosurgical research techniques and procedures and offers in-depth education in basic neurosciences. Other medical students seek a more formal and longitudinal exposure to neurosurgical investigation, and complete an approved scholarly project. Pitt medical students often use this educational opportunity as the base for their required graduation scholarly project.
Education Programs

• Pitt Med Neurosurgery Interest Group
The Neurosurgery Interest Group at the University of Pittsburgh School of Medicine is devoted to fostering an interest in the exciting field of neurological surgery. The group connects medical students to key resources in the Department of Neurological Surgery and provides opportunities to shadow, conduct cutting-edge research, and network with the department. Mentoring from several senior residents in our program helps to stimulate interest in the field.

Under the direction of senior residents and participating faculty, the department offers focused lectures and demonstrations on neurosurgical topics for University of Pittsburgh medical students. The goal is to provide a background of current advances in neurosurgery to prospective students interested in a neurosurgical career.

Residency Program
The UPMC Department of Neurological Surgery offers a seven-year (PGY 1-7) residency program that is internationally renowned as a training ground for exceptional neurosurgeons. Accredited by the UPMC Graduate Medical Education Council, as well as the Accreditation Council on Graduate Medical Education (ACGME), the program is currently approved to train 28 residents, four each year. The goal of the program is to provide exceptional clinical and scientific education to top-notch graduates of medical schools who wish to be future leaders in the field of neurological surgery. The program focuses on training to maximize medical knowledge, build patient care skills, and provide for practice based and systems based learning. The department stress professionalism and interpersonal and communication skills, and relies heavily on both inpatient and outpatient use of informatics.

The University of Pittsburgh Department of Neurological Surgery—which was founded in 1936 and has offered a residency training program dating back to the late 1940s—has always stressed a strong commitment to patient care, education and research. Today, the department is the largest neurosurgical academic provider in the United States, performing over 9,000 major procedures annually system-wide, the majority of which are performed at our academic hospitals of UPMC Presbyterian, UPMC Shadyside, UPMC Mercy, UPMC Children’s Hospital of Pittsburgh and the VA Pittsburgh Healthcare System, University Drive.

An article published in USA Today in February of 2018, ranked the University of Pittsburgh neurological surgery residency program as one of the top five programs in the country, citing the “advanced technology and focus on innovation” available here. In a ranking published in Becker’s Spine Review in August of 2018, our program was ranked among the top in five in the country based on a peer-rated, review-based survey.

A 2015 study published in the Journal of Neurosurgery showed that our department ranked among the top five neurosurgical residency programs in the country in terms of academic publishing output of faculty. Another Journal of Neurosurgery article, published in 2011, showed that our department ranked as the most productive residency program in the nation in terms of graduates remaining and contributing in academic neurosurgery. Still another article, published in informaHealthcare, showed that our stereotactic research effort was the most productive in the world.

In the 2018, the department completed a 50-year retrospective assessment of training at our program, published in the Journal of Neurosurgery [2018 Aug 1:1-7]. In each decade, beginning in 1971, we looked at admitted residents and finishing residents, tracking any changes in professional or behavioral events during training. We surveyed 98 graduates and analyzed the data in 76% who completed the survey. This study does not indicate that resi-
dents have changed in any significant way over these 50 years. The vast majority of resident
graduates express satisfaction with their career choice and its overall positive impact on their
families.

Almost eighty years at the forefront of neurosurgical care have demonstrated that we are
a proven international leader in patient care, research and training. Resident performance
and tracking is performed twice per year using the ACGME Milestones project.

• PGY-1
Residency training at the department begins with the first-year experience. PGY-1 resi-
dents who enter the field as novices in neurosurgery will spend three months on the
neurosurgical services, three months on critical care medical services (trauma, neuro,
surgical ICU), two months on neurology, and one month on trauma and emergency
room services. This year continues to evolve as we optimize the introductory experience
in neurosurgery. It is designed to optimize performance for the next year, when full inte-
gration into patient care teams is accomplished.

• PGY-2
The PGY-2 year represents an in-depth introductory year to clinical neurosurgery and
emphasizes critical care, basic operative techniques, and initial clinical decision mak-
ing. The department emphasizes the importance of the flow of information and com-
munication between residents, senior residents and responsible faculty. PGY-2 residents
routinely spend a block of three months on the cranial service, three months at UPMC
Mercy, three months on the pediatric service (Children’s Hospital of Pittsburgh of
UPMC) and three months on the trauma service.

Most junior residents participate in more than 250 neurosurgical procedures during
their first year. PGY-2 residents will complete basic training in many procedures, such as
lumbar puncture, external ventricular drain placement, intracranial pressure monitor in-
sertions and placement of cerebral blood flow technologies such as Licox tissue oxygen-
ation monitors. Initial case experience includes the selection and identification
of patients who will undergo craniotomy, routine spinal procedures and trauma cases.

Clinical judgment is enhanced by spending an average of one day per week in the physi-
cian outpatient office. Numerous midlevel providers, including physician assistants and
nurse practitioners, provide support both on the hospital floors and in the outpatient
clinics.

• PGY-3
The PGY-3 year emphasizes clinical experience in vascular neurosurgery (an initial
introduction to endovascular and exovascular techniques), neuropathology and image-
guided surgery (including stereotactic radiosurgery and functional neurosurgery) and
neuro-oncology at UPMC Shadyside.

During the PGY-3 year, residents have a greater opportunity to consolidate their knowledge
and to maximize supplemental reading and clinical reviews in preparation for a practice
run of the written board examination (American Board of Neurological Surgery). This test is
taken for practice in March of the PGY-3 year. Attendance at a training course in stereotactic
radiosurgery, as well as initial experience in movement disorder, pain surgery and neuro-
oncological surgery are obtained during this year. Each fall, PGY-3 residents also attend
the annual Research Update in Neuroscience for Neurosurgeons (RUNN) course at Woods
Hole, Mass. This course provides an update on exciting developments in neuroscience and is
intended to catalyze residents to pursue neuroscience basic or clinical research.
Education Programs

- **PGY-4**
  In the PGY-4 year, senior residents in neurological surgery will gain additional critical experience in multiple cranial and spinal cases in order to reach the next set of milestones in their education. Consolidation of medical knowledge, enhanced patient care skills and intense practice-based learning will occur in this year. PGY-4 residents spend a significant portion of their time in the operating room. Increasingly difficult procedures are assigned to senior residents and include complex spinal procedures with instrumentation, craniotomies for intra-axial tumors, meningiomas and posterior fossa surgery. Residents spend nine months on the adult service and three months as senior resident on the pediatric service. Typically a senior resident participates in between 400 and 500 cases per year.

- **PGY-5**
  The PGY-5 block provides a total of nine months of focused career development opportunities for senior residents. During this time, residents will spend three as the chief resident at the VA Pittsburgh Healthcare System where they will gain additional surgical and service management skills. During this time, residents take the ABNS training exam for credit. All residents must pass the exam in order to graduate. The departmental target goal is a performance on the written boards at or above the 50th percentile.

  The remaining time is flexibly designed for residents to actively pursue clinical or research-focused subspecialty training, along with investigations on topics that will eventually foster their subsequent career and provide benefit to the future course of neurosurgery. There are two paths for trainees in the PGY-5: the Clinical Investigator Path and the Surgeon Scientist Investigator Path:

  **Clinical Investigator Path:**

  The clinical investigator path includes an 18-month period of time during the PGY-5 and PGY-6 year for focused subspecialty training. Residents must identify a primary mentor during the PGY-4 year. The resident in this path must have identified a clinical subspecialty focus that will supplement career development and submit an internal funding grant request (Copeland Grant) on a clinical topic. The resident must complete and submit four to six publications in peer-reviewed journals during this interval of time. Residents also will participate in the Clinical and Translational Science Institute (CTSI) Seminar Series. Residents are expected to present at the AANS (American Association of Neurological Surgeons), CNS (Congress of Neurological Surgeons) or subsection meetings relative to their clinical or scientific work.

  **Surgeon Scientist Investigator Path:**

  During this interval of time, residents have between 18-20 months to further develop an academic research career, working in a functional and dedicated laboratory. Residents must identify a primary mentor during their PGY-4 year. They are expected to submit a Copeland Grant during their PGY-4 year on their research topic of choice. Residents in this path are able to submit for a national grant using existing mechanisms from the AANS, CNS, foundations or industry. Residents are expected to submit four to six peer-reviewed journal articles during this time. Residents also will have the opportunity to gain a master of science degree but must begin this process one year in advance. Selected residents who wish to obtain a PhD will be fully evaluated for this opportunity but must dedicate additional blocks of training time after they complete the residency training in order to complete such an advanced degree. All residents are expected to present their work at one or more national scientific meetings. During their PGY-6 year,
residents are freed from responsibility from both outpatient and operating room coverage, except for elective and approved moonlighting performed on the UPMC Presbyterian neurological surgery service.

The University of Pittsburgh provides a wide spectrum of faculty mentors and opportunities for research in neurosurgery, neurology, neuroscience, psychiatry, physical medicine and rehabilitation, neuro-imaging, neuropathology, bioengineering, public health, and regenerative medicine (McGowan Institute of Regenerative Medicine). Research may be funded from numerous sources, including the Walter Copeland Fund of the department (which is administered by The Pittsburgh Foundation). Residents in the department’s program have competed successfully for AANS, CNS and American College of Surgeons grants. All residents are expected to write scientific papers and to supplement this with additional book chapters. Residents are expected to learn the principals of investigation under the supervision of faculty mentors.

Residents at all levels are expected to attend the departmental teaching conferences, which are mandatory. Neurosurgical knowledge is gauged by performance on written boards, as well as by semi-annual written evaluations and meetings. Each year a promotion to the next level of training is determined by the departmental competency review committee.

• PGY-6
PGY-6 residents return to the service as residents on the clinical services at UPMC Presbyterian, UPMC Shadyside, UPMC Mercy, and in selected cases at UPMC Children’s Hospital of Pittsburgh. Coverage responsibilities include chief of the cranial service, the spinal service and the trauma service. On average, chief residents perform 400-500 major cases during PGY-6, such as clipping of aneurysms, skull-based tumors, complex spine surgery, and posterior fossa surgery. As future practitioners of neurosurgery, they also learn responsibilities of clinical oversight of the service that they are leading. They serve as primary instructors to the younger residents. By the time of their completion of the chief year, residents often have performed more than 1500 neurosurgical procedures as monitored by the ACGME online Accreditation Data System (ADS) database.

• PGY-7
Completing the case log requirements and skill set acquisition in the PGY-6 year allows residents to pursue subspeciality clinical or research training in their last year of clinical neurosurgery before final graduation in June. Selected infolded fellowship opportunities exist in spine (CAST approved), skull base, endovascular (CAST approved), and stereotactic-functional (CAST approved) training. For selected residents pursuing the surgeon scientist pathway, further research opportunities as well as mentoring for grant submission can be pursued.

• General
Residents in this program have a particularly unique experience in microneurosurgery, pediatric, endoscopic, and image-guided neurosurgery including radiosurgery. In addition to daily teaching rounds, led by individual members of the department faculty, the department holds a series of weekly resident conferences and review lectures to discuss specific neurosurgical concepts, techniques, problems and solutions. Both faculty and residents are regular participants in these programs, many of which include formal didactic presentations. The training program includes the following faculty/resident conference:

  Multidisciplinary Brain Tumor Board (weekly)
  Chairman’s Conference (twice monthly)
  Faculty Teaching Conference (weekly)
Education Programs

- Image-Guided/Radiosurgery Conference (weekly)
- Written Boards Preparation Conference
- Patient Care Conference (weekly)
- Pediatric Neurosurgical Conference (twice weekly)
- Pituitary Conference (quarterly)
- Skull Base Conference (weekly)
- Residents’ Conference (weekly)
- Visiting Professor Series (four to six per year)

The chief residents present the weekly patient care conference. Each resident also presents one or more annual 30-minute lectures on basic neurosurgical topics or recent research. To teach the skills required for the oral boards, several conferences use a board-simulated approach to presented cases. At least four times per year, an internationally known neurosurgeon serves as a lecturer and visiting professor. The visiting professor also reviews interesting cases with the residents and attends a journal club.

Trainees have been extremely productive during their clinical and non-clinical years. They commonly have five to 10 publications in refereed journals and multiple presentations at national meetings by the completion of their residency.

Since 1980, residents in the department have been awarded three Congress of Neurological Surgeons Preuss Awards for brain tumor research, two CNS clinical fellowships, American College of Surgeons research scholarships, the CNS Margot Anderson Foundation Fellowship in Brain Restoration Research, and two CNS Wilder Penfield Clinical Investigation Fellowships. Six University of Pittsburgh residents have received the Van Wagenen Fellowship, a prestigious award given annually by the American Association of Neurological Surgeons to a North American neurosurgical resident who is graduating that year. At each annual meeting, residents and faculty often receive named awards for their abstract presentations.

Given the extensive experience in microneurosurgery, skull base surgery, endovascular surgery, endoscopic surgery, and image-guided neurosurgery, many residents no longer require post residency fellowships and entered directly into academic or private practice. Residents who want to have a career focus in pediatric neurosurgery obtain prestigious fellowships at other institutions prior to beginning their neurosurgical careers.

Although the program’s focus is on training academic neurosurgeons interested in clinical and basic science research, it has produced many outstanding private practice neurosurgeons as well. Half of the department’s graduates in the last 25 years serve as full-time academic faculty members, and 25 percent have clinical affiliations with academic institutions.

- Neurosurgery Residency Research Opportunities

  Comprehensive programs in basic science and clinical research are conducted by department faculty along with investigators throughout the university community. Current research projects include:

  - Animal Models of Epilepsy
  - Clinical and Basic Science Head Injury Program
  - Computer-Image Integration into Surgical Planning
  - Brain Tumor Research
  - Intracranial Blood Flow and Saccular Aneurysm Formation
  - Clinical Outcomes of Radiosurgery
  - Research in Spinal Tumors and Spine Biomechanics
Basic science and clinical research projects are an integral part of department faculty and trainee activities. Most residents spend 18-24 months working on such projects. Local, regional and national peer-reviewed funding resources continue to grow and support productive basic and clinical research. Internal funding from the Walter Copeland Fund provides seed money for many unique and fascinating projects undertaken by residents and faculty. In many cases these projects subsequently receive extramural research funding.

**Neurosurgery Residency Special Features**
The Department of Neurological Surgery at the University of Pittsburgh has created a unique environment where centers of excellence flourish. The goals are to provide outstanding neurosurgical patient care, to promote education, and to perform clinical and basic science research. This group of dedicated individuals, including faculty, residents, and staff, is one of the most productive departments in the world.

These accomplishments in both patient care and research have resulted in numerous publications. Each year, more than 200 refereed articles, abstracts, proceedings, book chapters, and books are published by this department. Special features include:

- Clinical and Laboratory Program for the Surgery of Cranial Nerve Disorders
- Comprehensive Spine Surgery Center
- Endoscopic Endonasal and Skull Base Surgery
- Frameless Stereotactic Equipment (multiple technologies)
- Magnetic Resonance Spectroscopy
- Microsurgical Laboratory
- Microelectrode Recording System
- Laboratory for the Development and Evaluation of New Surgical Techniques
- Two Gamma Knife Radiosurgical Suites
- Spinal Radiosurgery
- State-of-the-Art Neuroimaging:
  - CT and MRI angiography
  - High Definition Fiber Tractography
  - Functional MRI, MRS
  - Magnetoencephalography
  - PET
  - MR Research Center
  - Intraoperative CT Imaging (Dedicated OR Suite)

The coordinator of the department’s medical education program is Melissa Lukehart. Raymond F. Sekula Jr, MD, is the department’s residency director, succeeding L. Dade Lunsford, MD, on July 1, 2020.

**Teaching Awards**
Annual departmental teaching awards are given to the best faculty teacher (selected by the residents) and to the best resident teacher (selected by faculty). In 2019-20, the faculty award was given to D. Kojo Hamilton, MD. The resident honor was given to Benjamin Zussman, MD.
Education Programs

Continuing Medical Education
Department faculty take an active role in national and regional continuing education programs. Course presentations are given every year at the annual meetings of both the Congress of Neurological Surgeons and the American Association of Neurological Surgeons. In addition, physicians of several department centers provide institutional training to other physicians throughout the world.

Professional Courses
*Principles and Practice of Gamma Knife Surgery*, detailing the practical aspects of stereotactic radiosurgery using the Leksell Gamma Knife, is co-directed by Drs. L. Dade Lunsford, John C. Flickinger and Ajay Niranjan. Principles of medical physics and radiobiology as they apply to single-session, focused, small-volume irradiation are covered. Patient selection techniques, didactic course presentations, and hands on computer skills are provided. More than 2,500 professionals from across the world have been trained in more than 120 courses during the past 20+ years. Course graduates are able to create radiosurgery dose plans for brain tumors, vascular malformations and trigeminal neuralgia. The week-long course is offered six times per year. Beginning in July of 2020 the course will be offered online.

The Center for Image-Guided Neurosurgery faculty and staff presents *Gamma Knife Radiosurgery Training for Nurses*, a basic training course geared for nurses and other allied health personnel. The course covers device management, patient preparation, patient education, neuroimaging and post-radiosurgery care related to the Gamma Knife.

*Comprehensive Endoscopic Endonasal Surgery of the Skull Base*, co-directed by Carl Snyderman, MD, MBA, Paul Gardner, MD, and Eric Wang, MD, demonstrates minimally invasive techniques for endoscopic endonasal surgery of the ventral skull base. The anatomical and technical aspects of this procedure—along with the risks, benefits and outcomes—are presented via didactic lectures, prosections, hands-on anatomical dissection, and live demonstration surgeries. This four-day course is designed for neurosurgeons, otolaryngologists, head and neck surgeons, and senior level residents, and is presented twice a year.

*Complex Endoscopic Endonasal Surgery of the Skull Base*, co-directed by Carl Snyderman, MD, MBA, Paul Gardner, MD, and Eric Wang, MD, highlights both surgical decision-making and advanced techniques in endoscopic endonasal skull base surgery (training levels 3-5). The course directors lead interactive case-based discussions, prosections, and hands-on anatomical dissection on the indications, limitations and technical nuances of these approaches by anatomical site. This three-day course is offered once a year and is designed for experienced endoscopic skull base teams.

*Principles and Practice of Intraoperative Neuromonitoring*, co-directed by Partha Thirumala, MD, and Jeffrey Balzer, PhD, is designed for advanced professionals who perform or support intraoperative neuromonitoring (IONM) procedures. The course highlights practice specifications, multimodality protocols, recent advances in the field, pre-/post-operative neurological evaluation, and telemedicine in IONM.

Stuart Rowe Society Lectureship and Research Day
On October 16, 2019, the department hosted the 15th annual Stuart Rowe Society Lectureship and Research Day. The event is intended to showcase research activities in the field of neurological surgery and provide a forum for discussion.

During this day, a series of talks are presented by department residents, each spotlighting a topical research issue relevant in the field. These talks are followed by discussion, moderated by
Education Programs

a special honored visiting professor prominent in the field of neurosurgery. The 2018 honored
guest was Mika Niemelä, MD, PhD, professor and chairman of neurosurgery at Helsinki University
Hospital in Finland and an international expert in cerebrovascular diseases, brain and spine
tumors, and brain aneurysms.

The visiting professor also selects a “best presentation” award, presented later in the evening at
a special dinner and reception. For 2019, PGY-4 resident Kamil Nowicki, MD, PhD, received the
best presentation award for his talk, "Blockade of the Platelet-Driven CXCL7-CXCR1/2 Pathway
Prevents Cerebral Aneurysm Formation." It was the second year in a row that Dr. Nowicki took
home top honors for a talk on this platelet topic. Receiving the second place award was PGY-6
resident Jeremy Stone, MD, for his talk on "Transradial Versus Transfemoral Approaches for
Diagnostic Cerebral Angiography: A Prospective Comparative Effectiveness Study."

This spotlight on research was a principle first emphasized by Stuart Niles Rowe, MD, the first
formally-trained neurosurgeon to practice in Pittsburgh. Rowe is widely considered the founding
figure of neurosurgery training in the city, establishing the base of what would later become the
University of Pittsburgh Department of Neurological Surgery.

Rowe believed that neurosurgery training should not only teach exceptional technique, but also
the critical clinical decision-making skills necessary to succeed. He preached the underlying
need for thorough literature review and independent research as a means for broadening clinical
knowledge.

Peter J. Jannetta Lecture

The Peter J. Jannetta Lecture—focusing on innovations in the field of neurosurgery—is
held annually in honor of the former, long-time chairman of the University of Pittsburgh
Department of Neurological Surgery. Dr. Jannetta was internationally acclaimed for his
development of microvascular decompression (MVD), an innovative procedure that moved
blood vessels away from the trigeminal nerve, alleviating chronic pain and spasms in facial
muscles. The procedure became commonly known as the 'Jannetta Procedure' around the
world and brought relief to thousands. Unfortunately, the Jannetta Lecture for 2019-20 was
canceled due to COVID-19 pandemic concerns.
**Education Programs**

**Visiting Professor Lecture Series**
Throughout the year, the department hosts prominent figures in the field of neurological surgery lecturing on their areas of interest. These visiting professors will also participate in journal clubs and patient care conferences throughout the day, discussing interesting papers and cases with faculty, residents and staff.

**Fridays with Friedlander**
*Fridays with Friedlander* is a weekly live webcast hosted by department chairman Robert M. Friedlander, MD, initiated in April of 2020. The webcasts feature Dr. Friedlander presenting updates on topical neurological surgery issues, and spotlight a different department faculty member each week, giving 30-minute talks on their specialty—followed by a Q&A session.

*(left) Department chairman Robert Friedlander offers insights into COVID-19 during the inaugural Fridays with Friedlander webcast on April 17, 2020; (right) Paul Gardner answers questions after his talk on endoscopic endonasal brain surgery during his appearance on the webcast.*

**Other Postgraduate Education**
The Department of Neurological Surgery participates in the education of house staff of other departments, including surgery, neurology, medicine (endocrinology) and emergency medicine. Educational endeavors include neuroscience conferences, general lectures on neurosurgical topics, and grand rounds. In addition, faculty takes part in the Department of Surgery’s Vascular Surgery Conference and provides speakers for the Critical Care Medicine Lecture Series.

**Neurocirugía en UPMC**
The Department of Neurological Surgery maintains a Spanish-language website at upmc.com/Services/neurosurgery/spanish/Pages/default.aspx to serve, educate and provide important information for Spanish-speaking visitors.
First Sports Med Fellowship Established

In what is considered the first such program of its kind in the nation, the University of Pittsburgh Department of Neurological Surgery has created a three-month sports medicine fellowship for residents. Fifth-year resident Enyinna Nwachuku, MD, served the first fellowship that included rotations with the Pittsburgh Steelers, the Pittsburgh Penguins and other area sports programs.

Sports medicine and brain and spine injury expert Vincent Miele, MD, was the driving force in establishing the fellowship with input from sports medicine expert Joseph Maroon, MD, long-time team neurosurgeon for the Pittsburgh Steelers. Fifth-year resident Nima Alan, MD, also played a critical role in the development of the program.

"Because of the Department of Neurological Surgery's close connection to sports and the area's teams and athletes—our department currently has five faculty with direct involvement in professional sports teams in the city—the opportunity to develop a fellowship in sports neurosurgery was a perfect fit and the next logical step in training and care," Dr. Miele said.

"This fellowship will provide an excellent opportunity for interested residents to spend a dedicated period of their training with neurosurgeons that subspecialize in sports and would be the first such program nationally. Residents would also have the opportunity to rotate with other specialties such as neuropsychology, orthopedics, and athletic training. These rotations would allow the participant to experience how these specialties approach mutual pathologies that we treat as a team.

"For over a century, neurological surgeons have been involved in the medical management of athletes. This includes the direct treatment of injuries to the brain, spine and spinal column, and peripheral nerves. Our specialty, unlike any other, has the ability to address pathology in all of these areas."

Dr. Miele and Daniel Wecht, MD, are the fellowship's directors, and Dr. Maroon will provide funds for research, a mandatory part of the fellowship.
Faculty Biographies
Taylor Abel, MD
Assistant Professor
Surgical Director, Pediatric Epilepsy Surgery Program

Taylor Abel, MD, is a pediatric neurosurgeon specializing in epilepsy surgery. He is surgical director of the Pediatric Epilepsy Surgery Program at UPMC Children’s Hospital of Pittsburgh. Dr. Abel is from Seattle, Wash. and completed his undergraduate and medical education at the University of Washington. After his medical education in Seattle, Dr. Abel completed neurosurgery residency at the University of Iowa, where he received specialized training in epilepsy surgery and brain mapping techniques. At Iowa, Dr. Abel completed an NIH-funded postdoctoral fellowship—receiving the Ruth L. Kirschstein National Research Service Award—focusing on electrophysiologic mechanisms of face and voice identification in the temporal lobe. Dr. Abel’s focus is pediatric epilepsy surgery and general pediatric neurosurgery. He completed a fellowship in epilepsy surgery and deep brain stimulation with Philippe Kahane, Dominique Hoffmann, and Stephan Chabardes at University Hospital of Grenoble in Grenoble, France. In Grenoble, Dr. Abel received special training in identification of epileptic foci using stereoelectroencephalography and use of the ROSA robot for epilepsy surgery. Dr. Abel then completed a pediatric neurosurgery fellowship with Jim Drake and Jim Rutka at The Hospital for Sick Children in Toronto, Canada focusing on epilepsy surgery, neuro-oncologic surgery, craniofacial surgery, and endoscopic techniques.

Specialized Areas of Interest
Pediatric epilepsy surgery; pediatric stereotactic and functional neurosurgery; general pediatric neurosurgery.

Hospital Privileges
UPMC Children’s Hospital of Pittsburgh
UPMC Magee-Womens Hospital
UPMC Presbyterian

Professional Organization Membership
American Association of Neurological Surgeons
American Epilepsy Society
Congress of Neurological Surgeons
International League Against Epilepsy
Joint Section on Pediatric Neurosurgery (AANS/CNS)

Education & Training
BS, Neurobiology, University of Washington, 2005
MD, University of Washington School of Medicine, 2010
Residency, University of Iowa Hospitals and Clinics, 2016
Fellowship, University of Iowa Hospitals and Clinics, 2016
Fellowship, Epilepsy Surgery, Centre Hospitalier Grenoble, Grenoble, France, 2017
Fellowship, Pediatric Neurosurgery, Hospital for Sick Children, Toronto, Canada, 2018

Editorial Service
• Ad Hoc Reviewer:
  Epilepsy
  JAMA Neurology
  Epileptic Disorders
Taylor Abel, MD

Faculty Biographies

Interdepartmental and Medical Center Activities
• UPMC Children’s Hospital of Pittsburgh:
  Neurosurgery Trauma Liaison
  Neurosurgery PICU Liaison

• University of Pittsburgh:
  Institutional Review Board

Professional Activities
Executive Board, International League Against Epilepsy North America
Young Epilepsy Section, North American Representative, International League Against Epilepsy North America
Task Force on Research Advocacy and Priorities, International League Against Epilepsy Guidelines Committee, AANS/CNS Joint Section on Pediatric Neurosurgery
Scientific Organizing Committee, 2020 ILAE North America Regional Congress
Scientific Review Committee, American Epilepsy Society

Honors and Awards
Robin and Judith Humphreys Fellowship in Pediatric Neurosurgery, 2017-18
NIH Clinical Research LRP Award, 2014-16
NIH Ruth L. Kirschstein National Research Service Award, 2014
Neurosurgery Resident Award, AANS/CNS Section on Stereotactic and Functional, 2014
Mary Gates Research Scholar, 2005

Media Appearances: 2019-20
“Learn About Epilepsy Research with Dr. Taylor Abel,” April 10, 2020, That’s Pediatrics podcast.

Publications: 2019-20
• Refereed Articles:


• Letters to the Editor:

Faculty Biographies

Taylor Abel, MD

Invited Lectures: 2019-20
• National:


• Local/Regional:

Sameer Agnihotri, PhD
Assistant Professor
Director, Brain Tumor Biology and Therapy Lab

Sameer Agnihotri, PhD, joined the faculty of the Department of Neurological Surgery at UPMC Children’s Hospital of Pittsburgh in November of 2016. Dr. Agnihotri graduated from the University of Toronto in 2005 with a bachelor of science honors degree in biology, specializing in genetics. He earned his PhD in medical biophysics in 2011 from the University of Toronto where he used genetic screens to identify novel drivers of glioblastoma, an incurable brain tumor. He subsequently completed his post-doctoral fellowship at the Arthur and Sonia Labatt Brain Tumor Research Centre at the Hospital for Sick Children, in Toronto, and the Princess Margaret Cancer Centre, Division of Neuro-oncology Research, also in Toronto.

Specialized Areas of Interest
Pediatric and adult high-grade gliomas.

Professional Organization Membership
Children’s Brain Tumor Consortium
Society of Neuro-Oncology

Education & Training
BSc, (hons), Biology, University of Toronto, 2005
PhD, Medical Biophysics, University of Toronto, 2011
Fellowship, Hospital for Sick Children, Toronto, 2016
Fellowship, Princess Margaret Cancer Centre, Toronto, 2016

Editorial Service
• Editorial Board:
  Frontiers in Genetics
  Journal Archirum Immunologiae et Therapiae Experimentalis (AITE)
  Translational Neuroscience

• Ad Hoc Reviewer:
  Cancer Research
  Neuro-oncology

Professional Activities
Scientific Committee, Children’s Brain Tumor Tissue Consortium
Membership Committee, Society of Neuro-oncology.
**Honors and Awards**

Children's Trust and Children's Hospital of Pittsburgh Young Investigator Award, 2017
Marlene Reimer Brain Star Award, 2016
Post-Doctoral Scholarship, Canadian Institute of Health Resources (CIHR), 2013-16
Trainee of the Year, Hospital for Sick Children, 2014
Young Investigator Award in Basic/Translational Research, Canadian Neuro-Oncology, 2014
Lucien J. Rubinstein Award, American Brain Tumor Association, 2013
Wolfgang Vogel Memorial Award, University of Toronto, 2013
Young Investigator Travel Award, Society of Neuro-Oncology, 2012
Graduate Student Scholarship, Ontario Institute for Cancer Research, 2009
Young Investigator Award in Pediatric Brain Tumour Research, Pediatric Brain Tumor Research Foundation, 2007

**Publications: 2019-20**

- **Refereed Articles:**


- **Invited Papers:**


**Invited Lectures: 2019-20**

- **Virtual:**

  Agnihotri S. “Slowing the Growth of Brain Tumors: Do Genetics, Sugar and Protein Hold the Answers?” *Fridays with Friedlander*, Department of Neurological Surgery, University of Pittsburgh, June 19, 2019.

- **Visiting Professorships:**

  University of Michigan, Department of Pathology University of Michigan, Ann Arbor, Mich.: “MAPKing pathways and filling in the GAPS for RAS signaling in high-grade gliomas.” October 9, 2019.
Nduka Amankulor, MD
Assistant Professor
Director, Adult Neurosurgical Oncology

Nduka Amankulor, MD, a specialist in the surgical treatment of complex brain and spine tumors, joined the Department of Neurological Surgery in June of 2012. Dr. Amankulor received his medical degree and neurosurgical training from the Yale University School of Medicine. He then completed a clinical fellowship in neurosurgical oncology at Memorial Sloan-Kettering Cancer Center in New York. In addition to his clinical practice, Dr. Amankulor is a cancer biologist and immunologist engaged in developing new therapeutic strategies for primary (diffuse gliomas and GBM) and metastatic brain tumors.

Specialized Areas of Interest
Surgical treatment of complex brain and spine tumors.

Board Certifications
American Board of Neurological Surgery

Hospital Privileges
UPMC Hamot
UPMC Mercy
UPMC Presbyterian
UPMC Shadyside

Professional Organization Membership
American Association of Neurological Surgeons
Congress of Neurological Surgeons
Society for Neuro-Oncology

Professional Activities
Scientific Program Director, 2019 Congress of Neurological Section Tumor Section Meeting

Education & Training
BA, Philosophy, New York University, 1998
MD, Yale School of Medicine, 2004
Residency, Yale School of Medicine, 2011
Fellowship, Neurosurgical Oncology, Memorial Sloan-Kettering Cancer Center, 2012

Editorial Service
• Editorial Board:
  Frontiers in Radiation Oncology
  Neurosurgery

• Ad Hoc Reviewer:
  Journal of Immunotherapy
  Journal of the National Cancer Institute
  Microvascular Research
  Nature Communications
  Neurosurgery
  World Neurosurgery
Honors and Awards
Hillman Clinician-Scientist Fellow for Innovative Cancer Research, 2020
Pittsburgh Best Doctors, Pittsburgh Magazine, 2019-20
Mark Foundation ASPIRE Award, 2019
Hank Karp Award, 2017
University of Pittsburgh Physicians Foundation Scholar, 2016
Leo H. Crip Executive Excellence in Patient Care Award University of Pittsburgh, 2015
Best Oral Presentation Award, Tumor Biology Session, 20th Annual Scientific Meeting and
Education Day of the Society for Neuro-Oncology (SNO), 2015

Media Appearances: 2019-20

Publications: 2019-20
• Refereed Articles:

Invited Lectures: 2019-20
• Virtual:
  Amankulor N. “Not All That Glitters Is Gold: The Surgical and Scientific Quandaries of Low-Grade Gliomas.” Fridays with Friedlander, Department of Neurological Surgery, University of Pittsburgh, June 12, 2019.

Katherine M. Anetakis, MD
Assistant Professor

Katherine M. Anetakis, MD joined the University of Pittsburgh Center of Clinical Neurophysiology in July of 2017. She specializes in intraoperative neurophysiological monitoring to adult and pediatric neurosurgical, orthopedic, ENT, vascular, and interventional neuroradiology procedures, as well as motor and language mapping during awake craniotomies. Dr. Anetakis completed her pediatric neurology residency and clinical neurophysiology fellowship at Children’s Hospital of Pittsburgh of UPMC. Her fellowship concentrations included pediatric epilepsy as well as intraoperative neuromonitoring.
Katherine M. Anetakis, MD

**Specialized Areas of Interest**
Intraoperative neurophysiological monitoring.

**Board Certifications**
- American Board of Psychiatry and Neurology: Special Qualifications in Child Neurology
- American Board of Psychiatry and Neurology: Subspecialty in Clinical Neurophysiology

**Hospital Privileges**
- Armstrong County Memorial Hospital
- JC Blair Memorial Hospital
- Excela Health Hospital System
- Indiana Regional Medical Center
- Monongahela Valley Hospital
- Trinity Health System
- UPMC Altoona
- UPMC Bedford
- UPMC Children’s Hospital of Pittsburgh
- UPMC Cranberry
- UPMC East
- UPMC Greenville
- UPMC Hamot
- UPMC Harrisburg
- UPMC Horizon
- UPMC Jameson
- UPMC Magee-Womens Hospital
- UPMC McKeesport
- UPMC Mercy
- UPMC Northwest
- UPMC Passavant
- UPMC Presbyterian
- UPMC St. Margaret
- UPMC Shadyside
- UPMC Shenango
- UPMC Somerset
- UPMC Susquehanna

**Professional Organization Membership**
- American Academy of Neurology
- American Clinical Neurophysiology Society

**Education & Training**
- BS, Human Physiology, Michigan State University, 2007
- MD, University of Pittsburgh School of Medicine, 2011
- Residency, Pediatric Neurology, Children's Hospital of Pittsburgh, 2016
- Fellowship, Clinical Neurophysiology, UPMC, 2017

**Professional Activities**
- Course Lecturer, Principles and Practice of Intraoperative Monitoring, University of Pittsburgh Medical Center, October 2019.
Robert L. Bailey, MD

Clinical Assistant Professor

Robert L. Bailey, MD, joined the University of Pittsburgh Department of Neurological Surgery in January of 2019 as a clinical assistant professor. He received his medical degree from the University of Pennsylvania and completed his residency training at the University of Pennsylvania. He completed fellowship training at Wellington Regional Hospital in Wellington, New Zealand. Dr. Bailey specializes in the surgical management of degenerative spine disease of the cervical, thoracic and lumbar spine, utilizing both traditional methods as well as the latest minimally invasive approaches. He also specializes in the surgical removal of both primary and secondary tumors of the spine. Dr. Bailey works with primary care physicians, neurologists, pain management specialists and other clinicians to formulate an individualized treatment plan for his patients.

Specialized Area of Interest
Degenerative spine disease; spine tumors.

Hospital Privileges
- UPMC Mercy
- UPMC Passavant
- UPMC Presbyterian
- UPMC Shadyside

Professional Organization Membership
- American Association of Neurological Surgeons
- American Medical Association
- Congress of Neurological Surgeons
- Pennsylvania Neurological Society

Education & Training
- BA, Brigham Young University, 2004
- MD, University of Pennsylvania, 2009
- Fellowship, Wellington Regional Hospital, New Zealand, 2014
- Residency, University of Pennsylvania, 2016
Jeffrey Balzer, PhD
Associate Professor
Director, Clinical Services, Center for Clinical Neurophysiology
Director, Cerebral Blood Flow Laboratory

Jeffrey Balzer, PhD, is director of clinical operations and staff clinical neurophysiologist at the Center for Clinical Neurophysiology and director of the Cerebral Blood Flow Laboratory at the University of Pittsburgh Medical Center. His current research interests range from the utilization of genetic biomarkers for the prediction of delayed cerebral ischemia in subarachnoid hemorrhage to the effects of exercise on arterial stiffness and cerebral blood flow. Dr. Balzer received his undergraduate education at the University of Pittsburgh, where he also pursued a graduate education and a PhD in behavioral neuroscience. He is also the secretary/treasurer of the American Board of Neurophysiological Monitoring and is on the board of directors of the American Society of Neurophysiological Monitoring. He has published 110 refereed articles and 17 book chapters.

Specialized Areas of Interest
Intraoperative neurophysiological monitoring, subarachnoid hemorrhage, cerebral blood flow and effects of exercise on cerebrovascular function.

Board Certifications
American Board of Neurophysiological Monitoring

Hospital Privileges
Armstrong Regional Health System
Excela Health System
Monongahela Valley Hospital
UPMC Altoona
UPMC Children’s Hospital of Pittsburgh
UPMC Horizon
UPMC Jameson
UPMC McKeesport
UPMC Mercy
UPMC Passavant
UPMC Pinnacle
UPMC Presbyterian
UPMC St. Margaret’s
UPMC Shadyside
UPMC Susquehanna

Professional Organization Membership
American Clinical Neurophysiology Society
American Association for the Advancement of Science
American Society for Neurophysiological Monitoring (Fellow)
New York Academy of Sciences
Pittsburgh Neuroscience Society

Education & Training
BS, Behavioral Neuroscience, University of Pittsburgh, 1984
MS, Behavioral Neuroscience, University of Pittsburgh, 1989
PhD, Behavioral Neuroscience, University of Pittsburgh, 1994
Fellowship, Neurophysiology, University of Pittsburgh, 1994
Jeffrey Balzer, PhD

Editorial Service
• Editorial Board:
The Neurodiagnostic Journal

• Ad Hoc Reviewer:
  Analgesia and Anesthesia
  Journal of Clinical Neurophysiology
  Operative Neurosurgery
  Spine
  World Neurosurgery
  Journal of Clinical Computing and Monitoring

Interdepartmental and Medical Center Activities
• UPMC Presbyterian:
  Co-Director, Neurosurgical Resident’s Basic Science Course

Professional Activities
Co-Course Director, Principles and Practice of Intraoperative Monitoring, University of Pittsburgh Medical Center, October 2019.
Secretary/Treasurer, American Board of Neurophysiologic Monitoring
Board of Directors, American Society of Neurophysiological Monitoring

Publications: 2019-20
• Refereed Articles:

• Letters to the Editor:

• Book Chapters:
Facility Biographies

• Presentations:

Invited Lectures: 2019-20
• National:

• Virtual:


J. Brad Bellotte, MD
Clinical Assistant Professor
Chief, Neurosurgery, UPMC Hamot

J. Brad Bellotte, MD, is chief of neurosurgery at UPMC Hamot in Erie, Pa. He joined the University of Pittsburgh Department of Neurosurgery as a clinical assistant professor in July of 2011. Dr. Bellotte is a leading expert in complex spine surgery, including minimally invasive surgeries. He earned his medical degree from West Virginia University School of Medicine, and completed an internship in general surgery and a residency in neurosurgery at Allegheny General Hospital in Pittsburgh.

Specialized Areas of Interest
Complex spine surgery; brain surgery.

Board Certifications
American Board of Neurological Surgery

Hospital Privileges
UPMC Hamot

Professional Organization Membership
American Association of Neurological Surgeons
Congress of Neurological Surgeons
North American Spine Society
Pennsylvania State Neurosurgical Society

Education & Training
MD, West Virginia University, 1999
Residency, Neurosurgery, Allegheny General Hospital, 2005
Honors & Awards
Orthopedic Teaching Award, UPMC Hamot, 2011-12

Jeffrey Bost, PA-C
Clinic Instructor

Jeffrey Bost, PA-C, graduated with a BS in 1983 from Allegheny College and attended Community College of Allegheny County for his physician assistant degree. He began working with Joseph Maroon, MD, at Allegheny General Hospital in June of 1987 and moved to UPMC in 1999. He has 65 invited lectures, 55 national posters, 29 coordinated research projects, five workshops presentations, 35 refereed articles and 24 book chapters. He also co-wrote three books. Bost retired from the department in August of 2019.

Gregory N. Bowden, MD
Clinical Assistant Professor

Gregory N. Bowden, MD, joined the University of Pittsburgh Department of Neurological Surgery in July of 2016. He completed his neurosurgical training at the University of Western Ontario in 2015 and did two years of advanced fellowship training at the University of Pittsburgh. His specialist training involved Gamma Knife stereotactic radiosurgery and neuro-oncology. Dr. Bowden left the department in July of 2019.

Marco Capogrosso, PhD
Assistant Professor
Director, Spinal Cord Stimulation Laboratory

Marco Capogrosso, PhD, joined the University of Pittsburgh Department of Neurological Surgery as an assistant professor in January of 2020. He completed his doctoral studies in biomedical engineering and robotics at the Scuola Superiore Sant’Anna in Pisa, Italy. His doctorate work focused on the implementation of a computational framework to support the design of peripheral and central neural interfaces for sensory and motor applications. After the receiving his PhD, Dr. Capogrosso completed his post-doctoral training at the Ecole Polytechnique Fédérale de Lausanne, Switzerland where he worked on the development of brain spinal interfaces for the restoration of voluntary motor control in animal models of spinal cord injury. Before joining the University of Pittsburgh, he directed his own research group as a research faculty at the primate center of the University of Fribourg, Switzerland. Dr Capogrosso was part of the managing team of the multi-centric primate platform helping direct the activities of the platform and being responsible for the set-up of its laboratories.

Specialized Areas of Interest
Neuroprosthetics; computer models of electrical stimulation; arm paralysis; spinal cord injury; brain computer interfaces, motor control.

Professional Organization Membership
Society for Neuroscience

Education & Training
BA, Physics (cum laude) Università di Pisa, Italy, 2007
MS, Applied Physics (cum laude) Università di Pisa, Italy, 2009
PhD, Engineering, Institute of Biorobotics, Scuola Superiore Sant’Anna, 2013
Post-Doc, Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland, 2016
Marco Capogrosso, PhD

**Editorial Service**

- **Editorial Board:**
  *Scientific Reports*

- **Ad Hoc Reviewer:**
  *Journal of Neural Engineering*
  *NeuroImage*
  *PNAS*

**Honors and Awards**

- European Research Council Starting Grant Award, 2019
- Swiss National Science Foundation Ambizione Fellowship, 2016
- Finalist, Tomorrow’s PI Prize, Swiss Life Science Annual Meeting, 2015

**Publications: 2019-20**

- **Refereed Articles:**
  


- **Invited Lectures: 2019-20**

  - **National:**
    

  - **Virtual:**
    

Diane L. Carlisle, PhD

**Assistant Professor**

Diane Carlisle, PhD, joined the Department of Neurological Surgery in October 2010. She received her undergraduate degree in molecular biology from Washington and Jefferson College and her graduate degree in molecular and cellular oncology from George Washington University where she identified new signaling pathways involved in occupational causes of lung cancer. Dr. Carlisle came to the University of Pittsburgh after a postdoctoral fellowship at Johns Hopkins University under the mentorship of Robert Casero Jr., PhD, in drug development for lung cancer. She then developed an independent research program using stem cells to investigate adult disease. The mission of her laboratory is to use human pluripotent stem cells to model disease. She has an active program using stem cells generated from tissue samples donated by sporadic ALS patients and by Huntington’s Disease patients. By differ-
Diane L. Carlisle, PhD

entiating these cells into mature neurons, she is able to identify neurologic disease specific changes in mitochondrial function. In addition, she uses her expertise in pluripotent stem cell methods and directed differentiation to collaborate in her department, and across the university, in cross disciplinary projects that use pluripotent stem cell technologies. Dr. Carlisle serves as faculty and course coordinator of the NIH-funded stem cell course, Frontiers in Stem Cells and Regeneration, which is held annually at the Marine Biological Laboratories in Woods Hole, Mass.

Specialized Areas of Interest
Fetal basis for adult disease; use of stem cells for developmental modeling and drug discovery; amyotrophic lateral sclerosis (ALS); Huntington’s Disease.

Education & Training
BA, Biology, Washington & Jefferson College, 1994
PhD, Molecular and Cellular Oncology, George Washington University, 1999
Fellowship, Johns Hopkins University, 2001

Interdepartmental and Medical Center Activities
• University of Pittsburgh:
  Mentor, First Experiences in Research, University of Pittsburgh Dietrich School of Arts and Sciences

• Department of Neurological Surgery:
  Journal club organizer

Professional Activities
Faculty, Course Coordinator, Frontiers in Stem Cells and Regeneration Course, Marine Biological Laboratories, Woods Hole, Mass.

Publications: 2019-20
• Refereed Articles:
Invited Lectures: 2019-20
• National:

• Local/Regional:
  Carlisle DL. "Mitochondrial Dysfunction in Sporadic ALS." Live Like Lou Center for ALS Research Center, University of Pittsburgh Brain Institute, Pittsburgh, Pa., November 25, 2019.

Shaun W. Carlson, PhD
Research Assistant Professor

Shaun Carlson, PhD, joined the faculty of the Department of Neurological Surgery at UPMC Children's Hospital of Pittsburgh in October of 2017. Dr. Carlson graduated from the University of Kansas in 2007 with a bachelor of science degree in cell biology. He earned his PhD in physiology in 2013 from the University of Kentucky, studying the effects of traumatic brain injury on hippocampal neurogenesis and the efficacy of a growth factor based therapeutic approach to promote neurogenic plasticity and functional recovery after injury. He continued his training in 2013 as a postdoctoral fellow at the University of Pittsburgh Department of Neurological Surgery.

Specialized Areas of Interest
Mechanisms of synaptic dysfunction and plasticity and the identification of therapeutic approaches to promote recovery following brain injury.

Professional Organization Membership
American Heart Association
National Neurotrauma Society
Society for Neuroscience

Education & Training
BSc, Cell Biology, University of Kansas, 2007
PhD, Physiology, University of Kentucky, 2013
Postdoctoral Fellowship, Neurological Surgery, University of Pittsburgh, 2013-2017

Editorial Service
• Ad Hoc Reviewer:
  Acta Biomaterialia
  BMC Neuroscience
  Brain Research
  European Neuropsychopharmacology
  Frontiers Neurology, section Neurotrauma
  Frontiers Neuroscience, section Neurodegeneration
  Journal of Neurotrauma
  Neuroscience
  Neuroscience Insights
  PLoS One

Interdepartmental and Medical Center Activities
• University of Pittsburgh:
  IACUC Committee, University of Pittsburgh
  Chair, Safar Center for Resuscitation Research COVID Response Team
Shaun W. Carlson, PhD

Professional Activities

Honors and Awards
Ruth L. Kirschstein National Research Service Award (NIH), 2015-17
Nancy Caroline Fellow Award, Safar Center for Resuscitation Research, 2016
Murray Goldstein Award of Excellence, National Neurotrauma Symposium, 2013
Anthony Marmarou Award of Excellence, National Neurotrauma Symposium, 2012
Brian J. Hardin Award for Research, Department of Physiology, University of Kentucky, 2008

Publications: 2019-20

• Refereed Articles:

• Presentations:

Invited Lectures: 2019-20

• National:

• Local/Regional:
  Carlson SW. "Synaptic dysfunction as a therapeutic target after pediatric cardiac arrest." Children’s Hospital of Pittsburgh Foundation Young Investigator Award Presentation, Pittsburgh, Pa., May 28, 2020.

• Virtual:
Yue-Fang Chang, PhD
Research Associate Professor

Yue-Fang Chang, PhD, joined the Department of Neurological Surgery as a research associate in June of 2000. She received her doctoral degree in statistics from the University of Illinois and master degree in epidemiology from the University of Pittsburgh. Dr. Chang has worked in a variety of areas, such as brain tumor, traumatic brain injury, health outcome, neuroimaging study, women’s health and diabetes epidemiology. She serves as the statistician in several epidemiological studies including Cardiovascular Health Study, Women’s Health Initiative and Study of Women’s Health Across the Nation. Over the years she has been involved in numerous grant preparations, providing statistical expertise in design, analysis and power/sample size calculations.

Specialized Areas of Interest
Longitudinal data analysis; survival analysis; statistical computing; research methodology; injury epidemiology.

Education & Training
BS, Statistics, National Chung-Hsing University, Taiwan, 1984
MS, Statistics, University of Illinois at Urbana-Champaign, 1987
PhD, Statistics, University of Illinois at Urbana-Champaign, 1991
MPH, Epidemiology, University of Pittsburgh, 1994

Publications: 2019-20
• Refereed Articles:


**Donald J. Crammond, PhD**

*Associate Professor*

*Associate Director, Movement Disorder Surgery*

Donald Crammond, PhD, joined the Center for Clinical Neurophysiology as a staff neurophysiologist in November 1997. Dr. Crammond received his undergraduate education in physiology at the University of Glasgow in Scotland and his graduate education in neurophysiology at the University of Toronto. After postdoctoral studies at the University of Wisconsin and later at the Université de Montréal, he was appointed visiting associate scientist at the National Institute of Mental Health in Bethesda, Md. Dr. Crammond specializes in intra-operative neurophysiological monitoring (IONM) and in systems-level, behavioral neurophysiology, examining the neuronal substrates of higher cognitive processes such as movement planning and speech and the functional interactions between the cerebral cortex and basal ganglia, and the mechanisms underlying motor control and movement disorders. Dr. Crammond is the associate director for microelectrode recording and subcortical mapping for the Movement Disorder Surgery Program at UPMC. Dr. Crammond is the chairman of the American Board of Neurophysiologic Monitoring (ABNM).

**Specialized Areas of Interest**

The application of neurophysiological mapping in the surgical treatment of movement disorders, functional localization in cerebral cortex; motor system physiology, peripheral nerve regeneration and intraoperative neurophysiological monitoring (IONM).

**Board Certifications**

American Board of Neurophysiological Monitoring

**Hospital Privileges**

Armstrong County Memorial Hospital
Excelsa Health - Westmoreland and Latrobe Hospitals
UPMC Altoona
UPMC Bedford
UPMC Children's Hospital of Pittsburgh
UPMC East
UPMC Horizon
UPMC Magee-Womens Hospital
UPMC McKeesport
UPMC Mercy
UPMC Northwest
UPMC Passavant
Faculty Biographies

Donald J. Crammond, PhD

UPMC Passavant, Cranberry
UPMC Presbyterian
UPMC St. Margaret
UPMC Shadyside
UPMC Somerset
UPMC Susquehanna

Professional Organization Membership
American Clinical Neurophysiology Society
American Society for Neurophysiological Monitoring
Movement Disorder Society
Society for Neuroscience

Education & Training
BSc (Hons), Physiology, University of Glasgow, 1980
PhD, Neurophysiology, University of Toronto, 1988
Fellowship, Neurophysiology, University of Wisconsin, 1987
Fellowship, Neurophysiology, Université de Montreal, 1992
Fellowship, Clinical Neurophysiology, University of Pittsburgh, 1999

Editorial Service
• Ad Hoc Reviewer:
  Journal of Neurology, Neurosurgery and Psychiatry
  World Neurosurgery

Interdepartmental and Medical Center Activities
• Department of Neurological Surgery:
  Chair, Large Animal Research Protocol Review Committee

Professional Activities
Chairman, American Board of Neurophysiologic Monitoring
Education Committee, American Society of Neurophysiologic Monitoring

Publications: 2019-20
• Refereed Articles:


- **Book Chapters:**


**Invited Lectures: 2019-20**

- **Local/Regional:**

**C. Edward Dixon, PhD**
*Neurotrauma Chair Professor*
*Vice Chair, Research*
*Director, Brain Trauma Research Center*

C. Edward Dixon, PhD, received his PhD degree in physiological psychology from the Virginia Commonwealth University in 1985. That year, he was awarded a National Research Service Award for Postdoctoral Fellows by the National Institutes of Health and joined the Division of Neurological Surgery at the Medical College of Virginia. In 1986, he became a postdoctoral fellow in the Biomedical Science Department of the General Motors Technical Center in Warren, Mich. Dr. Dixon was named assistant professor in the Division of Neurosurgery at the Medical College of Virginia in 1987 and became an assistant professor in the Department of Neurological Surgery at the University of Texas Health Science Center in Houston in 1991. In 1995, he joined the Brain Trauma Research Center in the Department of Neurological Surgery at the University of Pittsburgh as associate professor. He became the director of the center in October 2002. Dr. Dixon received his adjunct faculty positions with the Department of Anesthesiology in 1995; the Department of Neurobiology in 2000 and the Department of Physical Medicine/Rehabilitation in 2003. In 2001, he became a co-director of the Safar Center for Resuscitative Research. In May of 2004, Dr. Dixon was named full professor of neurological surgery at the University of Pittsburgh and was later appointed vice chairman of research in the Department of Neurological Surgery in 2008. In 2011, Dr. Dixon was honored with one of the highest honors the university can present a faculty member when he was awarded The Neurotrauma Chair in Neurosurgery at the University of Pittsburgh. Dr. Dixon served as president of the National Neurotrauma Society for the 2002-2003 term and continued as councilor of the society for terms 2004-2007 and 2009-2012. He also has continued as a study section participant of several public and private grant review panels. His research has dealt primarily with mechanisms of post-traumatic memory deficits, rodent models of traumatic brain injury, and functional outcomes. Dr. Dixon has published 230 papers in refereed journals, two books (coeditor), 29 book chapters, and two editorials.
Specialized Areas of Interest
Mechanisms of induction and recovery of functional deficits following traumatic brain injury; neurotransmitter agonist therapies for recovery of post traumatic functional deficits; models of traumatic brain injury; clinical studies of pharmacotherapy.

Professional Organization Membership
American Association for the Advancement of Science
Congress of Neurological Surgeons
International Behavioral Neuroscience Society
International Neurotrauma Society
National Neurotrauma Society (Charter Member)
Pittsburgh Chapter of Society for Neuroscience
Society for Neuroscience

Education & Training
BA, Psychology, Virginia Commonwealth University, 1981
MS, Physiology/Psychology, Virginia Commonwealth University, 1984
PhD, Physiology/Psychology, Virginia Commonwealth University, 1985
NIH-NHRSA Fellow, Medical College of Virginia, 1986
Fellowship, General Motor Research Laboratories, 1987

Editorial Service
• Editorial Board:
  Frontiers in Neurotrauma
  International Neurochemistry
  Journal of Neurotrauma
  Metabolic Brain Disease
  Neural Regeneration Research

• Ad Hoc Reviewer:
  Brain Injury
  Brain Research
  Frontiers in Neurology
  Journal of Biomechanical Engineering
  Journal of Cerebral Blood Flow and Metabolism
  Journal of Neurochemistry
  Journal of Neurosurgery
  Journal of Neuroscience
  Journal of Neuroscience Methods
  Learning and Memory
  Neurobiology of Disease
  NeuroMolecular Medicine
  Neuropathology and Applied Neurobiology
  Neuroscience
  Pharmacology, Biochemistry, and Behavior
  PLOS
  Stroke
  Therapeutic Hypothermia and Temperature Management

Interdepartmental and Medical Center Activities
• University of Pittsburgh:
  Faculty Promotions Committee, Department of Neurosurgery
C. Edward Dixon, PhD

Faculty Biographies

Co-Chair, Research Executive Committee, Department of Neurosurgery
Director, Walter L. Copeland Neurosurgery Research Laboratories
Associate Director, Safar Center for Resuscitation Research, University of Pittsburgh
Graduate Faculty Member, Center for Neuroscience and Neurobiology Training Program
Training Faculty Member, NIH-NICHD Training Grant in Neurointensive Care Training Faculty
Member, Center for Neuroscience at the University of Pittsburgh

• Pittsburgh VA Healthcare System:
  Chair, Institutional Animal Care and Use Committee
  Member, R&D Committee
  Member, Research Scientific Evaluation Committee

Professional Activities
Co-Chair, NIH/NINDS, Working group for preclinical common data elements for TBI
Scientific Board Member, Texas Institute for Rehabilitation Research
Grant Reviewer, Congressionally Directed Medical Research Programs (CDMRP)
Study Section Member, Kentucky Spinal Cord & Head Injury Study Section
Member Conflict Panel, National Institute of Health.
Adult Review Team Member, Colorado TBI Trust Fund Research Grant Program.
Award Peer Review Panel Member, Department of Defense Psychological Health/Traumatic Brain Injury (PHTBI) Longterm Impact of Military-Relevant Brain Injury Consortium (LIMBIC).

Publications: 2019-20
• Refereed Articles:


Faculty Biographies

• Presentations:

Svirsky SE, Henchir J, Carlson SW Dixon CE. "Reduction of neurogranin protein expression after controlled cortical impact." Society for Neuroscience Annual Symposium, Chicago, Ill., October 19-23, 2019


Invited Lectures: 2019-20
• National:


• Local/Regional:

Matt El-Kadi, MD, PhD
Clinical Professor
Vice Chair
Chief, Neurosurgery, UPMC Passavant
Director, UPMC Passavant Spine Center

Matt El-Kadi, MD, PhD, FACS, joined the Department of Neurological Surgery as a clinical assistant professor in September of 1999. He became clinical associate professor in January 2003 and clinical professor in June 2006. He became vice chairman of the Department of Neurological Surgery in 2010 and has been chief of neurosurgery at UPMC Passavant since 2005. Dr. El-Kadi is also director of the UPMC Passavant Spine Center and is a member of the Tri-State Neurosurgical Associates. Dr. El-Kadi is board-certified in neurological surgery.
and has been nominated as one of Pittsburgh's best doctors in the region since 2012 and as one of the best doctors in America by Castle Connelly since 2009. He specializes in the treatment of complex spine disorders, including spinal fusion and instrumentation, and minimally invasive spinal surgery for both the cervical and lumbar spine, with a special interest in the removal of primary and secondary spinal tumors. He has authored seven books and book chapters and has over 100 publications in circulation. He is an active participant in professional societies. Before joining UPMC, Dr. El-Kadi received training in complex spinal surgery at Allegheny General Hospital in Pittsburgh. He completed his neurosurgery residency training at West Virginia University and a one-year clinical fellowship in neurosurgery at Hartford Hospital, University of Connecticut. Dr. El-Kadi began his surgical career doing brain surgery. The minimally invasive and microscopic techniques used then on the brain have served him well as a spine surgeon for minimally invasive approaches and has been reflected in his patients' shorter hospital stays and good outcome.

**Specialized Areas of Interest**
Minimally invasive spine surgery; complex spine disorders; spinal stabilization; spinal tumors.

**Board Certifications**
American Board of Neurological Surgeons

**Hospital Privileges**
Grove City Medical Center
Heritage Valley Hospital, Sewickley
UPMC Mercy
UPMC Passavant
UPMC Presbyterian
The Washington Hospital

**Professional Organization Membership**
Allegheny County Medical Society
American Academy of Anti-Aging Medicine
American Association of Neurological Surgeons
American Medical Association
Congress of Neurological Surgeons
International Spinal Injections Society
North American Spine Society
Ohio County Medical Society
Pennsylvania Medical Society
Pennsylvania Neurosurgical Society

**Education & Training**
MD, Second Moscow State Pirogov Medical Institute, 1983
Residency, Neurosurgery, Burdenko Neurosurgical Institute, 1989
Fellowship, Brain Tumor Research, LAC + USC Medical Center, 1992
Internship, Cranial Surgery, LAC + USC Medical Center, 1993
Fellowship, Neurosurgery, University of Connecticut, 1994
Fellowship, Neurosurgery, Allegheny General Hospital, 1998
Residency, Neurosurgery, West Virginia University, 1999
Salem El-Zuway, MD, FRCSC, FAANS

Clinical Assistant Professor

Salem El-Zuway, MD, FRCSC, FAANS, is a board certified neurosurgeon by the Royal College of Physicians and Surgeons of Canada. He received his medical degree from the University of Garyounis in Libya. He completed his neurosurgery residency training at McMaster University in Canada followed by a neuro spine fellowship at Hamilton Health Sciences in Hamilton, Canada, with another year of complex spine/trauma fellowship at Sunnybrook Hospital in Toronto. Dr. El-Zuway completed a two-year clinical associateship at St. Michael’s Hospital in Toronto, under the supervision of R. Loch Macdonald, MD, PhD. He enhanced his skull base experience with a one-year clinical associateship at St. Michael’s under the supervision of Michael Cusimano, MD. Dr. El-Zuway has a wide scope of neurosurgery training experience managing cranial and spinal conditions. He is involved in clinical research with interest focused in cranial neurotrauma and spine focusing on cervical spondylotic myelopathy. He is also interested in advancement of medical education and student teaching.

Specialized Areas of Interest
Neuro oncology; complex spinal surgery; open cerebrovascular surgery; neuro-trauma; neuro-endoscopy; minimally invasive spinal surgery; chiari malformation; hydrocephalus, pseduotumor cerebri.

Board Certifications
Royal College of Physicians and Surgeons of Canada

Hospital Privileges
UPMC Hamot
Chikezie I. Eseonu, MD
Clinical Assistant Professor

Chikezie Eseonu, MD, is a clinical assistant professor at UPMC Pinnacle. He received his undergraduate degree at Harvard University in biomedical engineering in 2007 and completed his medical education at Yale School of Medicine in 2011. Following medical school, Dr. Eseonu completed his neurosurgery residency at Johns Hopkins Hospital in Baltimore, Md., where he also completed an enfolded neuro-oncology/endoscopic/skull base fellowship. Dr. Eseonu’s clinical interests embrace several aspects of brain tumor treatment, including open surgical, minimally invasive or radiosurgical techniques. He is also involved in the treatment of trigeminal neuralgia, Chiari malformation, hydrocephalus, and other general neurosurgical conditions including degenerative spine, spinal stenosis, disc herniation, trauma and carpal tunnel. Dr. Eseonu’s research has encompassed such areas as surgical technique and outcome studies for gliomas, pituitary adenomas, trigeminal neuralgia, and awake craniotomy for brain tumors, as well as cost efficacy studies in neurosurgery. He has published over 30 peer reviewed papers and book chapters. He is licensed to practice in Pennsylvania, and is a member of the American Association of Neurological Surgeons, the Congress of Neurological Surgeons, and the Facial Pain Association.

Specialized Areas of Interest
Brain tumors; radiosurgery; trigeminal neuralgia; Chiari malformation; spine surgery.

Hospital Privileges
UPMC Pinnacle

Professional Organization Membership
American Association of Neurological Surgeons
Congress of Neurological Surgeons
Facial Pain Association
Faculty Biographies

Chikezie I. Eseonu, MD

Education & Training
BA, Biomedical Engineering, Harvard University, 2007
MD, Yale School of Medicine, 2011
Neuro-oncology/Endoscopic/Skull Base Fellowship, Johns Hopkins Hospital, 2017
Neurosurgery Residency, Johns Hopkins Hospital, 2018

Publications: 2019-20
• Book Chapters:
  Eseonu C, Vivas-Buitrago T, Quinones-Hinojosa A. Meningiomas in the elderly.

Wendy Fellows-Mayle, PhD
Research Assistant Professor
Coordinator, The Walter Copeland Laboratory

Wendy Fellows-Mayle, PhD, joined the faculty of the Department of Neurological Surgery at the University of Pittsburgh in July of 1999. She received her bachelor degree at the University of Pittsburgh in 1994 and her doctoral degree at the University of Pittsburgh in 2004. Dr. Fellows-Mayle is the director of the histology core laboratory for the Department of Neurological Surgery and the coordinator for the Walter Copeland Laboratory for Neurological Research.

Specialized Areas of Interest
Immunotherapy of brain tumors; gene therapy of brain tumors; epilepsy; intracranial pressure; craniosynostosis; traumatic brain injury.

Education & Training
BA, Physical Anthropology, University of Pittsburgh, 1994
MA, Physical Anthropology, University of Pittsburgh, 1998
PhD, Physical Anthropology, University of Pittsburgh, 2004

Interdepartmental and Medical Center Activities
• University of Pittsburgh:
  Oversight of Anatomical Specimens Committee

• Department of Neurological Surgery:
  Director, Histology Core Laboratory
  Coordinator, Walter Copeland Laboratory for Neurological Research

Publications: 2019-20
• Refereed Articles:
Robert M. Friedlander, MD
Chair, Walter E. Dandy Professor
Head of Cerebrovascular Neurosurgery
Director, Complex Brain Surgery Program
Co-Director, UPMC Neurological Institute

Robert Friedlander, MD, MA, is the Walter E. Dandy Professor and chairman of the University of Pittsburgh Department of Neurological Surgery and co-director of the UPMC Neurological Institute, positions he has held since 2010. Before coming to the University of Pittsburgh, Dr. Friedlander was a professor at Harvard Medical School. He was also vice-chairman of neurosurgery, associate director of cerebrovascular surgery and co-director of the Neuroscience Research Center at the Brigham and Women’s Hospital in Boston. Dr. Friedlander has received many academic awards, including the Neurosurgery Resident Award from the Congress of Neurological Surgeons, the Bayer Cerebrovascular Award from the Joint Section of Cerebrovascular Surgery, the International Charcot Prize for Motor Neuron Diseases, the Award from the Academy of Neurological Surgeons, and the H. Richard Winn Prize from the Society of Neurological Surgeons. Dr. Friedlander is an elected member of the prestigious American Society for Clinical Investigation, the Association of American Physicians and the National Academy of Medicine. As a sign of his prominence as a clinician and scientist, Dr. Friedlander is one of a very select group of authors to have been invited by the *New England Journal of Medicine* to write both a basic science review (mechanisms of neuronal cell death), as well as a clinical review (management of AVMs). Clinically, Dr. Friedlander focuses on the operative management of complex cerebrovascular disorders and brain tumors. Dr. Friedlander’s major research interests lie in the study of the mechanistic pathways of the caspase apoptosis gene family. His work includes the evaluation of treatment strategies for neurodegenerative diseases (Huntington’s and ALS), stroke, brain trauma, and spinal cord injury through the modulation of the caspase-family apoptotic pathways. He was first to demonstrate activation and a functional role of caspase cell death pathways in neurological diseases. His research has received significant media attention. His major work has been published in the highest impact journals, most notably four publications in *Nature*, two in *Science*, one in *Nature Medicine*, one in *Nature Neuroscience* and eight in *PNAS*. For over two decades, he has had continuous NIH support as a principal investigator, as well numerous foundation awards. He directs a busy and prolific laboratory. Dr. Friedlander has been appointed to the National Advisory Council of the National Institutes of Neurological Disorders and Stroke (NINDS). Additionally, a rewarding aspect of Dr. Friedlander’s activities is his involvement in organized neurosurgery. He was a member of the executive committee of the Congress of Neurological Surgeons, as well as chair of the CNS Research Committee, the CNS Membership Committee, and the CNS Publications Committee. He directed the Society of Neurological Surgeons RUNN (Research Update in Neuroscience for Neurosurgeons) Course from 2004 to 2018 and served as chair of the Society of Neurological Surgeons research committee. He is a past chair of the AANS/CNS Joint Section of Cerebrovascular Surgery. A native of Caracas, Venezuela, Dr. Friedlander came to the United States in 1983 and earned a joint BA and MA in biochemistry from Brandeis University in 1987. In 1991, he graduated from Harvard Medical School and went on to fulfill his internship in general surgery and residency in neurosurgery at Massachusetts General Hospital.

**Specialized Areas of Interest**
Aneurysms, vascular malformations, brain tumors, carotid disease, cerebrovascular disease, Chiari malformation, spinal cord tumors. Research focuses on mechanisms of apoptosis, Huntington’s disease, ALS, and stroke
Robert M. Friedlander, MD

Faculty Biographies

Board Certifications
American Board of Neurological Surgery

Hospital Privileges
UPMC Altoona
UPMC Children’s Hospital of Pittsburgh
UPMC Hamot
UPMC Magee-Womens Hospital
UPMC Mercy
UPMC Passavant
UPMC Presbyterian
UPMC Shadyside

Professional Organization Membership
American Academy of Neurological Surgeons
American Association for the Advancement of Science
American Association of Neurological Surgeons
American Association of Physicians
American Society for Clinical Investigation
Brain Aneurysm Foundation, Medical Advisory Board
Congress of Neurological Surgeons
Joint Section of Cerebrovascular Surgery
National Academy of Medicine
Pennsylvania Neurosurgical Society
Sociedad Venezolana de Neurocirugia
Society for Neurological Surgeons
Society for Neuroscience

Education & Training
BA, Brandeis University, 1987
MA, Biochemistry, Brandeis University, 1987
MD, Harvard Medical School, 1991

Editorial Service
• Editorial Board:
  Neurological Surgery
  Neurosurgery
  U.S. Neurology

• Ad Hoc Reviewer:
  Annals of Neurology
  Cell Death and Differentiation
  EMBO
  Experimental Neurology
  Human Molecular Genetics
  Journal of Biological Chemistry
  Journal of Neurochemistry
  Journal of Neuroscience
  Letters in Drug Design and Discovery
  Nature
  Nature Biotechnology
  Nature Cell Biology
Robert M. Friedlander, MD

Faculty Biographies

Nature Genetics
Nature Medicine
Nature Neuroscience
Nature Reviews Molecular Biology
Neurobiology of Disease
Neuron
Neuropharmacology
Neuroscience Letters
Neurosurgery
New England Journal of Medicine
Proceedings of the National Academy of Sciences
Science
Science and Transitional Medicine
Trends in Neuroscience

Interdepartmental and Medical Center Activities

• UPMC Presbyterian:
  Medical Executive Committee

• University of Pittsburgh:
  School of Medicine Executive Committee

• UPMC:
  Global Care Steering Committee

• University of Pittsburgh Physicians:
  Chair of Chairs Compensation Committee
  Finance Committee
  MD/Administrator, CSI Committee

• University of Pittsburgh Cancer Institute:
  Comprehensive Stereotactic Radiosurgery Program Meetings

• UPMC Health Plan:
  Clinical Leadership Team Committee

Professional Activities

Society of Neurological Surgeons:
  Director, Research Update of Neurosciences for Neurosurgeons (RUNN Course)
  Research Committee

NINDS National Advisory Council:
  Clinical Trials Subcommittee
  Fellowships and Training Subcommittee
  Basic Science Subcommittee

American Association of Neurological Surgeons:
  Annual Meeting Committee
  Research Committee

The American Academy of Neurological Surgery:
  Chair, Scientific Program Committee
  Chair, AANS/CNS Joint Cerebrovascular Surgery Section

Fridays with Friedlander weekly webcast, neurosurgery.pitt.edu
Honors and Awards
Pittsburgh’s Best Doctors, Pittsburgh Magazine, 2012-20
National Academy of Medicine induction, 2019
Honored Guest, US Ambassador, Belgrade, Serbia, 2013
America’s Top Surgeons, 2013
Castle Connolly Top Doctor in the Field of Neurological Surgery, 2013
H. Richard Winn Prize for Neurosurgical Research, 2012

Media Appearances: 2019-20

Publications: 2019-20
• Refereed Articles:


**Letters to the Editor:**

**Presentations:**

**Invited Lectures: 2019-20**
- **National:**

- **Local/Regional:**

- **Visiting Professorships:**
  Houston Methodist Hospital Grand Rounds Department of Neurosurgery, Houston, Texas: “High Definition Fiber Tractography as a Tool for Resection of Hyper Eloquent Brain Lesions.” October 9-11, 2019

  Stanford University Department of Neurosurgery, Stanford, Calif.: “High Definition Fiber Tractography as a Tool for Resection of Hyper Eloquent Brain Lesions.” October 31-November 1, 2019

  University of Calgary, Canada Health Sciences Department of Clinical Neurosciences, Alberta, Canada: “High Definition Fiber Tractography as a Tool for Resection of Hyper Eloquent Brian Lesions.” December 4-6, 2019.
Paul A. Gardner, MD  
*Peter J. Jannetta Professor*  
*Executive Vice Chair, Surgical Services*  
*Neurosurgical Director, Center for Cranial Base Surgery*  
*Director, Surgical Neuroanatomy Lab*

Paul A. Gardner, MD, joined the faculty at the University of Pittsburgh Department of Neurological Surgery in 2008 after completing his residency and fellowship training at the University of Pittsburgh. He completed his undergraduate studies at Florida State University, majoring in biochemistry, and received his medical degree from the University of Pittsburgh School of Medicine. Dr. Gardner completed a two-year fellowship in endoscopic endonasal pituitary and endoscopic and open skull base surgery. His research has focused on evaluating patient outcomes following these surgeries and more recently on genomic and molecular analysis of rare tumors. Dr. Gardner has been the neurosurgical director of the Center for Cranial Base Surgery at the University of Pittsburgh Medical Center since April of 2008, and leads a renowned course on endoscopic endonasal surgery three times a year. Dr. Gardner is co-author of the book *Skull Base Surgery*, part of the *Master Techniques in Otolaryngology: Head and Neck Surgery* series published by Wolters Kluwer. The book offers step-by-step expert instruction on more than 45 procedures, covering both open and minimally invasive approaches to the skull base. In addition, he is an author on over 280 peer-reviewed articles.

**Specialized Areas of Interest**
Endoscopic endonasal and open skull base surgery; pituitary tumors; vascular surgery; cranial nerve disorders; minimally invasive surgery; peripheral nerve surgery.

**Board Certifications**
American Board of Neurological Surgeons

**Hospital Privileges**
UPMC Children’s Hospital of Pittsburgh  
UPMC Mercy  
UPMC Presbyterian  
Veterans Affairs Pittsburgh Healthcare System

**Professional Organization Membership**
Acoustic Neuroma Association  
American Association of Neurological Surgeons  
American Medical Association  
Congress of Neurological Surgeons  
North American Skull Base Society  
Pennsylvania Neurological Society  
Pituitary Network Society

**Education & Training**
AA, Okaloosa-Walton College, 1993  
BS, Biochemistry, Florida State University, 1997 (magna cum laude)  
MD, University of Pittsburgh, 2001  
Fellowship, Endoscopic and Open Skull Base Surgery, 2007  
Residency, Neurosurgery, University of Pittsburgh, 2008
Faculty Biographies

Editorial Service
• Editorial Board:
Operative Neurosurgery

• Ad Hoc Reviewer:
Journal of Neuroscience and Rehabilitation
Journal of Neurosurgical Sciences
Neurosurgery
World Neurosurgery

Interdepartmental and Medical Center Activities
• UPMC Presbyterian:
Surgical Services Oversight Committee
Executive Vice Chairman, Surgical Services
Neurosurgical Director, Center for Skull Base Surgery

• University of Pittsburgh:
Advisory Board, Collaborative Research Education and Technology Enhancement in Surgery (CREATES)
International Telemedicine Services Workgroup Committee

Professional Activities

Community Activities
Advisory Board Member, Chordoma Foundation

Honors and Awards
Pittsburgh’s Best Doctors, Pittsburgh Magazine, 2012-20

Publications: 2019-20
• Refereed Articles:


Faculty Biographies


**Invited Lectures: 2019-20**

- **International:**
  - Gardner PA. "Advances in endoscopic endonasal surgery (via teleconference).” Departments of Neurological Surgery and Otolaryngology, Hospital Universitario Evangelico de Curitiba, Curitiba, Brazil, April 20, 2020.

- **National:**
Faculty Biographies

Paul A. Gardner, MD


• Virtual:

Gardner PA. “Advances in endoscopic endonasal surgery.” Departments of Neurological Surgery and Otolaryngology, Hospital Universitario Evangelico de Curitiba, Curitiba, Brazil, April 20, 2020.


Peter C. Gerszten, MD, MPH

Peter C. Gerszten, MD, MPH, is the Peter E. Sheptak Professor of Neurosurgery at the University of Pittsburgh. Dr. Gerszten joined the Department of Neurological Surgery and the UPMC Spine Services Division in 1999. He received his undergraduate degree from the University of Virginia and completed his medical degree at the Johns Hopkins School of Medicine. He completed his residency in neurological surgery at the University of Pittsburgh Medical Center. Dr. Gerszten obtained a master of public health degree from the University of Pittsburgh Graduate School of Public Health. He completed a fellowship in spinal surgery at the University of Pittsburgh Medical Center. Dr. Gerszten specializes in disorders of the spine, focusing on spinal neoplasms. His clinical interests include minimally invasive approaches to the treatment of spinal disorders and spinal tumors. Dr. Gerszten’s area of research is the application of outcomes research to spinal surgical interventions. He is a pioneer in the field of spine radiosurgery. Dr. Gerszten is co-editor of the 2015 second edition Spine Radiosurgery, an authoritative textbook—and the first of its kind—on all aspects of spine radiosurgery. He is also co-editor of the book Controversies in Stereotactic Radiosurgery: Best Evidence Recommendations, a 277-page look into an evidence-based approach to stereotactic radiosurgery for the brain and spine. Dr. Gerszten currently serves on the editorial boards of Neurosurgery, The Spine Journal, The Journal of Radiosurgery and SBRT and Neurosurgical Focus. He also serves on the board of directors of The Radiosurgery Society.
Peter C. Genszen, MD, MPH

**Specialized Areas of Interest**
Outcomes research applied to neurosurgical interventions; failed back syndrome; epidural fibrosis; stereotactic radiosurgery of spinal lesions; minimally invasive spine surgical techniques; spinal motion preservation techniques; sacroiliac dysfunction and fusion; compression fractures and percutaneous cement techniques.

**Board Certifications**
American Board of Neurological Surgery

**Hospital Privileges**
UPMC Magee-Womens Hospital  
UPMC Presbyterian  
UPMC Shadyside  
Veterans Affairs Pittsburgh Healthcare System

**Professional Organization Membership**
Allegheny County Medical Society  
American Academy of Neurological Surgery  
American Association of Neurological Surgeons  
American College of Surgeons  
American Medical Association  
Congress of Neurological Surgeons  
Delta Omega Public Health National Honor Society  
International Stereotactic Radiosurgery Society  
Joint Section on Disorders of the Spine and Peripheral Nerves  
North American Spine Society  
Paleopathology Society  
Pennsylvania Neurosurgical Society  
Pennsylvania State Medical Society  
The Radiosurgery Society  
Sociedad Iberolatinoamericano de Radiocirugia

**Education & Training**
BA, University of Virginia, 1988  
MD, Johns Hopkins School of Medicine, 1992  
MPH, University of Pittsburgh Graduate School of Public Health, 1998  
Residency, Neurological Surgery, University of Pittsburgh, 1999  
Fellowship, Spine Surgery, University of Pittsburgh, 2000

**Editorial Service**
• Editorial Board:  
The Journal of Radiosurgery and SBRT  
Neurosurgery  
The Spine Journal

• Ad Hoc Reviewer:  
Clinical Cancer Research  
International Journal of Radiation Oncology Biology Physics  
Iranian Red Crescent Medical Journal  
Journal of Neurosurgery: Spine  
Journal of Neuro-Oncology  
The Journal of Radiosurgery and SBRT
Peter C. Gerszten, MD, MPH

Faculty Biographies

Neuro-Oncology
Neurosurgery
Neurosurgical Focus
Oncology
Practical Radiation Oncology
Radiation Oncology
The Spine Journal
World Neurosurgery

Interdepartmental and Medical Center Activities
• UPMC Presbyterian:
  Physician Unit Partner 6D

• University of Pittsburgh:
  Chair, Data Safety Monitoring Board for Brain-Machine Interface Study

• UPMC:
  Hospital Acquired Conditions (HAC) Steering Committee, UPMC Presbyterian and UPMC Shadyside
  Physician Clinical Quality Leadership Committee, Physician Services Division
  Quality and Safety Committee Clinical Leader, UPMC Presbyterian and UPMC Shadyside

• Department of Neurological Surgery:
  Vice Chairman, Quality Improvement, Department of Neurological Surgery
  Director, Percutaneous Spine Surgery
  Director, Spine Radiosurgery
  Editor, Department of Neurological Surgery Neurosurgery News
  Promotions Committee

Professional Activities
Board of Directors, The Radiosurgery Society
Abstract Review Committee, The Radiosurgery Society Annual Meeting: Scientific Program Committee
Course Lecturer, Principles and Practice of Gamma Knife Radiosurgery, University of Pittsburgh School of Medicine, Pittsburgh, Pa.
Spine Surgery Anatomy Course Lecturer, Cadaver Practical Course for MS2, University of Pittsburgh Medical School of Medicine, Pittsburgh, Pa., November 11, 2019.

Community Activities
The Portrait Society, The Warhol Museum
The Patron's Society, Carnegie Museums of Pittsburgh
Carnegie Museums of Pittsburgh Engagement Committee
Peter C. Gerszten Endowed Fund for Research in Anthropology, University of Virginia
Gerszten Family Lectureship in Spanish Literature, University of Virginia

Honors and Awards
Pittsburgh's Best Doctors, Pittsburgh Magazine, 2019-20

Publications: 2019-20
• Refereed Articles:
Faculty Biographies


• Published Abstracts:


• Presentations:


Invited Lectures: 2019-20
• National:
  Gerszten PC. "SI Fusion is Data-Supported and a Necessary Tool in the Spine Belt!" Midwest Spine Symposium, Pittsburgh, Pa., September 6, 2019.

• Local/Regional:

• Visiting Professorships:
  University of California, San Francisco, Department of Neurosurgery, San Francisco, Calif., Lars Leksell Lecture, "Radiosurgery as part of the multi-modality treatment for spine tumors." February 20, 2020.

• Virtual:

Avniel Singh Ghuman, PhD
Associate Professor
Director, Cognitive Neurodynamics Lab

Avniel Singh Ghuman, PhD, joined the Department of Neurological Surgery in September of 2011. Dr. Ghuman received his undergraduate education in math and physics at The Johns Hopkins University. He completed his doctoral education in biophysics at Harvard University. He completed his postdoctoral training at the National Institute of Mental Health prior to joining the faculty at the University of Pittsburgh. As director of MEG (Magnetoecephalography) Research, one of Dr. Ghuman’s primary roles is to facilitate, develop, and advance clinical and basic neuroscience research using MEG. To this end, he
Avniel Singh Ghuman, PhD

is helping to develop new research applications for MEG in collaboration with researchers throughout the community. MEG is the most powerful functional neuroimaging technique for noninvasively recording magnetic fields generated by electrophysiological brain activity, providing millisecond temporal resolution and adequate spatial resolution of neural events. Dr. Ghuman’s research focuses on how our brain turns what falls upon our eyes into the rich meaningful experience that we perceive in the world around us. Specifically, his lab studies the neural basis of the visual perception of objects, faces, words, and social and affective visual images. His lab examines the spatiotemporal dynamics of how neural activity reflects the stages of information processing and how information flow through brain networks responsible for visual perception. To accomplish these research goals, Dr. Ghuman’s lab records electrophysiological brain activity from humans using both invasive (intracranial EEG; iEEG — in collaboration with Jorge Gonzalez-Martinez, MD, PhD) and non-invasive (magnetoencephalography; MEG) measures. In conjunction with these millisecond scale recordings they use multivariate machine learning methods, network analysis, and advanced signal processing techniques to assess the information processing dynamics reflected in brain activity. Additionally, his lab uses direct neural stimulation to examine how disrupting and modulating brain activity alters visual perception. This combination of modalities and analysis techniques allow Dr. Ghuman to ask fine-grained questions about neural information processing and information flow at both the scale of local brain regions and broadly distributed networks.

Specialized Areas of Interest
The dynamics of brain interactions; visual cognition; magnetoencephalography (MEG), intracranial EEG (iEEG); face recognition; reading; social and affective perception.

Professional Organization Membership
Cognitive Neuroscience Society
Organization for Human Brain Mapping
Society for Neuroscience
Vision Sciences Society

Education & Training
BA, Math and Physics, The John Hopkins University, 1998
PhD, Biophysics, Harvard University, 2007

Editorial Service
• Editorial Board:
  Social Cognitive and Affective Neuroscience, Consulting Editor

  • Ad Hoc Reviewer:
    American Journal of Psychiatry
    Brain
    Cerebral Cortex
    Cognition
    Current Biology,
    European Journal of Neuroscience
    eLife
    Frontier in Brain Imaging Methods
    Frontiers in Neuroscience
    Human Brain Mapping
    Journal of Cognitive Neuroscience
    Journal of Neurophysiology
Avniel Singh Ghuman, PhD

Journal of Neuroscience
Nature Communications
Neurocase
Neuroimage
Neuron
Neuropsychologia
Neuroscience
Perception
Perception Science & Brain Imaging Methods
Psychological Science
Psychonomic Bulletin and Review
Scientific Data
Visual Cognition

Honors and Awards
Young Investigator Award, NARSAD, 2012
Award for Innovative New Scientists, National Institute of Mental Health, 2015

Publications: 2019-20
• Refereed Articles:


Jorge A. Gonzalez-Martinez, MD, PhD
Professor of Neurological Surgery
Director, Epilepsy & Movement Disorders Program
Co-Director, Epilepsy Center at University of Pittsburgh
Director, Cortical Systems Laboratory

Jorge Gonzalez-Martinez, MD, PhD, FAANS, is a board-certified and world-renowned neurosurgeon subspecializing in epilepsy and functional neurosurgery. He is director of the University of Pittsburgh Department of Neurological Surgery Epilepsy & Movement Disorders Program, co-director of the UPMC Epilepsy Center and director of the University of Pittsburgh Cortical Systems Laboratory. Dr. Gonzalez-Martinez is a medical pioneer in novel surgical methods for treating medically refractory seizures such as stereo-electroencephalography, SEEG guided laser ablative procedures, neuromodulatory interventions and robotic guided surgeries, bringing for the first time innovative surgical interventions to the United States and other countries. His particular field of interest and academic drive is related to neuro-electrophysiology, intracranial signal processing and behavioral neuroscience studies. Combined, the clinical and basic science efforts have been guiding his academic and clinical pathway for safer and more efficient methods for treating patients with severe seizures and abnormal movement disorders, promoting the improvement of symptoms, in combination with better functional and quality of life outcomes. Dr. Gonzalez-Martinez
Jorge A. Gonzalez-Martinez, MD, PhD

has published more than 180 peer-reviewed articles and book chapters related to epilepsy surgery and methods of brain mapping for patients with medically intractable epilepsy and movement disorders. He has been a member of the American Society of Stereotactic and Functional Neurosurgery executive committee since 2013, developing high relevant projects and topics related to the field of functional neurosurgery and epilepsy. He is also a member of the American Association of Neurological Surgery, Congress of Neurological Surgery and American Epilepsy Society.

Specialized Areas of Interest
Adult and pediatric epilepsy surgery; movement disorder surgery; neuro-oncology; general neurosurgery.

Board Certifications
American Board of Neurological Surgeons

Hospital Privileges
UPMC Children’s Hospital of Pittsburgh
UPMC Hamot
UPMC Presbyterian
UPMC Shadyside

Professional Organization Membership
American Association of Neurological Surgeons
American Epilepsy Society
American Society of Stereotactic and Functional Neurosurgery
Congress of Neurological Surgeons

Education & Training
Epilepsy & Stereotactic Fellowship, University of Grenoble, France, 2009
Neurosurgery Residency, Cleveland Clinic Foundation, 2008
Epilepsy Surgery Fellowship, Cleveland Clinic, 2003
Functional Neurosurgery Fellowship, Cleveland Clinic, 2002
Neuro-oncology Fellowship, Wayne State University, 2001
PhD, University of Sao Paulo Medical School, 2002
MD, University of Sao Paulo Medical School, 1994

Editorial Service
• Editorial Board:
  Neurosurgery
  Operative Neurosurgery
  World Neurosurgery

• Ad Hoc Reviewer:
  Epilepsia
  Frontiers
  Lancet

Honors and Awards
Best Doctor in Pittsburgh, Pittsburgh Magazine, 2020
Legacy Award, Cleveland Epilepsy Association, 2017
Harvey Cushing Award, Congress of Neurological Surgeons, 2005
Preuss Award, National Brain Tumor Foundation, 2002
Publications: 2019-20

• Refereed Articles:


Invited Lectures: 2019-20

• International:

González-Martínez JA. “SEEG implantation techniques.” Hospital Mater, Brisbane, Australia, September 15, 2019.


• National:


Stephanie Greene, MD

Associate Professor
Director of Vascular Neurosurgery, UPMC Children’s Hospital of Pittsburgh
Director of Perinatal Neurosurgery, UPMC Children’s Hospital of Pittsburgh

Stephanie Greene, MD, joined the faculty of the Department of Neurological Surgery in the pediatric neurosurgery division at UPMC Children’s Hospital of Pittsburgh in 2009. Dr. Greene graduated from Dartmouth College in 1993 with a degree in biology and psychology, and a concentration in neuroscience. She earned her medical degree from Albany Medical College, and completed her neurosurgical residency at Harvard University in the Brigham & Women’s and Children’s Hospital of Boston program. Her fellowship in pediatric neurosurgery was completed through the University of Washington at Seattle Children’s Hospital in 2005. She is board certified in both adult and pediatric neurosurgery. She was the director of pediatric neurosurgery at Hasbro Children’s Hospital, affiliated with Brown University, prior to accepting her position at UPMC Children’s Hospital of Pittsburgh. She is the director of vascular neurosurgery and perinatal neurosurgery at Children’s Hospital of Pittsburgh.

Specialized Areas of Interest
Vascular malformations; MoyaMoya syndrome; fetal surgery; Chiari malformation; spinal dysraphism; peripheral nerve disorders; brain tumors.

Board Certifications
American Board of Neurological Surgery
American Board of Pediatric Neurological Surgery

Hospital Privileges
UPMC Children’s Hospital of Pittsburgh
UPMC Magee-Womens Hospital

Professional Organization Membership
American Association of Neurological Surgeons
American Society of Pediatric Neurosurgeons
AANS/CNS Joint Section on Pediatric Neurosurgery
AANS/CNS Joint Section on Tumors
Congress of Neurological Surgeons
Pediatric Craniocervical Society
Pennsylvania Neurological Society
Sigma Xi
Women in Neurosurgery
World Federation of Neurological Societies

Education & Training
AB, Biology/Psychology, Dartmouth College, 1993
MD, Albany Medical College, 1998
Residency, Neurological Surgery, Penn State University, 2000
Residency, Neurological Surgery, Harvard University, 2004
Fellowship, Pediatric Neurological Surgery, 2005
Faculty Biographies

Stephanie Greene, MD

Editorial Service
• Editorial Board:
  Journal of Neurosurgery: Pediatrics

  • Ad Hoc Reviewer:
    Anesthesia and Analgesia
    Child's Nervous System
    Case Reports in Ophthalmology
    Cancer Medicine
    Fetal Diagnosis and Therapy
    Interdisciplinary Neurosurgery
    Journal of Neurochemistry
    Journal of Neuro-oncology
    Journal of Pediatric Neurology
    Neurosurgery
    Pediatric Neurosurgery
    Spinal Cord Injury Rehabilitation
    Therapeutics and Clinical Risk Management
    Ultrasound in Obstetrics and Gynecology
    World Neurosurgery

Interdepartmental and Medical Center Activities
• University of Pittsburgh:
  Admissions Interview Committee, School of Medicine
  Mentor for Pitt Physician-Scientist Training Program
  Mentor for Pitt Med Association of Women Surgeons
  Hereditary Hemorrhagic Telangiectasia (HHT) Center of Excellence
  Neurological Surgery Residency Interview Committee

  • UPMC Children's Hospital of Pittsburgh:
    Brachial Plexus Birth Trauma Committee
    Fetal Diagnosis and Treatment Committee
    Neurological Surgery Site Residency Director
    Pediatric Neuro-oncology Board
    Vascular Anomalies Committee

Professional Activities
Abstract Reviewer, CNS Annual Meetings
Abstract Reviewer, AANS Annual Meetings
AANS Resident Mentorship Program
Steering Committee, North American Fetal Treatment Network
Grant Review Committee, Walter L. Copeland Fund, Pittsburgh Foundation
Oral Board Examiner, American Board of Neurological Surgeons

Community Activities
Dartmouth College Admissions Interview Committee

Honors and Awards
Marquis Who's Who in the World, 2018-present
Marquis Who's Who in America, 2018-present
Castle Connolly Exceptional Women in Medicine, 2017-present
American's Most Honored Professionals (American Registry), 2017-present
Stephanie Greene, MD

Faculty Biographies

Castle Connolly Regional Top Doctor, 2017-present
Castle Connolly Metro Area Top Doctor, 2016-present
Castle Connolly Top Doctor, 2016-present
Top Ten Doctor – Metro Area, City, and State (Vitals.com), 2013-present
Patients’ Choice Five-Year Honoree, 2013-present
America’s Most Compassionate Doctors, 2011-present
Patients’ Choice Award, 2008-present

Media Appearances: 2019-20
“In-utero surgery used to successfully treat myelomeningocele at UPMC,” University of Pittsburgh Neurosurgery News, Fall 2019.

Publications: 2019-20
• Refereed Articles:

• Presentations:
  Greene S. "Fetal Surgery for Prenatally Diagnosed Myelomeningocele.” Neurosurgical Grand Rounds, University of Pittsburgh Medical Center, Pittsburgh Pa., November 6, 2019.
Invited Lectures: 2019-20
• National:


Bradley Gross, MD
Assistant Professor
Director, Endovascular Neurosurgery

Bradley Gross, MD, joined the Department of Neurological Surgery as an assistant professor in July of 2016 specializing in cerebrovascular disease. His particular clinical and research interests include the comprehensive management of aneurysms, arteriovenous malformations, arteriovenous fistulas and cavernous malformations of the brain and spinal cord. He also performs embolization of brain and spinal cord tumors, revascularization for acute ischemic stroke as well as cervical, intracranial and venous stenting. Dr. Gross graduated Summa Cum Laude from Northwestern University and then earned his medical degree from Northwestern University Medical School. He completed his internship and neurosurgical residency at Brigham and Women’s Hospital/Boston Children’s Hospital/Harvard Medical School. He then had the privilege to serve as an endovascular fellow at the Barrow Neurological Institute.

Specialized Areas of Interest
Intracranial aneurysms; arteriovenous malformations; arteriovenous fistulas; cavernous malformations; brain tumors; carotid stenosis; intracranial stenosis; venous sinus stenosis; ischemic stroke.

Hospital Privileges
UPMC Children’s Hospital of Pittsburgh
UPMC Mercy
UPMC Presbyterian
UPMC Shadyside

Professional Organization Membership
Alpha Omega Alpha
American Association of Neurological Surgeons
AANS/CNS Joint Section of Cerebrovascular Neurosurgery
Congress of Neurological Surgeons
Society of Neurointerventional Surgery
Phi Beta Kappa

Education & Training
BA with Honors, Chemistry, Northwestern University, 2004
MD, Feinberg School of Medicine, Northwestern University, 2008
Internship, Harvard Medical School, 2009
Residency, Harvard Medical School, 2015
Fellowship, Endovascular Neurosurgery, Barrow Neurological Institute, 2016
Faculty Biographies

Bradley Gross, MD

Editorial Service
• Ad Hoc Reviewer:
  American Journal of Neuroradiology
  Journal of Neurointerventional Surgery
  Neurology
  Neurosurgery
  World Neurosurgery

Professional Activities
Course Director, UPMC Stroke Institute Stroke Update Course, October 25, 2019.

Publications: 2019-20
• Refereed Articles:


  Gross BA, Jadhav AP, Jovin TG, Jankowitz BT. Clinical comparison of new generation 0.071 and 0.072 inch aspiration catheters. World Neurosurg 130: e463-466, 2019.


Faculty Biographies


• Book Chapters:

*Invited Lectures: 2019-20*

• Local/Regional:


• Virtual:

**D. Kojo Hamilton, MD**

*Associate Professor*

*Co-Director, Spine Fellowship Program*

*Residency Site Program Director, UPMC Mercy*

D. Kojo Hamilton, MD, a recognized leader in scoliosis, adult spinal deformity and trauma, joined the faculty at the University of Pittsburgh Department of Neurological Surgery in July of 2014. He received his medical degree and residency training from the University of Virginia in Charlottesville, Va. He underwent further subspecialty training in complex spine, spinal deformity, scoliosis and spine surgical oncology, with a combined neurosurgical and orthopedic (AOSpine) fellowship, at the University of Virginia. Dr. Hamilton further received subspecialty training in Auckland City Hospital in Auckland, New Zealand. He is board certified in neurological surgery and a fellow of the American Association of Neurological Surgeons and a candidate member of the Scoliosis Research Society. After training, Dr. Hamilton received appointments at the University of Maryland School of Medicine and Maryland Shock Trauma Hospital where he treated patients with complex spine deformity and severe spine and brain trauma. Before joining UPMC, Dr. Hamilton was at the Oregon Health and Science University Spine Center where he treated patients with neurological
trauma as well as spinal deformity conditions including adult idiopathic scoliosis, spondylolisthesis and general back and neck pain. Dr. Hamilton is nationally involved in teaching advanced and current techniques in scoliosis and adult spine deformity. He has an extensive research background in spine surgery and has presented nationally and internationally on the subject. Dr. Hamilton has received several awards and accolades from his patients, nurses and peers, including best doctor awards—locally and nationally, five years in a row—since his first year at the University of Pittsburgh School of Medicine.

**Specialized Areas of Interest**
Scoliosis; adult and pediatric spinal deformity; cranial and spine trauma; degenerative conditions of the spine; revision and reconstructive spine surgery.

**Board Certifications**
American Board of Neurological Surgery
Fellow of the American Association of Neurological Surgeons

**Hospital Privileges**
UPMC Children’s Hospital of Pittsburgh
UPMC Hamot Medical Center
UPMC Magee-Womens Hospital
UPMC Mercy
UPMC Presbyterian

**Professional Organization Membership**
American Association of Neurological Surgeons (AANS)
AANS/CNS Joint Section of Disorders of the Spine and Peripheral Nerves
AANS/CNS Joint Section of Neurotrauma and Critical Care
AOSpine North America (AOSNA)
International Spine Study Group
Congress of Neurological Surgeons (CNS)
Scoliosis Research Society (SRS)

**Education & Training**
BS (High Honors), Biochemistry, University of Maryland, 1998
MD, University of Virginia, 2003
Fellowship, Brain and Spine, Auckland City Hospital, 2008
Residency, University of Virginia, 2009
Fellowship, Complex Spine, University of Virginia, 2010

**Editorial Service**
- Editorial Board:
  European Spine Journal
  Neurosurgery
- Ad Hoc Reviewer:
  Global Spine Journal
  Journal of Neurosurgery
  Journal of Neurosurgery: Neurosurgical Focus
  Journal of Neurosurgery: Spine
  Neurosurgery
  The Spine Journal
Interdepartmental and Medical Center Activities
• UPMC Presbyterian:
  Reviewing Committee, Neurological Surgery Cranial and Spine Research Grant applications
  Resident Clinical Competency Committee, Core Faculty
  Technology and Innovative Practice Assessment Committee

• Department of Neurological Surgery:
  Grant Application Review Committee, Cranial and Spine Research

Professional Activities
IMAST Committee, Scoliosis Research Society
MOC/CME Committee, American Association of Neurological Surgeons
AANS/CNS Joint Section on Disorders of the Spine and Peripheral Nerves:
  Executive Committee
  Rapid Response Team
  Exhibit Committee
  DSPN Drugs & Devices Committee
ABNS Exam/Extra-Mural Writing Committee, American Board of Neurological Surgery

Honors and Awards
Pittsburgh’s Best Doctors, Pittsburgh Magazine, 2016-20
Distinguished Alumni, Univ of Virginia Summer Medical and Dental Education Program

Publications: 2019-20
• Refereed Articles:


Faculty Biographies


• Invited Papers:

• Presentations:
Faculty Biographies


Hamilton DK. “Always Cross the C/T Junction or Pay the Kyphosis Piper Later?” Midwest Spine Symposium. Pittsburgh, Pa., September 6-7, 2019


Invited Lectures: 2019-20

• International:


• National:

Faculty Biographies

- **Local/Regional:**
  

**Luke C. Henry, PhD**  
Assistant Professor

Luke Henry, PhD, joined the Department of Neurological Surgery in November of 2015. Dr. Henry completed his doctorate in clinical neuropsychology, specializing in research and intervention, at the Université de Montréal in 2011. He then moved to Pittsburgh where he completed a post-doctoral fellowship at the UPMC Sports Concussion Program. Dr. Henry worked for two years as a clinical instructor within the concussion program before joining the Department of Neurological Surgery. In his current role, Dr. Henry is responsible for pre- and post-operative neuropsychological testing for a variety of pathologies/conditions including movement disorders, epilepsy, Chiari malformations, brain tumors and post-TBI assessments. He is also actively involved with various research endeavors with other faculty members within the department.

**Specialized Areas of Interest**
Neuropsychological function; clinical outcomes.

**Hospital Privileges**
UPMC Mercy
UPMC Presbyterian
UPMC Shadyside

**Professional Organization Membership**
International Neuropsychological Society
National Academy of Neuropsychology
Sports Neuropsychology Society

**Education & Training**
BS, Psychology, University of Calgary, 2003
MS, Behavioral Neuroscience, University of Calgary, 2006
PhD, Clinical Neuropsychology, Université de Montréal, 2011
Fellowship, Clinical Neuropsychology, UPMC, 2013

**Publications: 2019-20**
- Refereed Articles:
Baoli Hu, PhD
Assistant Professor
Director, Brain Tumor Evolution & Therapy Lab

Baoli Hu, PhD, joined the faculty of the University of Pittsburgh Department of Neurological Surgery at Children’s Hospital of Pittsburgh of UPMC in July of 2017. Dr. Hu received his bachelor’s and master’s degrees from the Northwest A&F University in Xianyang, China in 2001. He earned his PhD degree in microbiology from Wuhan University in Wuhan, Hubei, China in 2004 and completed his postdoctoral training in molecular oncology at H. Lee Moffitt Cancer Center and Research Institute in Tampa, Fla. in 2007. Prior to joining the faculty at the University of Pittsburgh School of Medicine, Dr. Hu was a senior research scientist in the Department of Genomic Medicine and Cancer Biology at the University of Texas, MD Anderson Cancer Center from 2011-17, working in the lab of Ronald DePinho, MD. From 2007-11 he worked with Dr. DePinho as a research scientist in the Department of Medical Oncology and Belfer Institute for Applied Cancer Science at Dana-Farber Cancer Institute at the Harvard Medical School. Dr. Hu’s research is focused on understanding the molecular mechanisms of brain tumors evolution, including tumor progression and recurrence after the treatment; and developing new strategies for the treatment of these devastating diseases.

Specialized Areas of Interest
Oncobiology of glioma and medulloblastoma; cancer stem cells; functional cancer genomics; mechanisms of tumor initiation, progression, treatment resistance, and recurrence; translational research in druggable targets and biomarkers discovery.

Hospital Privileges
UPMC Children’s Hospital of Pittsburgh
UPMC Hillman Cancer Center

Professional Organization Membership
American Association for Cancer Research
Society for Neuro-Oncology
Children’s Brain Tumor Tissue Consortium (CBTTC)

Education & Training
BS, Animal Science and Technology, Northwest A&F University, 1998
MS, Animal Breeding and Genetics, Northwest A&F University, 2001
PhD, Microbiology, Wuhan University, 2004
Fellow, Molecular Oncology, Moffitt Cancer Center & Research Institute, 2007

Editorial Service
• Editorial Board:
  Glioma
  Molecular Carcinogenesis
  Frontiers in Oncology

• Ad Hoc Reviewer:
  Aging
  Cancer
  Neuroscience Bulletin
  Journal of Clinical Medicine
  Journal of Neuro-Oncology
Faculty Biographies

Esther Jane, PhD
Research Assistant Professor

Esther Jane, PhD, graduated from Madurai Kamaraj University in India. She did her post doctoral training in Case Western Reserve University in Cleveland, Ohio, on the molecular mechanisms underlying regulation of homeotic gene expression during Drosophila development. Before joining the University of Pittsburgh Department of Neurological Surgery, she worked in the Pittsburgh Development Center in studying the cell biology of human embryonic stem cells before and after differentiation towards neuronal lineage. Dr. Jane is currently working on a project examining compounds that inhibit the function of individual kinases using diverse panel of malignant glioma cell lines.

Specialized Areas of Interest
Mode of action of multi-target tyrosine kinase inhibitors in glioma cells.

Molecular Carcinogenesis
Molecular Therapy

Interdepartmental and Medical Center Activities
• Department of Neurological Surgery:
Review Committee, Neurological Surgery Cranial and Spine Research grant applications

Professional Activities
Ad Hoc Reviewer, CBTTC’s proposal review

Honors and Awards
Richard King Mellon Scholar, UPMC Children’s Hospital of Pittsburgh, 2018
UPMC Competitive Medical Research Fund Award, 2018
B*CURED Brain Cancer Research Investigator Award, 2018
Caroline Ross Endowed Fellowship Award, MD Anderson Cancer Center, 2017

Media Appearances: 2019-20
Investigator Spotlight, Children’s Brain Tumor Tissue Consortium, August 22, 2019.

Publications: 2019-20
• Refereed Articles:


Faculty Biographies

Esther Jane, PhD

Professional Organization Membership
American Association For Cancer Research

Education & Training
BSc, Zoology, Sarah Tucker College, 1983
MSc, Zoology, The American College, 1986
PhD, Biology, The Madurai Kamaraj University, 1992

Editorial Service
• Ad Hoc Reviewer:
  Cancer Letters

Publications: 2019-20
• Refereed Articles:

Hideyuki Kano, MD, PhD
Research Associate Professor
Director, Clinical Research, Center for Image-Guided Neurosurgery

Hideyuki Kano, MD, PhD, joined the faculty in the Department of Neurological Surgery Center for Image-Guided Neurosurgery in 2008 as a visiting research assistant professor and is now a research associate professor in the department. He was named clinical research director at the center in 2014. Dr. Kano received his medical training from the Shiga University of Medical Science in Otsu, Japan, earning his medical degree in 1997. He subsequently received his residency training at the Kyoto University School of Medicine, Kyoto, Japan and Osaka Saiseikai Izuo Hospital, Osaka, Japan in 2000. From 2000 to 2004, he received his residency training and then fellowship program of stereotactic radiosurgery and received a certificate of board of neurological surgery in Japan in 2004. In 2006, Dr. Kano received his PhD from the Graduate School of Medicine Kyoto University, Kyoto, Japan. From 2004 to 2007, Dr. Kano worked as a neurosurgeon-in-chief at Kishiwada City Hospital in Japan. He completed his fellowship program of image-guided neurosurgery at the University of Pittsburgh in 2008. In 2009, Dr. Kano received the National Brain Tumor Society Mahaley Clinical Research Award from the Joint Section on Tumors of the AANS/CNS. In 2012, Dr. Kano received the Leksell Radiosurgery Award from the AANS and the Synthes Skull Base Surgery Award from the CNS. Dr. Kano is currently working on a clinical study about stereotactic radiosurgery for benign and malignant brain tumors, arteriovenous malformation and functional disease. He has published more than 100 articles in refereed journals, 38 book chapters and/or invited publications, and has edited two books.

Specialized Areas of Interest
Gamma Knife stereotactic radiosurgery; malignant and benign brain tumors; vascular malformations; functional disorders.

Board Certifications
Japanese Board of Neurological Surgery
Faculty Biographies

Hideyuki Kano, MD, PhD

Professional Organization Membership
AANS/CNS Joint Section on Tumors
Congress of Neurological Surgeons
International Stereotactic Radiosurgery Society
Japanese Society of Neurosurgery
Japanese Society of Stereotactic Radiosurgery
The Japan Society of Neuro-Oncology

Education & Training
MD, Shiga University of Medical Science, 1997
PhD, Kyoto University Graduate School of Medicine, 2004
Residency, Neurosurgery, Kyoto University Hospital, 2004
Fellowship, Center for Image-Guided Neurosurgery, University of Pittsburgh, 2008

Editorial Service
• Editorial Board:
  BMC Neurology
  Scientific Reports

• Ad Hoc Reviewer:
  American Journal of Neuroradiology
  American Journal of Case Reports
  BMJ Open
  BMJ Case Reports
  Cancer Research
  CNS Oncology
  Cancer Biology & Medicine
  Cephalalgia
  Expert Review of Anticancer Therapy
  Expert Review of Medical Devices
  International Journal of Case Reports in Medicine
  International Journal of Molecular Sciences
  International Journal of Radiation Oncology, Biology, Physics
  Journal of Clinical Medicine and Research
  Journal of Clinical Oncology
  Journal of Neurosurgery
  Journal of Neurology, Neurosurgery & Psychiatry
  Journal of Neurological Surgery. Part B, Skull Base
  Journal of Neuro-oncology
  Journal of Pediatric Neuroradiology Journal of Pregnancy
  Journal of the Neurological Sciences
  Journal of Zhejiang University SCIENCE B - Biomedicine & Biotechnology
  Medical Imaging and Radiology Neurosurgery
  Neurosurgical Review
  New England Journal of Medicine
  Pain Management
  Technology in Cancer Research and Treatment
  QJM: An International Journal of Medicine
  World Neurosurgery

Honors and Awards
Marquis Who’s Who in the World, 2018
Marquis Who’s Who in America, 2014-16
Synthes Skull Base Surgery Award, AANS/CNS Joint Section on Tumors, 2013
Leksell Radiosurgery Award, AANS, 2013
Integra Foundation Award, AANS/CNS Joint Section on Tumors, 2012
Osaka Medical Research Foundation for Incurable Diseases Grant Award, 2007-09, 2011-12
National Brain Tumor Society Mahaley Clinical Research Award, 2009

**Publications: 2019-20**

- **Refereed Articles:**
Adam S. Kanter, MD
Associate Professor
Chief, UPMC Presbyterian Spine Service
Director, Minimally Invasive Spine Program
Co-Director, Spine Fellowship Program

Adam S. Kanter, MD, joined the faculty of the Department of Neurosurgery in January of 2008 as director of the department’s minimally invasive spine program. Dr. Kanter performed his undergraduate work at the University of Massachusetts in Amherst, graduating with Cum Laude honors. He obtained his master’s degree from Boston University and his medical degree from the University of Vermont in 2001. Dr. Kanter then completed his neurosurgical residency at the University of Virginia in 2007. He completed subspecialty fellowship training in minimally invasive spine surgery at the University of California in San Francisco and Auckland City Hospital in Auckland, New Zealand. Dr. Kanter is board certified in neurological surgery and was promoted to associate professor in 2013. He was named chief of spine services in 2014 and continues to push the surgical envelope in minimally invasive spine procedures utilizing many of the innovative portals that he has helped to develop. Dr. Kanter is principal investigator in several research studies evaluating the use of stem cell derived biologics to induce spinal fusion. His research focuses on patient derived clinical outcome measures, specifically appraising the utility of minimally invasive and lateral access surgical corridors. Dr. Kanter has published numerous papers in refereed journals and authored several book chapters. He provides editorial service to several peer reviewed journals and is a key member of several major neurosurgical societies. He resided as chairman of the 2016 Spine Summit’s Scientific Program, recording the highest attendance in the history of the section’s conference. Dr. Kanter has also received numerous accolades for his clinical expertise, including top doctor, most compassionate doctor, and patient’s choice awards.

Specialized Areas of Interest
Minimally invasive spine surgery; lateral access spine surgery; artificial disc technology; spinal tumors; experimental therapies for spinal fusion.

Board Certifications
American Board of Neurological Surgery

Hospital Privileges
UPMC Magee-Womens Hospital
UPMC Passavant
UPMC Presbyterian
UPMC St. Margaret
UPMC Shadyside

Professional Organization Membership
Allegheny County Medical Society
American Association of Neurological Surgeons
AANS/CNS Section on Disorders of the Spine & Peripheral Nerves
AANS/CNS Section of Neurotrauma & Critical Care
AANS/CNS Section on Tumors
American College of Surgeons
American Medical Association
Congress of Neurological Surgeons
North American Spine Society
Pennsylvania Medical Society
Adam S. Kanter, MD

Faculty Biographies

Society of Lateral Access Surgeons (SOLAS)
Society of Minimally Invasive Spine Surgeons (SMISS)
World Spinal Column Society

Education & Training
BS, Psychology, University of Massachusetts, 1993
MS, Medical Sciences, Boston University, 1997
MD, University of Vermont, 2001
Residency, Neurosurgery, University of Virginia, 2007
Fellowship, Spine Surgery, University of California, San Francisco, 2007

Editorial Service
- Editorial Board:
  International Journal of Spine Surgery
  The Physician & Sports Medicine
  SpineLine
- Ad Hoc Reviewer:
  Journal of Neurosurgery
  Neurosurgery
  Neurosurgical Focus
  The Spine Journal

Interdepartmental and Medical Center Activities
- UPMC Presbyterian:
  Chief, UPMC Presbyterian Spine Service
  Director, Minimally Spine Program
  Co-director, Spine Fellow Program
- University of Pittsburgh:
  Medical Executive Committee
  Value Analysis Team

Professional Activities
AANS/CNS Division of Spine & Peripheral Nerves:
  Annual Meeting Chair
  Executive Committee Member
  Scientific Program Chairman
  Secretary
Society of Minimally Invasive Spine Surgeons:
  Secretary
Society of Lateral Access Surgery:
  North American Regional Director
  CNS Spine Complications Course
Course Director, Complications, Management, and Challenges in Spine Surgery, Park City, Utah, February 7-9, 2020
Course Director, Spinal Deformity: Case-based Pearls and Pitfalls for the Practicing Spine Surgeon, Las Vegas, Nev., March 5-8, 2020

Honors and Awards
Pittsburgh’s Best Doctors, Pittsburgh Magazine, 2012-20
Patients’ Choice Award, UPMC, 2012-20
Faculty Biographies

Adam S. Kanter, MD

Top 10 Doctor, Vitals Neurosurgical Specialists, 2012-20
Most Compassionate Doctor Award, UPMC, December 2012-20
Top 3 Neurosurgeons in Pittsburgh, Three Best Rated, 2020
UPMC ‘ACES’ Award for Commitment & Excellence in Service, 2019

Publications: 2019-20
• Refereed Articles:
Faculty Biographies

Adam S. Kanter, MD


- **Published Abstracts:**

**Invited Lectures: 2019-20**
- **National:**

  Kanter AS. "Single Position Deformity Surgery: Is Anterior Column Reconstruction (ACR) the New PSO, and is it For Everyone?" Midwest Spine Symposium, Pittsburgh, Pa., September 6-7, 2019.


David L. Kaufmann, MD

David L. Kaufmann, MD, is clinical assistant professor of neurological surgery at the University of Pittsburgh School of Medicine and is chief of neurosurgery at UPMC Mercy. He maintains a general neurosurgery practice with an emphasis on treating degenerative disorders of the spine and traumatic injuries of the brain and spine. He also has an interest in complex spinal reconstructive surgery for conditions involving spinal deformity and brain tumors. Dr. Kaufmann received his medical degree from the Albert Einstein College of Medicine in New York City and completed a general surgery internship at the Johns Hopkins Hospital in Baltimore. He performed his neurosurgical residency at Montefiore Medical Center and the Hyman-Newman Institute for Neurology and Neurosurgery at Beth Israel Medical Center in New York City. He is board certified in neurological surgery. Dr. Kaufmann is a member of the American Association of Neurological Surgeons, the Congress of Neurological Surgeons and the Pennsylvania Neurosurgical Society.

Specialized Areas of Interest
Spinal decompression and fusion surgery; complex spine surgery; brain and spine trauma; brain tumors; neurosurgical treatment of pain.
Gary Kohanbash, PhD
Assistant Professor
Director, PNIO Laboratory

Gary Kohanbash, PhD, joined the faculty of the Department of Neurological Surgery at UPMC Children’s Hospital of Pittsburgh in January of 2017. Dr. Kohanbash graduated from the University of Pittsburgh in 2007 with a bachelor of science honors degree in neuroscience, specializing in neurodegenerative diseases. He then earned his masters of science degree in infectious diseases and microbiology in 2009, and a doctorate in philosophy in 2012, both from the University of Pittsburgh Graduate School of Public Health. While there, he identified novel pathways of immunosuppression in gliomas and participated in multiple phase I/II immunotherapy clinical trials. Dr. Kohanbash subsequently completed a post-doctoral fellowship in the University of Pittsburgh Department of Neurological Surgery in 2014. He continued his training as a postdoctoral fellow at the University of California, San Francisco (UCSF) Department of Neurological Surgery. While at UCSF, Dr. Kohanbash was privileged to complete a prestigious T32 training program in translational brain tumor research.

Specialized Areas of Interest
Immunotherapy for pediatric and adult central nervous system tumors.

Professional Organization Membership
American Association for Cancer Research
Society for Immunotherapy of Cancer
Society for Neuro-Oncology

Education & Training
BS, (hons), Neuroscience, University of Pittsburgh, 2007
MS, Infectious Diseases and Microbiology, University of Pittsburgh, 2009
PhD, Brain Tumor Immunology, University of Pittsburgh, 2012
Postdoctoral Fellow, Neurological Surgery, University of Pittsburgh, 2014
Postdoctoral Fellow, Neurological Surgery, University of California, San Francisco, 2016
Gary Kohanbash, PhD

Faculty Biographies

Editorial Service
• Editorial Board:
  Cancers

• Ad Hoc Reviewer:
  Cancer Immunology Immunotherapy
  Cancers
  Journal of Clinical Investigation
  Journal of Clinical Investigation Insight
  Journal of Neuro-Oncology
  Journal of Nuclear Medicine
  Medicines
  Neuro-Oncology
  OncoImmunology

Interdepartmental and Medical Center Activities
• University of Pittsburgh:
  Committee Member, PhD Candidate, Department of Pharmacology

Professional Activities
Co-Chair, Immunotherapy Session, Society for Neuro-Oncology Annual Meeting
Pediatric Brain Tumor Consortium Immunology Section
Scientific Committee Member, Childhood Brain Tumor Tissue Consortium
External Grant Advisor, University of Toledo
Study Section, St. Baldrick’s Foundation Fellowship
University of Pittsburgh Senate Library Committee

Honors and Awards
Research Travel Award, Society for Immunotherapy of Cancer, 2014-15
Honoree, The Annual Convocation of the University of Pittsburgh, 2010, 2014
Best Dissertation Award, Department of Infectious Diseases and Microbiology, University of Pittsburgh, 2013
Top Oral Presentation, Translational Research Cancer Center Consortium (TRCC), 2013
International Research Travel Award, Japanese Society for Brain Tumor Pathology, 2012
Best Graduate Thesis Award, Department of Infectious Diseases and Microbiology, University of Pittsburgh, 2010
Top Poster Award, Translational Research Cancer Center Consortium (TRCC), 2009

Publications: 2019-20
• Refereed Articles:

**Michael J. Lang, MD**  
*Assistant Professor*

Michael J. Lang, MD, joined the University of Pittsburgh in 2019 as a vascular and endovascular neurosurgeon who specializes in treatment of vessel diseases of the brain, including aneurysms, stroke, carotid artery stenosis, arteriovenous malformations and fistulas, cavernomas, and intracerebral hemorrhage. He performs both minimally invasive endovascular and traditional open & skull base surgery, allowing a comprehensive approach in the treatment of cerebrovascular disease. He also has subspecialty training in functional/epilepsy neurosurgery. Dr. Lang completed his undergraduate work at the University of Wisconsin. He received his medical degree from Ohio State University, graduating with honors. Dr. Lang completed his neurosurgical residency and fellowships in both endovascular neurosurgery and functional & epilepsy surgery at Thomas Jefferson University. He then completed the prestigious fellowship in open cerebrovascular and skull base surgery at the Barrow Neurological Institute with extensive training in cerebral bypass surgery and removal of vascular lesions of the brainstem. Dr. Lang has published numerous papers and book chapters, participated in clinical trials, and delivered lectures to audiences all over the world. His research interests include clinical outcomes in the treatment of cerebrovascular disease and epilepsy surgery, as well as MRI-compatible robotics.

**Specialized Areas of Interest**  
Intracranial aneurysms, arteriovenous malformations, arteriovenous fistulas, cavernous malformations, brain tumors carotid stenosis, intracranial stenosis, venous sinus stenosis, ischemic stroke, trigeminal neuralgia, and epilepsy.

**Board Certifications**  
American Board of Neurological Surgery (board eligible)

**Hospital Privileges**  
UPMC Children’s Hospital of Pittsburgh  
UPMC Mercy  
UPMC Presbyterian  
UPMC Shadyside

**Professional Organization Membership**  
Alpha Omega Alpha  
American Association of Neurological Surgeons  
AANS/CNS Joint Section of Cerebrovascular Neurosurgery  
Congress of Neurological Surgeons  
North American Neuromodulation Society

**Education & Training**  
BS, Biology, University of Wisconsin-Madison, 2006  
MD (Honors), The Ohio State University College of Medicine, 2011  
Residency, Neurosurgery, Thomas Jefferson University, 2018  
Fellowship, Functional/Epilepsy, Thomas Jefferson University, 2016  
Fellowship, Endovascular, Thomas Jefferson University, 2018  
Fellowship, Cerebrovascular/Skull Base, Barrow Neurological Institute, 2019
Faculty Biographies

Michael J. Lang, MD

Editorial Service
• Ad Hoc Reviewer:
  - Journal of Neurointerventional Surgery
  - Journal of Neurosurgery
  - Neurosurgery
  - World Neurosurgery

Publications: 2019-20
• Refereed Articles:
  

  Mascitelli JR, Gandhi S, Baranoski JE, Lang MJ, Lawton MT. An a3-Anterior Inferior Cerebellar Artery to p3-Posterior Inferior Cerebellar Artery Bypass With Thrombectomy and Trapping of an Anterior Inferior Cerebellar Artery Aneurysm: 3-Dimensional Operative Video. 
  Oper Neurosurg (Hagerstown) 19(3):E311-E312, 2020.


Daniela Leronni, PhD
Research Instructor

Daniela Leronni, PhD, has been a research instructor at the University of Pittsburgh Department of Neurological Surgery since January 2017. She earned her BS/MS in biological sciences with a thesis in molecular biology at the University of Bari, Italy, in 2007. She completed her doctorate in genetics and molecular evolution at the University of Bari, in 2011. Dr. Leronni’s early work as a PhD student and research assistant at the University of Bari from 2008 to 2011 focused on the functional characterization of genetics elements in the genome of model organisms with a low number of chromosomes, such as Drosophila Melanogaster (fruit fly) and Culex Quinquefasciatus (southern house mosquito). She studied the insulator activity of retrotransposons, genomic elements present in all organisms’ genome. The study of the genetics of regulatory elements was the basis for Dr. Leronni’s background in molecular biology and her interest in gene therapy. In 2009, Dr. Leronni was offered a fellowship as a visiting research student in the Department of Surgery at Harvard University. Here she contributed to the finding that demonstrates that mitochondria host segregated cAMP cascades with distinct functional and kinetic signatures. In this way, she began to investigate biological mechanism at a cellular level and applied her knowledge in molecular biology to carry on research in cellular biology. In 2012, Dr. Leronni joined the University of Pittsburgh via the Department of Microbiology and Molecular Genetics as a postdoctoral associate. Under the supervision of Joseph C. Glorioso III, PhD, she gained experience in the design and generation of gene therapy vectors that can be used to deliver multiple protective genes simultaneously to neurons, with the long-term goal of using these vectors as new approaches to neurological disease. In 2015, Dr. Leronni was recruited by Robert Friedlander, MD, as postdoctoral associate to develop novel approaches for gene therapy for Huntington's disease (HD) and amyotrophic lateral sclerosis (ALS) and to study the basic mechanism of these diseases. One of the main objectives of her research is the creation of gene therapy vectors for HD, including, vectors targeting melatonin synthesis, which plays a protective role in the brain. Additionally, Dr. Leronni leads a research project investigating mitochondrial dysfunction in neurodegenerative disease and mitochondria signal transduction.

Specialized Areas of Interest
Molecular biology; neurodegenerative diseases; gene therapy; mitochondria.

Board Certifications
Biologo Professionista, Italy

Professional Organization Membership
American Association for the Advancement of Science
National Center for Faculty Development & Diversity

Education & Training
BS/MS, Biology/Molecular Genetics, Università degli Studi Aldo Moro, Bari, Italy, 2007
Research Scholar, Cell Signaling, Harvard Medical School, 2010
PhD, Genetics and Molecular Evolution, Università degli Studi Aldo Moro, Bari, Italy, 2011
Postdoctoral Fellowship, Molecular Genetics/Gene Therapy, University of Pittsburgh, 2012
Postdoctoral Fellowship, Neurodegenerative Diseases, University of Pittsburgh, 2015

Interdepartmental and Medical Center Activities
• University of Pittsburgh:
Mentor, First Experiences in Research, University of Pittsburgh Dietrich School of Arts and Sciences
Daniela Leronni, PhD

Faculty Biographies

Publications: 2019-20
• Refereed Articles:

Witold Lipski, PhD
Research Instructor

Witold Lipski, PhD received his undergraduate education in physics at Colby College in Waterville, Maine. He completed his doctoral degree in neuroscience at the Center for Neuroscience at the University of Pittsburgh, where he studied the neurophysiological mechanisms involved in the effects of stress on motivated behavior. There, he also became interested in the therapeutic mechanisms of deep brain stimulation (DBS), and investigated the behavioral and physiological effects of DBS in a rat model of obsessive compulsive disorder. In 2013, he joined the University of Pittsburgh Department of Neurological Surgery as a post-doctoral scientist, where he helped establish a basic research program aimed at understanding the pathophysiology of Parkinson’s disease and essential tremor and the therapeutic action of DBS in these disorders. He was also involved in studies aimed at examining the network dynamics leading to seizures in epilepsy, and answering other basic research questions using neurophysiological recordings in epilepsy patients undergoing intracranial seizure monitoring. After joining the department as a research instructor in 2017, Dr. Lipski has continued to use his expertise in neurophysiological recording and systems neuroscience to pursue both basic science and clinical research questions.

Specialized Areas of Interest
Basal ganglia contributions to production of speech and language; neural network dynamics in epilepsy; neurophysiological mechanism of motivated behavior.

Professional Organization Membership
Society for Neuroscience
Society for the Neurobiology of Language

Education & Training
BA, Physics, Colby College, 2000
PhD, Neuroscience, University of Pittsburgh, 2011

Publications: 2019-20
• Refereed Articles:

L. Dade Lunsford, MD
Lars Leksell Distinguished Professor
Director, Center for Image-Guided Neurosurgery
Director, Residency Training Program

L. Dade Lunsford, MD, is the Lars Leksell Professor and Distinguished Professor at the Department of Neurological Surgery at the University of Pittsburgh. He is also director of the Center for Image-Guided Neurosurgery at the University of Pittsburgh Medical Center and an internationally recognized authority on stereotactic surgery, radiosurgery, and minimally invasive surgery. In 1987, Dr. Lunsford was responsible for bringing the Gamma Knife to the University of Pittsburgh Medical Center, the first center in the United States to offer this state-of-the-art, minimally invasive form of brain surgery. Dr. Lunsford received his medical degree in 1974 from the Columbia University College of Physicians and Surgeons. He completed his internship in surgery at the University of Virginia Hospital and his residency in neurological surgery at the University of Pittsburgh training under Peter Jannetta. Following a one-year fellowship in stereotactic and functional neurosurgery at the Karolinska institute in Stockholm, Sweden where he studied with professors Lars Leksell and Erik-Olof Backlund, he joined the Department of Neurological Surgery faculty in 1981. He is an active staff member of several UPMC hospitals and was president of the medical staff at UPMC Presbyterian from 1999-2001 and past president of the Council of Clinical Chairs for the University of Pittsburgh School of Medicine in 2001-2003. Dr. Lunsford chairs the UPMC Health System Technology and Innovative Practice (TIPAC) committee and co-chairs the UPMC Brain Mapping (MEG) Center. Dr. Lunsford has been board-certified by the American Board of Neurological Surgery since 1983. He is the author of more than 1,400 published articles, abstracts, and book chapters and has served as the editor or co-editor of 16 books. Dr. Lunsford served as department chairman for ten years, stepping down in July of 2006 to devote more time to his clinical work, clinical investigation, and resident and fellow training. Since 2012 he has served as a team physician (neurosurgeon) for the National Hockey League’s Pittsburgh Penguins. In 2016, Dr. Lunsford received the Cushing Award for Technical Excellence and Innovation in Neurosurgery from the American Association of Neurological Surgery. In December of 2017, he received the prestigious Herbert Olivecrona Award—known by some as the “Nobel Prize of Neurosurgery”—from the Karolinska Institute & Karolinska University Hospital in Stockholm, Sweden. In April of 2018, he was honored to present the 2018 Van Wagenen Lecture during the American Association of Neurological Surgeons Annual Meeting in New Orleans. On June 19, 2020, via live stream, he delivered the inaugural Dan Leksell Lecture at the 4th IRRF/ISRS Biennial Radiosurgery Research and Education meeting.

Specialized Areas of Interest
Brain tumor management; Gamma Knife stereotactic radiosurgery; movement disorders and trigeminal neuralgia; vascular malformations; concussion and sports medicine.

Board Certifications
American Board of Neurological Surgery

Hospital Privileges
UPMC Presbyterian
UPMC Shadyside

Professional Organization Membership
AANS/CNS Joint Section for Stereotactic and Functional Neurosurgery (chair, 1995-97)
Allegheny County Medical Society
Faculty Biographies

L. Dade Lunsford, MD

American Academy of Neurological Surgery
American Association of Neurological Surgeons, Fellow
American College of Surgeons, Fellow
American Medical Association
American Society for Stereotactic and Functional Neurosurgery (president, 1995-97)
Congress of Neurological Surgeons
Florida Medical Association
Focused Ultrasound Surgery Foundation, Data Safety Monitoring Board
International Radiosurgery Research Foundation, Founding Chairman
North American Skull Base Society
Pennsylvania Medical Society
Pennsylvania Neurosurgical Society
Society of Neurological Surgeons

Education & Training
BA, University of Virginia, 1970
MD, Columbia University, 1974
Internship, General Surgery, University of Virginia, 1975
Residency, University of Pittsburgh, 1980
Fellowship, Stereotactic and Functional Neurosurgery, Karolinska Sjukhuset, 1981

Editorial Service
• Editorial Board:
  Egyptian Journal of Neurological
  Stereotactic and Functional Neurosurgery
  Progress in Neurological Surgery (Editor)

• Ad Hoc Reviewer:
  Acta Neurologica Scandinavica
  American Journal of Otology
  British Journal of Neurosurgery
  Cancer
  Headache
  International Journal of Radiation Oncology, Biology and Physics
  Journal of Neurosurgery
  Neurosurgery

Interdepartmental and Medical Center Activities
• UPMC Presbyterian:
  Director, Center for Image Guided Neurosurgery
  Co-Chair, Brain Mapping (MEG) Center

• University of Pittsburgh:
  Radiation Safety Committee

• UPMC:
  Director, Neurological Surgery Residency Program
  Chair, Technology and Innovative Practice Committee
  Value Analysis Executive Steering Committee
Faculty Biographies

L. Dade Lunsford, MD

Professional Activities
Course Co-Director, Principles and Practices of Gamma Knife Radiosurgery, Pittsburgh Pa.
Past Chair and Founder, International Gamma Knife Radiosurgery Foundation
Team Co-Neurosurgeon, Pittsburgh Penguins, National Hockey League

Honors and Awards
Pittsburgh’s Best Doctors, Pittsburgh Magazine, 2012-20
Excellence in Patient Experience Award, UPMC, 2018
Van Wagenen Lecturer, American Association of Neurological Surgeons Annual Meeting, 2018
Herbert Olivecrona Award, Karolinska Institute & Karolinska University Hospital, 2017
AANS Cushing Award for Technical Excellence and Innovation in Neurosurgery, 2016
Best Doctors in America, Pittsburgh Business Times, 2016
American Most Honored Professionals, Top 1%, 2016
America’s Top Doctors for Cancer, Castle Connolly Medical, Ltd., 2005-20
Best Doctors in America, 2005-20
Best Doctors in America database, 2010-20
Who’s Who In America, Marquis, 2003, 2006-14
Pioneers in Radiosurgery Award, Leksell Gamma Knife Society, 2010
Leading Health Professionals of the World, 2010
Faculty Teaching Award, Department of Neurosurgery 1997, 1999, 2000, 2010
Guide to America’s Top Surgeons, 2006-09
Allegheny County Medical Society Ralph C. Wilde Award, 2008
Castle Connolly Medical Ltd. National Physician of the Year Award, 2008
Distinguished Professor, University of Pittsburgh, 2007
Who’s Who in Science and Engineering, 2007
Congress of Neurological Surgeons Honored Guest, 2007
AANS Young Neurosurgeon Award, 2005
Academic Keys Who’s Who in Medical Sciences Education, 2005
Lars Leksell Provost Lecture, 2000
International Stereotactic Radiosurgery Jacob Fabrikant Award, 1997
William S. McEllroy Award, University of Pittsburgh School of Medicine, 1997
Good Housekeeping, Best Doctors, 1996
William P. Van Wagenen Fellowship, AANS, 1980
Phi Beta Kappa - University of Virginia, 1970
BA with High Honors - University of Virginia, 1970

Publications: 2019-20
- Refereed Articles:


**Invited Lectures: 2019-20**
- **Virtual:**
  - Lunsford LD. “When is it reasonable and unreasonable to consider hypofractionation as opposed to single session SRS?” Leksell Gamma Knife Society, June 8, 2020.

**Joseph C. Maroon, MD**

*Clinical Professor, Heindl Scholar in Neuroscience*

Joseph C. Maroon, MD, is a board-certified clinical professor of neurological surgery at the University of Pittsburgh Medical Center, and the Heindl Scholar in Neuroscience. His clinical and research interests have been in the areas of the development of minimally invasive surgical procedures to the brain and spine, the prevention and treatment of traumatic injuries to the central nervous system, innovative approaches to pituitary and other brain tumors and more recently complimentary approaches to inflammatory diseases associated with aging. Working with neuropsychologist, Mark Lovell, PhD, he co-developed ImPACT® (Immediate Post-Concussion Assessment and Cognitive Testing). This is the first computerized system to determine concussion severity and the timing for return to contact sports. It is now the standard of care for concussion management in the National Football League, National Hockey League, Major League Baseball, NASCAR and is used in over 12,000 colleges and high schools in the United States. For over 20 years he has served as the neurosurgical consultant to professional and college athletes in football, baseball, golf, hockey and soccer.
and has been the team neurosurgeon to the Pittsburgh Steelers for 20 years. He has been honored by the neurosurgical societies of Japan, Korea, Thailand, Egypt, Brazil, Lebanon and China for his neurosurgical contributions. He was honored by his peers when he was elected president of the Congress of Neurological Surgeons, the largest society of neurosurgeons in North America. Other outside activities include a former member of the board of directors and chairman of the scientific and technology committee of Mylan Laboratories, the largest generic drug manufacturer in the world; former chairman of the scientific advisory board to General Nutrition Corporation (GNC); and, chairman of the medical and scientific advisory board to Stemedica. He also serves on the NFL Head, Neck and Spine Committee and, in 2008, he became medical director of the World Wrestling Entertainment Corporation (WWE). Also in 2008, he was named senior vice president of the American Academy of Anti-Aging Medicine (A4M). Honored as one of America’s best neurosurgeons for 12 consecutive years he has written over 290 papers, 40 book chapters and five books. His most recent book, published in February of 2017 and re-released in December of 2018, is entitled Square One: A Simple Guide to a Balanced Life that takes a look at the importance of understanding where you are in life and the need to keep all elements of your life in proper “balance.” He has also authored Fish Oil: The Natural Anti-Inflammatory, published in 2006, and The Longevity Factor: How Resveratrol and Red Wine Activate Genes for Longer and Healthier Life, published in 2008. In his early years, his athletic abilities earned him a football scholarship to the University of Indiana in Bloomington where he was selected as Scholastic All-American in football. Despite his busy professional schedule, Dr. Maroon remains an avid athlete and has competed in over 78 triathlon events. These include eight Ironman distant triathlons (2.4 mile swim, 112 mile bike and 26.2 run) in Hawaii (1993, 2003, 2008, 2010 and 2013), Canada (1995), New Zealand (1997) and Europe (2000). He placed sixth in the Senior U.S. Olympics Triathlon in 2005. In 1999, he—along with Joe Montana and Kareem Abdul Jabaar—was inducted into the Lou Holtz Upper Ohio Valley Hall of Fame for his athletic accomplishments and contributions to sports medicine. On May 2, 2009, he was inducted into the Western Pennsylvania Sports Hall of Fame, and on March 14, 2010, he was inducted into the National Fitness Hall of Fame in Chicago. In June of 2017, Dr. Maroon was selected as Man of the Year by the Saints and Sinners Club of America, and in September of 2018, he was named Humanitarian of the Year by the Jerome Bettis Bus Stops Here Foundation. As medical director of the Live Free African Freedom Tour, on February 26, 2014, Dr. Maroon and his daughter, Isabella—along with a group of amputees—summitted Mt. Kilimanjaro in Africa, the highest free standing mountain in the world. In May of 2015, Dr. Maroon completed The Crucible Extreme Hike, a 3-day, 70-mile hike in the Laurel Mountains of Pennsylvania to raise awareness for wounded veterans. In February of 2020, Dr. Maroon was named recipient of the UPMC Clinician of Courage Award. To further honor Dr. Maroon, upon presenting the award, UPMC announced that the award would be renamed the Joseph Maroon Clinician of Courage Award for future award winners.

### Specialized Areas of Interest
- Microdiscectomy; lumbar laminectomy; anterior cervical discectomy; Arnold-Chiari Malformation; pituitary tumors; orbital tumors; acoustic tumors; brain tumors; concussion; sports medicine.

### Board Certifications
- American Board of Neurological Surgery

### Professional Organization Membership
- Allegheny County Medical Society
- American Academy of Anti-Aging Medicine
- American Association of Neurological Surgeons
American College of Sports Medicine
American College of Surgeons
American Medical Association
Congress of Neurological Surgeons
Mid-Atlantic Neurosurgical Society
National Association for Disabled Athletes
National Football League Physicians Society
Neurosurgical Society of America
Pennsylvania Medical Society
Pennsylvania Neurosurgical Society

**Education & Training**
AB, Anatomy & Physiology, Indiana University, 1961
MD, Indiana University, 1965
Residency, General Surgery, Georgetown University, 1967
Residency, Neurological Surgery, Indiana University, 1968
Residency, Neurological Surgery, Oxford University, 1969
Fellowship, Vermont College of Medicine, 1972

**Editorial Service**
• Editorial Board:
  *Anti-Aging News Journal*
  *Neurological Research*
  *The Physician and Sportsmedicine*
  *Surgical Neurology International*

• Ad Hoc Reviewer:
  *Annals of Otolaryngology and Rhinology*
  *Canadian Journal of Neurological Surgery*
  *Chinese Journal of Neural Regeneration Research*
  *European Journal of Pain*
  *Journal of Cranial Base Surgery*
  *Journal of Neurotrauma*
  *Journal of the American College of Surgeons*
  *Neurology India*
  *Neurosurgery*
  *Pharmacogenetics*
  *Stroke*
  *Surgical Neurology*
  *Spine Surgery Today*
  *World Neurosurgery*

**Professional Activities**
Medical Advisory Panel, The Chuck Noll Foundation for Brain Injury Research
Team Neurosurgeon, Pittsburgh Steelers
Medical Consultant, Mylan Laboratories
Medical Director, WWE
Senior Vice President, American Academy of Anti-Aging Medicine (A4M)
Senior Advisor, NFL Head, Neck and Spine Committee
World Advisory Board of the International Sports Hall of Fame
Chairman, Medical and Scientific Advisory Board, Stemedica
Consulting Neurosurgeon, Operation Backbone
Facult Biographies

Joseph C. Maroon, MD

Honors and Awards
UPMC Physician Excellence Award: Clinician of Courage, 2020
Inaugural Chuck Noll Foundation Lecture on Sports Related Trauma, American Association of Neurological Surgeons Annual Scientific Meeting, San Diego, 2019
Humanitarian of the Year, Jerome Bettis Bus Stops Here Foundation, 2018
Man of the Year, Circus Saints & Sinners Club, Bob Prince Tent, 2017
Pittsburgh’s Best Doctors, Pittsburgh Magazine, 2017-19
Lifetime Leadership Award for Concussion Research, UPMC Sports Medicine Concussion Program, 2016
The Best Doctors in America, 2000-20
Honorary President, World Association of Lebanese Neurosurgeons, 1999-2020
Ohio Valley Athletic Conference Hall of Fame Class of 2012
Pioneer Award, 25th Anniversary UPMC Center for Cranial Base Surgery, Pittsburgh, Pa., 2012
Distinguished Alumni Service Award, Indiana University, Bloomington, Ind., 2011
National Fitness Hall of Fame, 2010
Western Pennsylvania Chapter of the Sports Hall of Fame, 2009
Lou Holtz/Upper Ohio Valley Hall of Fame inductee, for excellence in athletics and medicine, June 1999

Media Appearances: 2019-20
“Try These 5 CBD Products for Better Sleep and Reduced Anxiety,” 929nin.com (Wichita Falls, Texas), April 15, 2020.
“Try These 5 CBD Products for Better Sleep and Reduced Anxiety,” thebeet.com, April 15, 2020.
“Apart from the Ordinary’ St. Barnabas caring, growing for more than a century,” Trib Live, February 23, 2020.
“‘Square One’: Dr. Joseph Maroon reveals how to find balance in life,” The South Hills Almanac, June 24, 2019.

Publications: 2019-20
• Refereed Articles:


• Invited Papers:

• Presentations:
Invited Lectures: 2019-20
• National:


• Virtual:
Maroon JC. “Avoiding Burunout During ANY Pandemic.” Fridays with Friedlander, Department of Neurological Surgery, University of Pittsburgh, Pittsburgh, Pa., May 15, 2020.

• Visiting Professorships:
West Virginia University, Morgantown, W.Wa.: “Burnout to Wellness and Beyond…”, November 1, 2019.

Vincent J. Miele, MD
Clinical Associate Professor
Chief, Neurosurgery, UPMC East
Director Neurosurgery Sports Fellowship

Vincent J. Miele, MD, joined the University of Pittsburgh Department of Neurosurgery as a clinical assistant professor on January 1, 2014 and was promoted to clinical associate professor in July of 2018. He is the former director of the neurosurgical spine service at West Virginia University. Dr. Miele received his undergraduate degree at Northeastern University in Boston where he graduated summa cum laude and was inducted into the Rho Chi Academic Pharmacy Honor Society as well as the Phi Kappa Phi Honor Society. He was also awarded the Northeastern University Alumni of the Year President’s Award in 2001. Dr. Miele completed medical school and his neurosurgical residency at West Virginia University where he was elected to the medical honor society Alpha Omega Alpha and won the Gandee-Massey Award based on academic achievement. He is fellowship-trained in complex spine surgery from Cleveland Clinic Foundation, where he remains adjunct faculty in the Spine Research Laboratory. Dr. Miele’s research has encompassed such areas as spinal biomechanics, concussion management and return to play, as well as accelerometer and MEMs technology translation into clinical applications. He has published more than 30 papers in refereed journals, authored 20 book chapters, and has presented scientific lectures both nationally and internationally. His research has lead to invited written editorials in prominent media such as the New York Times. Dr. Miele has been actively involved in the Congress of Neurological Surgeons, American Association of Neurological Surgery, and North American Spine Society and is an ad hoc reviewer for various journals. Dr. Miele’s major clinical interests embrace many aspects of neurosurgery, but are focused on spinal disorders including pathologies associated with degeneration and trauma, complex spinal instrumentation, revision spinal surgery, and spinal tumors. His areas of expertise include minimally invasive spine surgery and the newer motion preservation technologies as well as the larger surgeries required for conditions such as adolescent/adult spinal deformity and the multidisciplinary treatment of spinal tumors. Dr. Miele also has a strong background in cranial neurosurgery and treats
Vincent J. Miele, MD

Facility Biographies

peripheral nerve conditions such as carpel tunnel syndrome. Dr. Miele frequently evaluates and manages sports-related head and spine injuries, and works at a national level with athletes on return to play issues. He is involved in the development of devices used to detect and prevent concussion and is frequently invited to speak on this subject nationally. He also is an independent neurosurgical consultant for the National Football League and the Pittsburgh Steelers. He is licensed to practice in Pennsylvania, Ohio, and West Virginia and has established clinics in Coraopolis, Monroeville, Mt. Morris, Bethel Park, UPMC Mercy and Wexford in Pennsylvania, and Martins Ferry in Ohio.

Specialized Areas of Interest
Spinal disorders and injuries, spine tumors, revision spinal surgery, adult deformity/scoliosis surgery, sports-related brain and spine injuries, peripheral nerve disorders, and spinal fusions.

Board Certifications
American Board of Neurological Surgery

Hospital Privileges
UPMC East
UPMC Mercy
UPMC Presbyterian

Professional Organization Membership
Alpha Omega Alpha Medical Honor Society
American Association for the Improvement of Boxing
American Association of Neurological Surgeons
American Association of Professional Ringside Physicians
American College of Sports Medicine
Congress of Neurological Surgeons
International Federation of Sports Medicine
North American Spine Society
Ohio State Medical Society
Pennsylvania State Medical Society
United States Amateur Boxing Ringside Physicians
West Virginia State Medical Society

Education & Training
MD, West Virginia University, 2001
Residency, West Virginia University, 2007
Fellowship, Complex Spine, Cleveland Clinic, 2008

Editorial Service
• Editorial Board:
World Neurosurgery

• Ad Hoc Reviewer:
BioMed Central Neurology
Clinical Neurology and Neurosurgery
Journal of Neurology, Neurosurgery & Psychiatry
Neurology India

Honors and Awards
Pittsburgh’s Best Doctors, Pittsburgh Magazine, 2016-20
Edward A. Monaco III, MD, PhD
Assistant Professor

Edward A. Monaco III, MD, PhD, joined the Department of Neurological Surgery faculty as an assistant professor in June of 2013 after completing the University of Pittsburgh’s neurosurgery residency program. Dr. Monaco earned a PhD in neuroscience and physiology at SUNY Upstate Medical University in Syracuse and his medical degree from Columbia University College of Physicians and Surgeons in New York, N.Y. He completed undergraduate degrees in biology and chemistry at LeMoyne College in Syracuse, N.Y. Dr. Monaco left the department in June of 2020 to take a position with Geisinger Medical Center in Danville, Pa.

John J. Moossy, MD
Professor
Director, Center for Pain Management
Chief, Neurosurgery, VA Pittsburgh Healthcare System

John J. Moossy, MD, joined the faculty of the Department of Neurological Surgery at the University of Pittsburgh in 1986. He is now chief of neurosurgery at the Veterans Affairs Pittsburgh Healthcare System. He attended medical school at Tulane University, earning an MD degree in 1980. He completed a surgical internship and the residency program in neurosurgery at Duke University. Prior to that, he was an undergraduate student at Wake Forest University in Winston Salem, North Carolina, and at the University of Pittsburgh. His clinical practice is one of general neurosurgery with a special interest in the surgical management of medically intractable pain. Dr. Moossy’s publications include 32 articles in refereed journals and nine book chapters.

Specialized Areas of Interest
The surgical treatment of intractable pain problems through neuro-augmentative and neuro-ablative procedures.

Board Certifications
American Board of Neurological Surgery

Hospital Privileges
Latrobe Area Hospital
UPMC Presbyterian
UPMC Shadyside
Veterans Affairs Pittsburgh Healthcare System

Professional Organization Membership
Allegheny County Medical Association
American Association of Neurological Surgeons (AANS)
American Medical Association
Carroll F. Reynolds History of Medicine Society
Pennsylvania Medical Association
Pennsylvania Neurosurgical Society
Section on Pain of the AANS/CNS
Section on Disorders of the Spine & Peripheral Nerves of the AANS/CNS
Section on History of the AANS/CNS
**Faculty Biographies**

**Education & Training**
- BA, French, University of Pittsburgh, 1976
- MD, Tulane University, 1980
- Residency, Neurosurgery, Duke University, 1986

**Honors and Awards**
- Department of Neurological Surgery, Resident Teaching Award, 2001-03
- Rudolf Matas Prize in History of Medicine, 1980

**Ajay Niranjan, MD, MBA**
*Professor, Neurological Surgery*
*Associate Director, Center for Image-Guided Neurosurgery*
*Director, UPMC Brain Mapping Center*

Ajay Niranjan, MD, is a professor of neurological surgery at the University of Pittsburgh. Dr. Niranjan received his medical training at the King George's Medical College in Lucknow, India from 1980 to 1985, graduating with a bachelor of medicine and bachelor of surgery degree. Dr. Niranjan completed general surgery residency in 1989 and neurological surgery residency 1992. Dr. Niranjan joined the University of Pittsburgh as a fellow in image-guided neurosurgery in 1997 and completed his fellowship in 2000. He joined the faculty of neurological surgery in July of 2000. Dr. Niranjan’s major research interest is the analysis of clinical outcomes gamma Knife radiosurgery for tumors, vascular malformations and functional disorders of brain. His another research interest is in the development of pre-surgical brain mapping using magnetoencephalography (MEG). His other research interests include development of strategies to enhance the effect of radiosurgery on brain tumors. His laboratory has studied the radiobiological effects of radiation on brain-tumor microenvironment and has evaluated the effects of radiation on neural stem cells implantation in the brain. Dr. Niranjan serves as principal investigator on the project: “Thalamic Segmentation using Advanced MR Imaging Techniques.” Dr. Niranjan has co-authored over 210 articles in refereed journals, over 170 book chapters and five books. His recent book, *Leksell Radiosurgery*—presenting an update on state-of-the-art radiosurgery technology, including outcomes—was published in May of 2019. He has contributed guidelines for stereotactic radiosurgery for trigeminal neuralgia, pituitary adenomas, arteriovenous malformation, acoustic tumors, and brain metastases. Dr. Niranjan is the director of UPMC Brain Mapping Center which houses a magnetoencephalography unit. MEG is performed for pre-surgical mapping of critical brain functions in patients with brain tumors and for localization of seizure focus in patients with long standing epilepsy.

**Specialized Areas of Interest**
- Radiosurgery for benign and malignant brain tumors; radio surgery for brain vascular malformations; radio surgery for functional brain disorders; pre-surgical brain mapping using MEG.

**Hospital Privileges**
- UPMC Presbyterian

**Professional Organization Membership**
- American Clinical MEG Society
- Congress of Neurological Surgeons
- International Radiosurgery Research Foundation
- International Stereotactic Radiosurgery Society

**John J. Moosay, MD**
Ajay Niranjan, MD, MBA

Education & Training
MBBS, King George's Medical College, 1985
Residency, General Surgery, King George's Medical College, 1989
Residency, Neurological Surgery, King George's Medical College, 1992
Fellowship, University of Pittsburgh, 2000
MBA, University of Pittsburgh, 2009

Editorial Service
• Ad Hoc Reviewer:
  Gene Therapy
  Expert Review of Neurotherapeutics
  Interdisciplinary Neurosurgery: Advanced Techniques and Case Management
  Journal of Neurosurgery
  Neurology India
  Neurosurgery
  Radiation Oncology
  Technology In Cancer Research And Treatment (TCRT)
  World Neurosurgery
  World-Science

Interdepartmental and Medical Center Activities
• UPMC Presbyterian:
  Radiation Safety Committee
  Director of Operations, UPMC Brain Mapping Center
  Total Quality & Patient Safety Council

• University of Pittsburgh:
  Radiation Safety Committee

Professional Activities
Board Member, American Association of Neurological Surgeons
Board Member, American Society for Radiation Oncology (ASTRO)
Member, International Radiosurgery Research Foundation

Honors and Awards
Best Doctors in America, Pittsburgh Magazine, 2016-20
UPMC Excellence in Patient Experience, Physician and Medical Staff Honor Roll, 2017

Publications: 2019-20
• Refereed Articles:

• Virtual Presentations:

David O. Okonkwo, MD, PhD
Professor
Director, Neurotrauma Clinical Trials Center
Director, Scoliosis and Spinal Deformity Program
Special Advisor, UPMC Enterprises

David Okonkwo, MD, PhD, is professor of neurological surgery and director of the Neurotrauma Clinical Trials Center at the University of Pittsburgh. He is also director of neurotrauma and the scoliosis and spinal deformity program at UPMC Presbyterian. In addition, Dr. Okonkwo is a member of the medical staff for the Pittsburgh Steelers Football Club. Dr. Okonkwo completed his undergraduate work at the University of Virginia, where he was a Howard Hughes Undergraduate Biomedical Research Scholar. He completed his medical and doctoral education through the MD/PhD program of the Medical College of Virginia of Virginia Commonwealth University. He joined the University of Pittsburgh Department of Neurological Surgery in 2006 following completion of neurosurgical residency at the University of Virginia and a fellowship at Auckland Public Hospital in Auckland, New Zealand. He has additional specialized training in scoliosis surgery. Dr. Okonkwo’s clinical interests are traumatic injuries to the brain and spine as well as scoliosis and spinal deformity. His research endeavors involve developing biomarkers, advanced neuroimaging modalities and novel therapeutic interventions for brain and spinal cord injury. Dr. Okonkwo is a principal investigator of a national clinical research network (TRACK-TBI) to advance our understanding and treatment of traumatic brain injury. He is also principal investigator of several ongoing clinical studies in neurotrauma in Pittsburgh. Dr. Okonkwo has published more than 200 papers in refereed journals, authored numerous book chapters, and garnered several awards for his scientific research. He is a member of the American Association of Neurological Surgeons, the Congress of Neurological Surgeons and the National and International Neurotrauma Societies.

Specialized Areas of Interest
Brain and spine trauma; scoliosis; spinal deformity; minimally invasive spine surgery; sports medicine; experimental therapies for brain and spinal cord injuries.

Board Certifications
American Board of Neurological Surgery
David O. Okonkwo, MD, PhD

**Hospital Privileges**
UPMC Children’s Hospital of Pittsburgh
UPMC Mercy
UPMC Presbyterian

**Professional Organization Membership**
Alpha Omega Alpha Medical Honor Society
American Academy of Neurosurgery
American Association of Neurological Surgery
Congress of Neurological Surgeons
International Spine Study Group
National Neurotrauma Society
Society of Lateral Access Surgery

**Education & Training**
BA, Biology, University of Virginia, 1994
MD, Virginia Commonwealth University, 2000
PhD, Anatomy, Virginia Commonwealth University, 2000
Fellowship, Neurosurgery, Auckland Public Hospital, 2005
Residency, Neurosurgery, University of Virginia, 2006

**Editorial Service**
• Editorial Board:
  Therapeutic Hypothermia

• Ad Hoc Reviewer:
  Journal of Neurosurgery
  Journal of Neurotrauma
  Neurosurgery

**Interdepartmental and Medical Center Activities**
• UPMC Presbyterian:
  Trauma Medical Audit Committee
  UPMC Physician Clinical Quality Leadership Committee
  Medical Executive Committee

• University of Pittsburgh:
  Institutional Review Board

• UPMC Enterprises:
  Special Advisor

**Professional Activities**
Chair, AANS/CNS Section on Neurotrauma and Critical Care
Councilor, National Neurotrauma Society

**Honors and Awards**
Best Doctors in Pittsburgh, Pittsburgh Magazine, 2018-20

**Media Appearances: 2019-20**
Faculty Biographies

David O. Okonkwo, MD, PhD

Publications: 2019-20

- Refereed Articles:


**Visiting Professorships:**

**Invited Lectures: 2019-20**
• National:
Faculty Biographies

David O. Okonkwo, MD, PhD


• Local/Regional:

Okonkwo DO. "Running two rooms: overlapping surgery for the busy spine surgeon." Midwest Spine Symposium, Pittsburgh, Pa., September 6, 2019.


Eva F. Pamias-Portalatin, MD

Clinical Assistant Professor

Eva F. Pamias-Portalatin, MD, is a clinical assistant professor at UPMC Pinnacle, joining the University of Pittsburgh Department of Neurological Surgery in September of 2018. She received her undergraduate degree at The University of Puerto Rico where she received a BS in biology and then completed her medical education at Universidad de Monterrey School of Medicine where she was an active member of altruistic organizations, graduating with honors and ranking at the top of her class. Following medical school, she completed a sub-internship year at The University of Texas and Methodist Health Care System in San Antonio, Texas and her neurosurgery residency at The University of Puerto Rico Medical Science Campus where she served as chief resident. While in residency she completed an enfolded research fellowship in brain tumors at The Johns Hopkins Hospital in Baltimore, Md. After the completion of her residency training, she completed a surgical fellowship in skull base, endoscopic and oncologic neurosurgery at The Mayo Clinic in Jacksonville, Fla., where she was also involved in academic activities, directing resident neurosurgery knowledge update and co-directing the neuroncology skull base lecture series. Her clinical interests include a broad spectrum of brain tumors treatments, including endoscopic, open surgical and minimally invasive techniques. She is also interested in other general neurosurgical conditions including degenerative spine, spinal stenosis, disc herniation, peripheral nerve and trauma. A main author of multiple book chapters and manuscripts in the neuro-oncology field, Dr. Pamias-Portalatin is fluent in english and spanish. She is a member of the Congress of Neurological Surgeons and the American Association of Neurological Surgeons.
Faculty Biographies

Eva F. Pamias-Portalatin, MD

Specialized Areas of Interest
Brain tumors; spine tumors and degenerative disease; hydrocephalus; awake craniotomy and brain mapping, Chiari malformations, carpal tunnel release surgery.

Board Certifications
American Board of Neurological Surgeons (board eligible)

Hospital Privileges
UPMC Pinnacle

Professional Organization Membership
American Association of Neurological Surgeons
Congress of Neurological Surgeons

Education & Training
BA, Biology, University of Puerto Rico, 1996
MD, Universidad de Monterrey, Nuevo Leon, Mexico, 2003
Neurosurgery Residency, University of Puerto Rico Medical Science Camous, San Juan City
Hospital, San Juan, P.R., 2010
Fellowship, Johns Hopkins, Baltimore, Md., 2015
Fellowship, Mayo Clinic, Jacksonville, Fla., 2018

Ian F. Pollack, MD
A. Leland Albright Distinguished Professor
Vice Chair, Academic Affairs
Chief, Pediatric Neurosurgery
Co-Director, Neurosurgical Oncology
Professor of Clinical and Translational Science

Ian Pollack, MD, is chief of pediatric neurosurgery at UPMC Children’s Hospital of Pittsburgh, A. Leland Albright Professor of Neurosurgery at the University of Pittsburgh School of Medicine, and co-director of the Neurosurgical Oncology Program at the Hillman Cancer Institute. Prior to joining the faculty of the Department of Neurological Surgery at the University of Pittsburgh in 1992, he was awarded the 1991 Van Wagenen Traveling Fellowship, which afforded him a year of subspecialty training in the Department of Neurosurgery at the Hospital for Sick Children in Toronto, the Neuro-Oncology Laboratory of the University of Lausanne in Switzerland, and the Laboratory of Tumor Biology of the University of Uppsala in Sweden. Dr. Pollack graduated magna cum laude from Emory University in 1980, where he earned a BS degree in chemistry. He received his medical degree from the Johns Hopkins University School of Medicine in 1984, then completed a surgical internship and neurosurgical residency at the University of Pittsburgh School of Medicine. He also was a research fellow in neuropathology and neurobiology during some of that time. Dr. Pollack has published more than 350 papers in refereed journals, numerous book chapters and invited papers, and has edited two books on childhood brain tumors. He is co-editor of the book Principles and Practice of Pediatric Neurosurgery—currently in its third edition—and an accompanying atlas Operative Techniques In Pediatric Neurosurgery. He is currently a principal investigator on NIH grants focusing on novel therapies for brain tumors and evaluating molecular markers of tumor prognosis. Dr. Pollack was named vice chairman of academic affairs for the department in July of 2008. He also chaired the Children’s Oncology Group CNS Tumor Committee from 1999-2009, and co-chaired the National Cancer Institute Brain Malignancy Steering Committee between 2010 and 2017.
Faculty Biographies

Ian F. Pollack, MD

Specialized Areas of Interest
Pediatric neurosurgery; pediatric neuro-oncology; craniofacial surgery; congenital spinal abnormalities; brain tumor clinical trials.

Board Certifications
American Board of Neurological Surgery
American Board of Pediatric Neurosurgery

Hospital Privileges
UPMC Children’s Hospital of Pittsburgh
UPMC Magee-Womens Hospital
UPMC Presbyterian

Professional Organization Membership
Academy of Neurological Surgeons
Alpha Omega Alpha
American Academy of Pediatrics
American Association for the Advancement of Science
American Association for Cancer Research
American Association of Neurological Surgeons
American College of Surgeons
American Society for Pediatric Neurosurgery
American Society for Clinical Investigation
Association of American Physicians
Children’s Oncology Group
Congress of Neurological Surgeons
John Hopkins Medical and Surgical Society
Joint Section on Tumors (AANS/CNS)
Phi Beta Kappa
Society of Neurological Surgeons
Society for Neuro-Oncology
Society of Surgical Oncology

Education & Training
BS, Chemistry, Emory University, Magna cum Laude, 1980
MD, Johns Hopkins University School of Medicine, 1984
Fellowship, University of Pittsburgh, 1990
Residency, University of Pittsburgh, 1991
Fellowship, Hospital for Sick Children, 1991
Fellowship, University of Lausanne, 1991
Fellowship, University of Uppsala, 1992

Editorial Service
• Editorial Board:
  ASCO-PLWC
  Child’s Nervous System
  Pediatric Blood and Cancer

Interdepartmental and Medical Center Activities
• University of Pittsburgh:
  Director, Pediatric Neuro-Oncology Laboratory
• University of Pittsburgh Cancer Institute:
  Co-Director, Brain Tumor Program

• UPMC Children’s Hospital of Pittsburgh:
  Co-Director, Pediatric Neuro-Oncology Tumor Board
  Perioperative Executive Committee

Professional Activities
Pediatric Brain Tumor Consortium:
  Institutional PI
  Steering Committee
  Chair, Translational Biology Committee
Director, American Board of Pediatric Neurological Surgery
Director, Accreditation Council for Pediatric Neurosurgery Fellowships

Honors and Awards
Pittsburgh’s Best Doctors, *Pittsburgh Magazine*, 2012-20
Joan Venes Lectureship, University of Michigan, 2019
Albert Nelson Marquis Lifetime Achievement Award, Marquis Who’s Who, 2018
Castle Connolly’s America’s Top Doctors, 2002-20
*Who’s Who in America*, Marquis, 2005-20
*Who’s Who in the World*, Marquis, 2008-20
Castle Connolly’s America’s Top Cancer Doctors, 2005-20
Certificate of Appreciation for BMSC Co-chairship, National Cancer Institute, 2017
E. Bruce Hendrick Visiting Professor in Pediatric Neurosurgery, University of Toronto, 2016
Columbia Softball Charity Award, American Association of Neurological Surgeons Annual Meeting, 2016
Children’s Brain Tumor Foundation, Award for Scientific Excellence, 2016
Winn Prize, Society of Neurological Surgeons, 2015
Van Wagenen Lecturer, American Association of Neurological Surgeons Annual Meeting, 2014

Publications: 2019-20
• Refereed Articles:


Faculty Biographies


Faculty Biographies


• Book Chapters:

• Published Abstracts:


Faculty Biographies


Invited Lectures: 2019-20:
- Visiting Professorships:

Daniel R. Premkumar, PhD

*Research Assistant Professor*

Prior to joining the faculty of the Department of Neurological Surgery at the University of Pittsburgh in 2008, Daniel R. Premkumar, PhD, was a senior scientist at a biotechnology company. He graduated from Madurai Kamaraj University in India where he earned his masters and doctorate degrees. Dr. Premkumar then completed his post-doctoral training at Case Western Reserve University in Cleveland. Dr. Premkumar has published more than 40 papers in refereed journals and has been awarded patents to characterize protein-protein interaction biosensors for cellular systems biology profiling. He is currently examining the efficacy of promising various receptor inhibitors, for inhibiting glioma proliferation in vitro, using genotypically diverse panel of malignant glioma cell lines to identify potential genotype-response associations.

**Specialized Areas of Interest**

Major research emphasis is directed towards understanding the molecular mechanisms of receptor tyrosine kinase inhibition and signaling in malignant human glioma cell lines.

**Professional Organization Membership**

- American Association for Cancer Research
- American Society of Pharmacology and Experimental Therapeutics

**Education & Training**

- BS, Biology, Madura College, 1982
- MS, Animal Sciences, Madurai Kamaraj University, 1984
- PhD, Entomology, Madurai Kamaraj University, 1990

**Editorial Service**

- Editorial Board:
  - *Journal of Neurology and Neurosciences*
  - *Journal of Neurology and Neurosurgery*
Faculty Biographies

Daniel R. Premkumar, PhD

- Ad Hoc Reviewer:
  - Carcinogenesis
  - Journal of Cellular Physiology
  - Molecular Carcinogenesis
  - PLoS ONE

Publications: 2019-20
- Refereed Articles:

Ava Puccio, RN, PhD

Assistant Professor
Co-Director, Neurotrauma Clinical Trials Center

Ava M. Puccio, RN, PhD, is an assistant professor in the department of neurological surgery and also co-director of the Neurotrauma Clinical Trials Center in collaboration with David O. Okonkwo, MD, PhD. Dr. Puccio received her bachelor of science degree in neuroscience in 1988 and bachelor degree in nursing in 1994, both from the University of Pittsburgh. In 1995, she joined the Department of Neurological Surgery as a nurse coordinator on the National Acute Brain Injury Study: Hypothermia (NABIS:H) study and also the coordinator for the Brain Trauma Research Center. Throughout her years of employment as a nurse coordinator, she pursued part-time advanced schooling to graduate with a master’s degree in nursing from the University of Pittsburgh in 2000 and as a university scholar (top 2% of class) from the University of Pittsburgh School of Nursing with a doctoral degree, emphasis in neuroscience in 2008. Her dissertation, “Effect of short periods of normobaric hyperoxia on local brain tissue oxygenation and cerebrospinal fluid oxidative stress markers in severe traumatic brain injury” was published in the Journal of Neurotrauma in 2009. Dr. Puccio was appointed assistant professor in the Department of Neurological Surgery at the University of Pittsburgh in 2010 and received her adjunct faculty position with The School of Nursing, Department of Acute/Tertiary Care in 2010 with collaborations with Yvette Conley, PhD and Richard Henker, RN, PhD. Her research has focused on improving outcomes in traumatic brain injury patients, with clinical venues of controlled normothermia, mechanisms of brain oxygenations and exploring genetic variances and expression on outcome and was awarded a K99/R00 NINR grant in 2014, entitled “Transcriptomics in Traumatic Brain Injury: Relationship to Brain Oxygenation and Outcomes.” With 25 years of clinical trial design, involvement and management, several traumatic brain and spine injury research studies have been completed and are ongoing. Many cutting-edge biomarker and high definition fiber tracking imaging and additional observational research studies are being conducted. Dr. Puccio is very involved in the Transforming Research and Clinical Knowledge in TBI (TRACK-TBI) consortium and was awarded a Department of Defense grant as PI of the Biospecimen Repository which collects, catalogues and stores cerebrospinal fluid, blood, serum DNA and RNA samples obtained from mild, moderate and severe TBI patients at 17 clinical sites. Analyses from these samples has provided additional validation to the recent FDA-approval of the use of 2 biomarkers, glial fibrillary acidic protein (GFAP) and ubiquitin C-terminal hydrolase L1 (UCH-L1) obtained within 12 hours of a suspected TBI in determining the need for a brain CT scan, and a FDA-pivotal trial with Abbott Laboratories will commence in the coming fiscal year. The success of this biorepository has also springboarded opportunities to acquire additional ongoing grant support this year through the DoD, as the biorepository for the biomarkers in the Brain Oxygenation Optimization Study...
Faculty Biographies

Ava Puccio, RN, PhD

Trial (Bio-BOOST), as well as TRACK-TBI Geriatric Initiative (NIH funded) to further define the elderly TBI cohort. Dr. Puccio is a member of the Neurocritical Care Society, Society of Critical Care Medicine, National and International Neurotrauma Society.

Specialized Areas of Interest
Traumatic brain injury research.

Board Certifications
RN License: Pennsylvania

Hospital Privileges
UPMC Mercy
UPMC Presbyterian

Professional Organization Membership
Eastern Nursing Research Society
National Neurotrauma Society
Neurocritical Care Society
Sigma Theta Tau International Nursing Honor Society
Society of Critical Care Medicine
Training, Education and Mentoring (TEAM) Neurotrauma

Education & Training
BS, Neuroscience, University of Pittsburgh, 1988
BSN, Nursing, University of Pittsburgh, 1994
MSN, Nursing, University of Pittsburgh, 2000
PhD, Nursing/Neuroscience, University of Pittsburgh, 2008

Editorial Service
• Ad Hoc Reviewer:
  Neurocritical Care
  Pediatric Critical Care
  Society of Critical Care Medicine
  State of the Science Congress on Nursing Research
  Therapeutic Hypothermia and Temperature Management

Interdepartmental and Medical Center Activities
• UPMC Presbyterian:
  Nursing Neuroscience Critical Care Course, UPMC
  Annual residents’ training for ‘TBI Management and Mayfield Technique’

• University of Pittsburgh:
  Co-Director, Neurotrauma Clinical Trials Center
  Mentor for one medical student; one doctoral of nursing student and two post-doctoral fellows

Professional Activities
Guest Lecturer, Pathophysiology Across the Lifespan, Nursing Graduate Course, University of Pittsburgh
Ad Hoc Grant Reviewer NIH/NINDS, Copeland Foundation Grant Committee, University of Pittsburgh
Abstract Reviewer, Professor Walk Rounds, National Neuroscience Society, Society of Critical Care Medicine, Safar Symposium, University of Pittsburgh Biomarker Working Group, TRACK-TBI, University of California, San Francisco Working Group, Genetic Associations in Neurotrauma (GAIN) Consortium Biomarker Working Group, International TBI Research (InTIBIR) Steering Committee, TRACK-TBI, University of California, San Francisco

Honors and Awards
Cold Spring Harbor Scholarship, 2012
Ruth Perkins Kuehn Nursing Research Award, 2011
Cameos of Caring Nursing Scholarship, 2007
Society of Critical Care Nursing Section Award, 2006

Publications: 2019-20
• Refereed Articles:
Faculty Biographies

Ava Puccio, RN, PhD

**Book Chapters:**


**Invited Lectures: 2019-20**

• International:

• National:

Rodwan K. Rajjoub, MD
Clinical Assistant Professor
Neurosurgery Director, UPMC Susquehanna

Rodwan K. Rajjoub, MD, joined UPMC Susquehanna in March of 2017 after almost 30 years in private practice. He served his residency at George Washington University and the National Institute of Health after receiving his medical degree and undergraduate degree from Damascus University in Syria. He is married, a father of five physicians and enjoys playing tennis in his spare time.

**Specialized Areas of Interest**
Brain tumor; spinal disorders; peripheral nerves.

**Board Certifications**
American Board of Neurological Surgery, Diplomate

**Hospital Privileges**
Divine Providence Hospital
Evangelical Community Hospital
Jersey Shore Hospital
Muncy Valley Hospital
Williamsport Regional Medical Center

**Professional Organization Membership**
American Association of Neurological Surgeons
American College of Surgeons
Congress of Neurological Surgeons
Pennsylvania Medical Society
Mid-Atlantic Neurosurgical Society
Pennsylvania Neurological Society
Lycoming County Medical Society
Faculty Biographies

Rodwan K. Rajjoub, MD

Education & Training
BA, (Physics, Chemistry, Biology), Damascus University, 1967
MD, Damascus University, 1972
Residency, George Washington University, 1979

Honors and Awards
AANS Continuing Education Award 2019—earned 60 or more AMA PRA Credits between January 1, 2017 and December 31, 2019.

Michael J. Rutigliano, MD
Clinical Associate Professor
Director, Westmoreland County Community Neurosurgery

Michael J. Rutigliano, MD, MBA, was appointed to the University of Pittsburgh faculty in 1996. An active staff member of the University of Pittsburgh Medical Center, Dr. Rutigliano lives in Greensburg, Pa., and the primary focus of his clinical practice is in Westmoreland County at the hospitals of the Excela Health System through a cooperative venture between UPMC and Excela Health. His clinical interests include a wide range of neurosurgical diseases, focusing mostly in the areas of spinal and peripheral nerve disorders, and concussi
cision and other sports-related injury. Surgical procedures performed include simple spinal surgery such as lumbar and cervical discectomy, laminectomies for spinal stenosis, and more complex spinal reconstructive surgery for spondylolisthesis and scoliosis. Common peripheral nerve surgery includes carpal tunnel release and ulnar neurolysis. He received his medical degree in 1989 from the University of Pittsburgh School of Medicine. Following an internship in general surgery, he completed residency training in neurological surgery at the University of Pittsburgh Medical Center. During this time he also obtained an MBA from the Katz Graduate School of Business. Dr. Rutigliano’s academic expertise is in medical economics and cost-effectiveness analysis. He was awarded the Pittsburgh Academy of Medicine Study Scholarship and was honored by the Stroke Council of the American Heart Association with a scholarship for research in cerebrovascular disease. Dr. Rutigliano has retired from the United States Army Reserve and has served in support of Operation Iraqi Freedom at Walter Reed Medical Center from April to July 2003, and in Balad, Iraq from October 2007 to February 2008.

Specialized Areas of Interest
Spinal disorders; peripheral nerve disorders,

Board Certifications
American Board of Neurological Surgery

Hospital Privileges
Latrobe Area Hospital
UPMC East
UPMC Presbyterian
Westmoreland Hospital

Professional Organization Membership
American Association of Neurological Surgeons
AANS/CNS Joint Section on Spine and Peripheral Nerve
Congress of Neurological Surgeons
Robert J. Schlegel Jr., MD
Clinical Assistant Professor

Robert J. Schlegel Jr., MD, with over 30 years of experience as a neurosurgeon, joined the University of Pittsburgh Department of Neurological Surgery in April of 2018. He completed his residency at the University of Maryland Medical Center in Baltimore and has a medical degree from the University of New Mexico, Albuquerque.

Medical Education
- MD, University of New Mexico
- Residency, University of Maryland

Board Certifications
American Board of Neurological Surgery

Hospital Privileges
UPMC Pinnacle

Professional Organization Membership
- American Association of Neurological Surgeons
- American College of Surgeons

Media Appearances: 2019-20

Invited Lectures: 2019-20
- Local/Regional:
Raymond F. Sekula Jr., MD
Associate Professor
Director, Cranial Nerve Disorders Program
Vice Chair, UPMC Central Pa.

Raymond F. Sekula Jr., MD, MBA, a native of western Pennsylvania, is vice chair of UPMC Central Pa., associate professor of neurological surgery at the University of Pittsburgh and director of UPMC’s Cranial Nerve and Brainstem Disorders program. He is a graduate of Pittsburgh’s Central Catholic High School, the University of Virginia with a degree in classics, the Georgetown University School of Medicine with a degree in medicine, and Carnegie Mellon University with a degree in business administration. An internationally renowned expert in minimally invasive brain surgery, Dr. Sekula performs more than 500 operations each year for patients throughout the United States and beyond for the most complex neurologic disorders. Dr. Sekula has performed more than 2,000 procedures for patients with trigeminal neuralgia, hemifacial spasm, and other cranial neuralgias. Last year, he performed more than 200 operations for patients with cranial neuralgias and 50 operations for patients with brain tumors of all types. He is an expert in minimally invasive brain and spine surgery and has developed techniques in brain surgeries of all types that reduce patients’ hospital stays to one or two days without the need for the intensive care unit after the procedure. Dr. Sekula has been honored with numerous awards including the Young Investigator Award from the American Association of Neurological Surgeons, the Allen Humphrey Excellence in Mentoring Award at the University of Pittsburgh School of Medicine, Pittsburgh Magazine’s “40 under 40” and “Best Doctors” Awards, and a UPMC Champion of Nursing Award. He has been twice awarded the Department’s annual faculty teaching award. In addition to his clinical and administrative duties at the University of Pittsburgh, Dr. Sekula oversees a preclinical laboratory studying fundamental mechanisms of facial pain. He has published more than 100 scientific article and is a coeditor of the textbook Microvascular Decompression Surgery, a comprehensive look at MVD surgery, widely accepted as an effective remedy for cranial nerve hyperexcitability disorders including hemifacial spasm, trigeminal neuralgia, and glossopharyngeal neuralgia. Dr. Sekula’s international outreach includes co-founding the World Federation of Cranial Nerve Disorders in 2016. He is a member of the medical advisory board of the Facial Pain Association, an international association dedicated to helping patients with facial pain of all types. In 2015, he traveled to Kazakhstan to help advise the structure of the Republican Scientific Center of Neurosurgery in Astana. In 2015, he was the honored guest of La Sociedad Ecuatoriana de Neurocirugia of South America. Beginning July 1, 2020, Dr. Sekula will direct the department’s neurosurgery residency program.

Specialized Areas of Interest
Minimally invasive brain and spine surgery; trigeminal neuralgia; hemifacial spasm; brain and skull base tumors.

Board Certifications
American Board of Neurological Surgery

Hospital Privileges
UPMC Hamot
UPMC Mercy
UPMC Passavant
UPMC Presbyterian
UPMC Shadyside
Raymond F. Sekula Jr., MD

**Professional Organization Membership**
- Allegheny County Medical Society
- American Association of Neurological Surgeons
- AANS/CNS Section of Pain
- Congress of Neurological Surgeons
- Facial Pain Association
- Hemifacial Spasm Association
- Medical Advisory Board of TNA
- Pennsylvania Neurosurgical Society
- The Facial Pain Association
- Trigeminal Neuralgia Association
- World Neurosurgeon Federation of Cranial Nerve Disorders

**Education & Training**
- BA, Classics, University of Virginia, 1994
- MD, Georgetown, 2000
- Residency, Pediatric Neurosurgery, Children’s Hospital of Pittsburgh, 2004
- Residency, Neurosurgery, Allegheny General Hospital, 2006
- Fellowship, Microvascular & Skull Base Surgery, 2006
- MBA, Carnegie Mellon University, 2009

**Editorial Service**
- **Editorial Board:**
  - *Science Times*
- **Ad Hoc Reviewer:**
  - *Journal of Neurosurgery*
  - *Journal of Neurology, Neurosurgery, and Psychiatry*
  - *Neurosurgery Journal*
  - *OncoTarget*
  - *World Neurosurgery Journal*

**Interdepartmental and Medical Center Activities**
- **UPMC Presbyterian:**
  - Clinical Competency Committee
  - Physician Champion, Neurosurgery Care Coordination
- **University of Pittsburgh:**
  - Health Career Scholars Academy: Shadow Day
  - Course Director, Neurological Surgery Introductory Course for second year students
- **Department of Neurological Surgery:**
  - Associate Residency Program Director, Neurological Surgery
  - Executive Committee, Department of Neurological Surgery
  - Executive Resident Selection Committee
  - Craniotomy Supply Chain Analytics Team Member, Neurosurgery Service Line

**Professional Activities**
- Portal Editorial Board (Pain Section), American Association of Neurological Surgeons/Congress of Neurological Surgeons
- Activity Director, Functional Neurosurgery Oral Board Review, Congress of Neurological Surgeons webinar series
Faculty Biographies

Raymond F. Sekula Jr., MD

Course Director, *Brain and Blade: The World of Neurosurgery*, University of Pittsburgh School of Medicine, Mini-Elective for 2nd year students, nine two-hour sessions.

Course Director, Functional Neurosurgery Review For Residents, Congress of Neurological Surgeons webinar series.

Course Director, Functional Neurosurgery Oral Board Review For Practicing Neurosurgeons, Congress of Neurological Surgeons webinar series.

**Honors and Awards**

- Best Doctors in Pittsburgh, *Pittsburgh Magazine*, 2016-20
- UPMC ACES Award, 2018
- UPMC Champion of Nursing Nomination, 2017
- SANS Challenge Finalist, Congress of Neurological Surgeons, 2017
- Faculty Teaching Award, Department of Neurological Surgery, 2016
- Allen L. Humphrey Excellence in Mentoring, University of Pittsburgh School of Medicine, 2016

**Publications: 2019-20**

- Refereed Articles:

- Invited Papers:

- Letters to the Editor:

- Book Chapters:

**Invited Lectures: 2019-20**

- Local/Regional:

- Virtual:
Nilkantha Sen, PhD

Nilkantha Sen, PhD, joined the University of Pittsburgh Department of Neurological Surgery in March of 2017 as an associate professor. After graduating from Indian Institute of Chemical Biology—one of the most prestigious institutes of India—Dr. Sen joined Johns Hopkins University in 2010 as a post-doctoral fellow under the mentorship of Solomon H. Snyder, MD. His work studied the mechanism involved for nitric oxide-induced neuronal cell death and he discovered a novel mechanism which was shown to play a key role in cell death associated with several neurodegenerative diseases such as Alzheimer’s Disease, Parkinson’s Disease and brain injury. Dr. Sen also identified a novel neuroprotective protein, GOSPEL, which can protect cell death in the brain during neurodegeneration. Furthermore, his findings further clarified the molecular mechanism associated with both hyperactivity and neurotoxicity following exposure of cocaine, providing a new insight in the field of drug abuse. While working in the field of nitric oxide, Dr. Sen also explored another newly discovered gasotransmitter, hydrogen sulfide (H2S) in the brain and in peripheral tissues such as the liver. However, its role in physiology and pathophysiology was poorly understood. Dr. Sen found that, like nitric oxide, H2S also modifies proteins through a process of sulfhydration and shows that sulfhydration of several proteins affects their biological functions and influences the outcome of neurodegenerative diseases. In 2012, Dr. Sen joined Georgia Regents University as an assistant professor and started working in the field of traumatic brain injury. His major interest in TBI is to understand the role of gasotransmitter in the pathology. Recently, he has identified a novel mechanism that can explain the edema and cell death following TBI. Dr. Sen has published 38 papers in refereed journals including seven review articles. Total citations have exceeded 2,500.

Specialized Areas of Interest

Elucidating molecular mechanisms associated with pathology of TBI; cognitive dysfunction, memory impairment and vision impairment following TBI; pre-clinical testing of potential compounds against TBI in mice model.

Professional Organization Membership

Indian Science Congress Association, India
Society of Biological Chemistry, India
Society for Neuroscience

Education & Training

BSc, Chemistry, Calcutta University, India 1998
MSc, Biochemistry, Calcutta University, India, 2000
PhD, Oxidative Stress, Cell Death, Indian Institute of Chemical Biology, 2006
Fellow, Neuroscience, Johns Hopkins Medical College, USA, 2010

Editorial Service

• Editorial Board:
  American Journal of Neuroscience Research
  International Journal of Neurology Research
  Journal of Neurology and Neurosurgery
  Neurology and Neurotechnology
Tanusree Sen, PhD

Tanusree Sen, PhD, joined the University of Pittsburgh Department of Neurological Surgery in March of 2017 as a research assistant professor. As part of her PhD training, she developed expertise in the area of oxidative stress-mediated cellular dysfunctions and brain aging. After she graduated from the University of Calcutta in 2007, she joined the research group of David Sidransky, MD, at Johns Hopkins University’s Division of Head and Neck Cancer. In Dr. Sidransky’s lab, Dr. Sen worked on multiple projects unraveling the molecular pathways and mechanisms involving different cancers including cigarette smoking-induced bladder cancer. Her work studied the mechanism involved p53 isoform, p63 for cell death, and che-
moreistance. She discovered novel mechanisms that were shown to play a key role in cell death associated with several different cancers. In a separate project of age-related macular degeneration, she discovered the key role of lens structural protein CRYBA1 in anoikis and autophagy process in mouse retinal astrocytes and retinal pigmented epithelial cells. In 2012, Dr. Sen joined Augusta University as a postdoctoral fellow and extended her expertise of cellular-molecular biology in the field of immunology, autoimmunity, and traumatic brain injury and discovered molecular mechanisms regulating neuronal death and memory function after traumatic brain injury. In 2015, Dr. Sen started working as a research assistant professor at the University of Georgia and worked on the mechanism of diet-induced vagal nerve injury specifically in the context of the gut-microbiota-inflammation-brain axis. At this time, she discovered how different diet might contribute to gut microbial dysbiosis, inflammation, and subsequently damage to the vagal nerve. Dr. Sen has published 37 papers in refereed journals with total citations that have exceeded 2,500.

**Specialized Areas of Interest**

Studying the influence of oncogenic transcription factors on the TBI-pathology; regulation of immune response and its influence on cognitive dysfunction following TBI; tauopathy following TBI; studying the role of resident microbial cells on TBI-pathology.

**Professional Organization Membership**

Society for Neuroscience

**Education & Training**

BSc, Chemistry, Calcutta University, India 1998
MSc, Biochemistry, Calcutta University, India, 2000
PhD, Brain Aging, University of Calcutta, 2006
Fellow, Head and Neck Cancer, Johns Hopkins, 2010
Fellow, Cancer Immunology and Neuroscience, Augusta University, 2014

**Editorial Service**

- **Editorial Board:**
  
  *Brain Sciences*

  *Journal of Neuroscience and Psychology*

- **Ad Hoc Reviewer:**

  *Cell Cycle*

  *Eye and Brain*

  *Hypoxia ImmunoTargets and Therapy*

  *Infection and Drug Resistance*

  *Journal of Biological Chemistry*

  *Neurobiology of Diseases*

  *OncoTargets and Therapy*

  *PloS One*

**Publications: 2019-20**

- **Refereed Articles:**


**Mingui Sun, PhD**

*Professor*

Mingui Sun, PhD, received a BS degree in instrumental and industrial automation in 1982 from the Shenyang Chemical Engineering Institute in Shenyang, China, and an MS degree in electrical engineering in 1986 from the University of Pittsburgh, where he also earned a PhD degree in electrical engineering in 1989. He was later appointed to the faculty in the Department of Neurological Surgery. Dr. Sun’s research interests include neurophysiological signals and systems, biosensor designs, brain-computer interface, bioelectronics and bioinformatics. He has more than 460 publications.

**Specialized Areas of Interest**

Biomedical engineering, biomedical instrumentation, biomedical signal processing, computational neurophysiology, image and video processing, computer-assisted neurosurgery and diagnosis.

**Professional Organization Membership**

American Institute for Medical and Biological Engineering
Institute of Electrical and Electronics Engineers
IEEE Engineering in Medicine and Biology Society
IEEE Circuit and Systems Society

**Education & Training**

BS, Instrumentation/Industrial Automation, Shenyang Chemical Institute, 1982
MS, Electrical Engineering, University of Pittsburgh, 1986
PhD, Electrical Engineering, University of Pittsburgh, 1989

**Editorial Service**

- Editorial Board:
  *International Journal of Medical Implants and Devices*
  *Journal of Healthcare Engineering*

- Ad Hoc Reviewer:
  *National Institutes of Health*
  *National Science Foundation*
  *University Grants Committee* (Hong Kong)

**Professional Activities**

Fellow, American Institute of Biological and Medical Engineers (AIBME)
Technical Committee, Biomedical and Life Science Systems, Circuit and Systems Society, IEEE

**Publications: 2019-20**

- Refereed Articles:


• Book Chapters:

**Parthasarathy D. Thirumala, MD**
Associate Professor
Director, Center of Clinical Neurophysiology

Parthasarathy D. Thirumala, MD, joined the Center of Clinical Neurophysiology in June 2008. Dr. Thirumala specializes in intraoperative neurophysiological monitoring to adult and pediatric neurosurgical, orthopedic, ENT, vascular and interventional neuroradiology procedures. Dr. Thirumala completed his neurology residency and clinical neurophysiology fellowship training at the University of Pittsburgh Medical Center. He completed his internship in internal medicine training at Brookdale University Hospital and Medical Center in Brooklyn, N.Y. Prior to clinical training he completed his masters degree in biomedical engineering at the University of Illinois at Chicago. Dr. Thirumala completed his medical training in India at Stanley Medical College in Chennai, India. His clinical and research interests include intraoperative neurophysiological monitoring during expanded endonasal approach, functional cortical mapping during awake craniotomies, ICU EEG. He has published over 100 peer reviewed articles, book chapters, and invited articles in the journals including JAMA, Neurology, Neurology, Neurosurgery, Journal of Neurosurgery, and Journal of Clinical Neurophysiology. He has given lectures both nationally and internationally on the value of intraoperative neurophysiological monitoring.

**Specialized Areas of Interest**
Intraoperative neurophysiological monitoring; functional cortical mapping during awake craniotomies; neurophysiological monitoring during minimally invasive endonasal approach to skull base surgeries, electroencephalography in the intensive care unit.

**Board Certifications**
American Board of Clinical Neurophysiology: Intraoperative Monitoring
American Board of Neuroimaging
American Board of Neurophysiologic Monitoring
American Board of Psychiatry and Neurology
Hospital Privileges
Jameson Hospital
Monongahela Valley Hospital
UPMC Children’s Hospital of Pittsburgh
UPMC Hamot
UPMC Horizon
UPMC Magee-Womens Hospital
UPMC Mercy
UPMC Passavant
UPMC Presbyterian
UPMC St. Margaret
UPMC Shadyside

Professional Organization Membership
American Academy of Neurology
American Association of Neuromuscular and Electrodiagnostic Medicine
American Clinical Neurophysiology Society
American Epilepsy Society
American Medical Association
American Society of Neuroimaging
American Society of Neuromonitoring
America’s Registry of Outstanding Professionals
North American Spine Society

Education & Training
MBBS, Stanley Medical College, 1997
MS, University of Illinois, Bioengineering, 2001
Residency, Neurology, University of Pittsburgh, 2006
Fellowship, Clinical Neurophysiology, University of Pittsburgh, 2007

Editorial Service
• Ad Hoc Reviewer:
  American Journal of Electroneurodiagnostic Technology
  Brain and Behavior
  European Neurology
  Frontiers in Neuroscience
  Journal of Biomedical and Health Informatics present
  Journal of Clinical Computation and Research
  Journal of Clinical Neurophysiology
  Journal of Neurological Surgery Part B
  Journal of Neurology, Neurosurgery and Psychiatry
  PLOS One
  Neurohospitalist
  Neurological Research
  Neurology
  Scientific Reports
  Transactions on Neural Systems and Rehabilitation Engineering

Professional Activities
Co-Course Director, Principles and Practice of Intraoperative Monitoring, University of Pittsburgh Medical Center, November 15-16, 2019.
Faculty Biographies

Parthasarathy D. Thirumala, MD

Publications: 2019-20
• Refereed Articles:


Invited Lectures: 2019-20
• International:
Thirumala PD. "Basics of Auditory Evoked Potential." Brazilian Congress of Clinical Neurophysiology, Sao Paulo, Brazil, August 14, 2019.

Thirumala PD. "Intraoperative Neurophysiological Monitoring in Infratentorial Surgeries." Brazilian Congress of Clinical Neurophysiology, Sao Paulo, Brazil, August 14, 2019.

Thirumala PD. "Intraoperative Neurophysiological Monitoring During Carotid Endarterectomy." Brazilian Congress of Clinical Neurophysiology, Sao Paulo, Brazil, August 14, 2019.
Erin Thomson, PA-C
Clinical Instructor

Erin E. Thomson, PA-C, joined the Department of Neurological Surgery as a surgical physician assistant for the Spine Services Division in 2009. She currently serves as a clinical instructor in the University of Pittsburgh School of Medicine, and she is a member of the Preceptor Academy for Advanced Practice Providers. She also is a clinical assistant professor at Chatham University where she earned her masters of physician assistant studies degree.

Board Certifications
National Commission on Certification of Physician Assistants

Hospital Privileges
UPMC Passavant
UPMC Presbyterian

Professional Organization Membership
American Academy of Physician Assistants
American Association of Neurological Surgeons
Pennsylvania Society of Physician Assistants

Education & Training
BS, Biology, Allegheny College, 2003
Pre-Medical Program, Duquesne University, 2004
MPAS, Chatham University, 2009

Elizabeth C. Tyler-Kabara, MD, PhD
Associate Professor

Elizabeth C. Tyler-Kabara, MD, PhD completed her bachelor’s degree at Duke University, double majoring in biomedical and electrical engineering, in 1989. After leaving Duke, she worked at the National Institutes of Health as a biomedical engineer, developing and testing molecular biology software. She then attended Vanderbilt University, earning her MD and PhD in 1997. She completed her internship in general surgery at the University of Pittsburgh in 1998 and continued residency training in neurological surgery at UPMC and VA hospitals from 1998-2004 under L. Dade Lunsford, MD. She completed a fellowship in pediatric neurosurgery at the Children’s Hospital of Alabama in 2005. Dr. Tyler-Kabara joined the University of Pittsburgh Department of Neurological Surgery faculty in 2005, and subsequently left in February of 2020 to become chief of pediatric neurosurgery with Dell Children’s Medical Center at the University of Texas, Austin.

Daniel A. Wecht, MD, MSc
Clinical Professor
Chief, Neurosurgery, UPMC McKeesport
Chief, Neurosurgery, UPMC St. Margaret
Chief, Neurosurgery, UPMC Shadyside

Daniel A. Wecht, MD, joined the Department of Neurological Surgery as a clinical assistant professor in September of 1999. He was promoted to clinical associate professor in 2002 and full clinical professor in 2008. He was born and raised in Pittsburgh. After graduating from Harvard University, Dr. Wecht attended medical school at the University of Pennsylvania. He completed his neurosurgery residency at Baylor College and then completed a
Daniel A. Wecht, MD, MSc

Faculty Biographies

two-year neurovascular surgery fellowship at Yale University School of Medicine. He was board-certified with the American Board of Neurological Surgery in 2000 and was recertified in 2010. Dr. Wecht specializes in the treatment of brain tumors and cerebrovascular diseases such as stroke, aneurysms and vascular malformations. He also has an active spine and general neurosurgery practice. He has co-authored or authored several articles and publications. Dr. Wecht has been a neurosurgical faculty member at Yale University, University of New Mexico and Allegheny University of the Health Sciences (Pittsburgh, Pa.). He is an active participant in multiple professional and scientific societies. He is licensed to practice in Pennsylvania and New Mexico.

Specialized Areas of Interest
Vascular neurosurgery (aneurysms and vascular malformations); brain tumors; spinal and peripheral nerve microsurgery; trigeminal neuralgia, chiari malformation and hydrocephalus.

Board Certifications
American Board of Neurological Surgery

Hospital Privileges
UPMC McKeosport
UPMC Presbyterian
UPMC St. Margaret
UPMC Shadyside

Professional Organization Membership
AANS/CNS Joint Section on Cerebrovascular Surgery
AANS/CNS Joint Section on Trauma
American Association of Neurological Surgeons

Education & Training
AB, Anthropology, Harvard University, 1985
MS, Anthropology, University of Pennsylvania, 1989
MD, University of Pennsylvania, 1989
Residency, Baylor College of Medicine, 1995
Fellowship, Neurovascular, Yale University, 1997

Professional Activities
Team Neurosurgeon, The Pittsburgh Penguins Hockey Club

Media Appearances: 2019-20

Publications: 2019-20
• Letters to the Editor:
Fang-Cheng Yeh, MD, PhD
Assistant Professor
Director, High-Definition Fiber Tractography Lab

Fang-Cheng (Frank) Yeh, MD, PhD, joined the Department of Neurological Surgery in 2016 as a tenure-track assistant professor. Prior to joining the faculty at the University of Pittsburgh, Dr. Yeh received his MD degree from National Taiwan University and completed his PhD study in biomedical engineering at Carnegie Mellon University in 2014. Dr. Yeh is currently working on diffusion MRI and its role as image biomarkers for neurological and psychiatric disorders. His research focuses on novel applications of computational methods to brain connectome research, a challenging field with a lot of known unknowns and unsolved questions that require extensive technological development. He has developed several diffusion MRI methods and applied them to both clinical and translational studies. Dr. Yeh is known for his development of DSI Studio, an integrated platform for diffusion MRI analysis, fiber tracking, and 3D tractography visualization. In 2018 alone, DSI Studio facilitated more than 100 peer-reviewed publications. DSI Studio provides the core technique for “high accuracy fiber tracking,” which has been widely used by many research groups to investigate how major fiber pathways are affected by neurological and psychiatric diseases. In an open competition sponsored by the International Society for Magnetic Resonance in Medicine (ISMRM) in 2015, Dr. Yeh’s method achieved the highest valid connection score (92.49%, ID:03) among 96 different approaches submitted by a total of 20 groups from around the world.

Specialized Areas of Interest
Diffusion MRI, tractography, network analysis, medical image analysis, pathology informatics.

Professional Organization Membership
International Society for Magnetic Resonance in Medicine

Education & Training
MD, National Taiwan University, 2006
PhD, Biomedical Engineering, Carnegie Mellon University, 2014

Editorial Service
• Ad Hoc Reviewer:
  Journal of Magnetic Resonance Imaging
  Neuroimage
  Neurosurgery

Interdepartmental and Medical Center Activities
• UPMC Presbyterian:
  Advisory Board, MR Research Center, Department of Radiology

Honors and Awards
Chancellor’s Commercialization Fund Award, Pitt Ventures First Gear Program, University of Pittsburgh, 2019

Publications: 2019-20
• Refereed Articles:


**Invited Lectures: 2019-20**

- **National:**


**Georgios A. Zenonos, MD**

*Assistant Professor*

*Associate Director, Center for Cranial Base Surgery*

Georgios A. Zenonos, MD, joined the University of Pittsburgh Department of Neurological Surgery as associate director of Center for Cranial Base Surgery in July of 2019 after having received extensive formal sub-specialization in the field. He is one of a handful of neurosurgeons to have completed two fellowships in skull base surgery, one focusing on endoscopic and minimally invasive approaches at the University of Pittsburgh, and another focusing on complex cranial neurosurgery and cerebrovascular neurosurgery at the University of Miami with the renown doctors Jacques J. Morcos, MD, and Roberto C. Heros, MD. Dr. Zenonos completed his internship, residency and chief residency in neurosurgery at the University of Pittsburgh from 2011-18. During this time, he received several distinctions and awards, including an award for achieving the highest score in the nation on the American Board of Neurological Surgery written exam. Other awards include the Robert J. Dempsey Award by the CNS/AANS Joint Cerebrovascular Section, the University of Pittsburgh Stuart N. Rowe Research Award, first place in the North American Skull Base Society knowledge competition, and four Walter L. Copeland Awards for cranial research. In addition, Dr. Zenonos has published extensively (see Google Scholar and PubMed), has given numerous presentations nationally and internationally, and has been frequently invited as a scientific reviewer by prominent neurosurgical journals. Before residency, Dr. Zenonos, a native of Greece, graduated as valedictorian from the University of Athens School of Medicine in Greece, which he attended with a scholarship from the Ministry of Education. Winning the Alexander S. Onassis Award, he then pursued a basic science post-doctoral research fellowship at Harvard Medical School to study the mechanisms of programmed cell death. “I understand that having to see a neurosurgeon, or needing a neurosurgical procedure has to be one of the most frightening experiences in someone’s life,” Dr. Zenonos says. “My goal is to always to provide the best care possible for each and every one of my patients, one that utilizes the latest technologies and techniques, and one that is founded by evidence-based medicine – the same care I would want for my family, my friends, or myself. Putting myself in the patient’s shoes, and understanding the unique difficulties they are facing is always
step one.” Dr. Zenonos’ research interests include genetics of skull base tumors; surgical anatomy (refinement of skull base approaches, and surgical technique); skull base outcomes research; and high definition fiber tactography.

Specialized Areas of Interest
Endoscopic endonasal neurosurgery; minimally invasive neurosurgery; skull base tumors; skull base pathology; neuro-oncology; cerebrovascular neurosurgery; cranial nerve disorders; radiosurgery.

Board Certifications
American Board of Neurological Surgeons

Hospital Privileges
UPMC Altoona
UPMC Children’s Hospital of Pittsburgh
UPMC Hamot
UPMC Mercy
UPMC Presbyterian
UPMC Shadyside

Professional Organization Membership
American Association of Neurological Surgeons
American Medical Association
Congress of Neurological Surgeons
North American Skull Base Society
Alexander S. Onassis Scholars Society

Education & Training
MD, National & Kapodistrian University of Athens School of Medicine, 2002-08
Post-Doctoral Research Fellowship, Harvard Medical School, 2009-10
Residency, neurological surgery, UPMC, 2011-18
Fellowship, Minimally Invasive, and Open Skull Base Neurosurgery, University of Pittsburgh, 2015-17
Fellowship, Complex Skull Base and Cerebrovascular Neurosurgery, University of Miami, 2019

Editorial Service
• Ad Hoc Reviewer:
  Operative Neurosurgery
  Neurosurgery
  World Neurosurgery

Professional Activities
Proctor, Anatomy of the Skull Base, Cranial Nerves, Dura and Venous Sinuses Hands-On Anatomical Workshop, First-Year Medical Students, University of Pittsburgh School of Medicine.
Director, Neurosurgery Preceptorship Program, University of Pittsburgh School of Medicine.
Director, Integrated Life Sciences Neurosurgery and ENT Dissection Course, Fourth-Year Medical Students.
Supervisor, PGY7 neurosurgery resident in the operating room, outpatient office, and ward rounds.
Supervisor, PGY2 neurosurgery resident in the operating room, outpatient office, and ward rounds.
Faculty Biographies

Georgios A. Zenonos, MD

Supervisor, skull base fellows in the operating room, outpatient office, ward rounds, and clinical and anatomical research.

Honors and Awards
Best Neurosurgical Fellow Teacher Award, University of Miami, 2019
First Place, North American Skull Base Society Jeopardy Knowledge Competition, 2018
p clinical abstract presentation shortlist, North American Skull Base Society Annual Meeting, 2018
The Walter L. Copeland Award for Cranial Research, 2012-13, 2015, 2017
Runner-Up Presentation Award, Stuart N. Rowe Society Lectureship, 2017
Best Presentation Award, Stuart Rowe Society Lectureship, 2016
Award for achieving the highest score in the nation, ABNS Primary Examination, 2016
Chordoma Foundation Travel Scholarship, 2016
Robert J. Dempsey Joint AANS/CNS Cerebrovascular Section Award, 2015
Third Best Abstract, Stereotactic and Functional Section, American Association of Neurological Surgery Annual Scientific Meeting, 2014
Alexander S. Onassis Award, 2010
Valedictorian, National and Kapodistrian University of Athens, School of Medicine, 2008
National Scholarship Foundation Award: 2003-08
Baronos Award for Excellence in Pharmacology, 2005
Ministry of Education Scholarship, 2002-08
First ranking graduate, Military Officer Academy, 2001
National Physics Olympiad Prize, 2000

Publications: 2019-20
• Refereed Articles:
Faculty Biographies

Georgios A. Zenonos, MD


Invited Lectures: 2019-20

• National:

• Virtual Lectures:
  Zenonos GA. “Personal evaluation in transpetrosal skull base surgery panel discussion.” Miami Global Brain Tumor Symposium, Department of Neurological Surgery, University of Miami, May 6, 2020.

  Zenonos GA. “Personal evaluation in transpetrosal skull base surgery.” Panelist, Miami Global Brain Tumor Symposium, Department of Neurological Surgery, University of Miami, May 6, 2020.

Pascal O. Zinn, MD, PhD
Assistant Professor
Associate Director, Adult Neurosurgical Oncology
Director, Molecular Tumor Biology and Personalized Precision Therapy Lab

Pascal O. Zinn, MD, PhD, joined the University of Pittsburgh Department of Neurological Surgery as an assistant professor and associate director of the adult neurosurgical oncology program in August of 2019. Dr. Zinn has undergone subspecialty training in tumor biology and neurosurgical oncology at the Dana-Farber Harvard Cancer Institute and the MD Anderson Cancer Center in state-of-the-art, patient-tailored treatment paradigms. At UPMC Hillman Cancer Center, Dr. Zinn is the principal investigator of a molecular biology laboratory studying approaches in hyper-personalized tumor treatments and patient care. Dr. Zinn strongly believes in the individuality of every patient and is an expert in patient-tailored treatment approaches throughout the course of diagnosis (imaging/biopsy), possible surgical tumor removal/medical management, and follow-up. Dr. Zinn enjoys spending time with his patients and their families walking them through this seemingly complex treatment course through discussion, counseling, and review of evidence-based medicine approaches, thus reaching the very best and most personalized conclusion towards a comprehensive treatment plan.

Specialized Areas of Interest
Neurosurgical oncology: brain, skull base and spinal cord tumors. Personalized Precision Care for brain and spinal tumor patients.

Board Certifications
American Board of Neurological Surgery (board eligible)
Faculty Biographies

Pascal O. Zinn, MD, PhD

Hospital Privileges
UPMC Hamot
UPMC Hillman Cancer Center
UPMC Mercy
UPMC Presbyterian
UPMC Shadyside

Professional Organization Membership
American Association of Neurological Surgeons
Congress of Neurological Surgeons
CNS/AANS Joint Tumor Section
Glioma Society
Society for Neuro-Oncology

Education & Training
MD, University of Zurich, Switzerland, 2007
PhD, University of Lausanne, Switzerland, 2012
Research Fellowship, Dana-Farber Cancer Institute, Harvard Medical School, 2012
Neurosurgery Residency, Baylor College of Medicine and MD Anderson Cancer Center, 2019

Editorial Service
• Ad Hoc Reviewer:
  BMC Cancer
  Journal of Neuro-Oncology
  Journal of Neurosurgery
  Neuro-Oncology
  Neurosurgery
  New England Journal of Medicine
  World Neurosurgery

Professional Activities
Young Neurosurgeons Co-Chair, AANS and CNS Tumor Section, 2020-2022

Honors and Awards
Kinjiro Iwata Award, Baylor College of Medicine, 2019
Caroline Ross Endowed Fellowship, MD Anderson Cancer Center, 2018
Rosenblum-Mahaley Clinical Research Award, Congress of Neurological Surgeons, 2018
Resident Award, Congress of Neurological Surgeons, 2018
Runner-Up Oral Platform Presentation Competition, Texas Association of Neurological Surgeons Annual Meeting, 2017
National Brain Tumor Society Mahaley Award, Congress of Neurological Surgeons, 2016
Kinjiro Iwata Academic Award, Baylor College of Medicine, 2016
Journal of Neuro-Oncology Award, Congress of Neurological Surgeons, 2015
William R. Cheek Award, Texas Children’s Hospital, 2015
Best Oral Platform Presentation Award, American Society of Neuroradiology, 2015
Best Scientific Poster Award, American Society of Functional Neuroradiology, 2014
Kinjiro Iwata Academic Award, Baylor College of Medicine, 2013
Best Scientific Poster Award, American Society of Functional Neuroradiology, 2013
Travel Award, European Association of Neurological Surgeons, 2013
Best Oral Platform Presentation Award, American Society of Neuroradiology, 2012
Journal of Neuro-Oncology Award, Congress of Neurological Surgeons, 2012
The Thomas H. and Mayme P. Scott Fellowship in Cancer Research Award, 2012
Poster Award, MD Anderson Brain Tumor Center Retreat, 2011
First Prize, Clowes Visiting Professor Research Competition, Beth Israel Deaconess Medical Center, Harvard Medical School, 2010
Cold Spring Harbor Course on Brain Tumors Scholarship, American Brain Tumor Association, 2010
Swiss National Science Foundation two-year fellowship, Harvard Medical School, 2009
Socrates-Erasmus Scholarship, 2004
Acceptance to Swiss Army Special Forces: Honors in Marksmanship, Combat, Commando, and Fit Test, 2000

Publications: 2019-20
• Refereed Articles:

David S. Zorub, MS, MD
Clinical Professor
Director, Neuro-Intensive Care, UPMC Shadyside

David S. Zorub, MD, joined the faculty of the University of Pittsburgh Department of Neurological Surgery in May of 2014. Dr. Zorub was born in Lebanon and immigrated to the United States at the age of nine. He grew up in Hot Springs, Ark., where he received his primary education. Dr. Zorub received his undergraduate degree from Tulane University College of Arts and Sciences, graduating summa cum laude with a major in history. His subsequent education was at Tulane University School of Medicine where he received his medical degree cum laude and a masters of science in neuroanatomy. Post-graduate education was at Duke University Medical Center where he completed his internship and residency in neurologic surgery. While at Duke he did a special postdoctoral fellowship for the Veteran’s Administration and did research at the Institute of Physiology in Pisa, Italy. Upon completion of training at Duke University Medical Center, Dr. Zorub came to the University of Pittsburgh and Presbyterian University Hospital where he served as director of residency education and director of stereotactic surgery. He subsequently relocated to Shadyside Hospital and Foundation in 1979 and has served as director of neurosurgery, and subsequently as chief of neurosurgery from January 1979 to September 2014 and director of neuro-intensive care until June 30, 2019. Dr. Zorub served as chief of surgery at Shadyside Hospital from July 1993 to August 31, 2009. Dr. Zorub also functioned as vice president of clinical affairs for Shadyside Hospital for seven years and his responsibilities included the clinical oversight of the merger agreement with UPMC Presbyterian for the Shadyside Board of Trustees as well as serving as vice president overseeing medical staff services, infection control, informatics and process improvement and quality management. He has also been active in organized medicine, having served as president of the Allegheny County Medical Society, chair of its board of trustees, and chair of the ACMS Foundation Board of Trustees. Dr. Zorub continues to be active clinically at UPMC Shadyside. He has served in numerous positions at the hospital, participating in essentially all facets of the institution. His areas of expertise include brain tumors, pituitary microsurgery, cranial nerve disorders like trigeminal neuralgia, hemifacial spasm, treatment for benign and malignant disease and spine surgery. He also specializes in peripheral nerve disorders, having trained under Barnes Woodhall, MD.
David S. Zorub, MS, MD

**Faculty Biographies**

**Specialized Areas of Interest**
Brain tumors; pituitary microsurgery; cranial nerve disorders; hemifacial spasm; spine surgery; peripheral nerve surgery; pain management.

**Board Certifications**
American Board of Neurological Surgery

**Hospital Privileges**
- UPMC Cancer Center
- UPMC Presbyterian
- UPMC Shadyside

**Professional Organization Membership**
- American Association of Neurological Surgeons
- American Association for Stereotactic Surgery
- American Medical Association
- Congress of Neurological Surgeons
- Pennsylvania Medical Society
- Pennsylvania Neurosurgical Society

**Education & Training**
- MS, Anatomy, Tulane University, 1970
- MD, Tulane University, Cum Laude, 1970
- Residency, Duke University, 1970-76
- Fellowship, University of Pisa, 1974
- Fellowship, Duke University, 1974
Resident Biographies
Hussam Abou-Al-Shaar, MD
PGY-2 Resident

Hussam Abou-Al-Shaar, MD, received his medical degree from Alfaisal University College of Medicine in Riyadh, Saudi Arabia where he graduated Summa Cum Laude, valedictorian and the top of his class. During medical school, Dr. Abou-Al-Shaar spent several years in the neurogenetics lab studying the genetics and novel therapeutic treatments for Parkinson’s disease patients. After graduating from medical school, Dr. Abou-Al-Shaar completed 10 months of post-doctoral research fellowship in the Department of Neurosurgery at the University of Utah and a year of neurosurgery internship at Hofstra Northwell School of Medicine in New York. Dr. Abou-Al-Shaar is an avid researcher with deep interest in skull base and cerebrovascular neurosurgery. To date, he has published over 100 peer-reviewed articles and 25 book chapters and has spoken at several national and international conferences, with over 70 oral and poster presentations. He is also the section editor on two published books, most recently the tumor section in Neurosurgery Case Review: Questions and Answers, published by Thieme Publishing in January of 2020. He recently edited The Surgical Handbook, published by Thieme Publishing in July of 2020. Dr. Abou-Al-Shaar is actively involved in teaching medical students interested in neuroscience and neurosurgery. His hobbies outside of neurosurgery include soccer, tennis, and traveling.

Specialized Areas of Interest
Skull base and cerebrovascular neurosurgery

Professional Organization Membership
American Association of Neurological Surgeons
American Medical Association
Congress of Neurological Surgeons

Education & Training
MD, Alfaisal University College of Medicine, 2017

Editorial Service
• Editorial Board:
  EC Neurology Journal

• Ad Hoc Reviewer:
  Cureus
  Neurosurgery Journal
  Operative Neurosurgery
  World Neurosurgery Journal

Honors and Awards
Best Resident Teacher Award, Department of Neurosurgery, Hofstra Northwell School of Medicine, 2018-19.
Summa Cum Laude and Valedictorian, Alfaisal University 2017
Academic Dean’s List Scholarship, Alfaisal University, 2010-17
PORCHE Award for the Best Student in Surgical Clerkship, 2013
Best Poster Presentation, Alfaisal University Annual Research Day Poster Competition, 2015 & 2016
Teacher of the Year, Alfaisal University, 2012
Publications: 2019-20

• Refereed Articles:


Resident Biographies

Hussam Abou-Al-Shaar, MD


• Book Chapters:


Resident Biographies


• Published Abstracts:

• Presentations:
Hussain Abou-Al-Shaar, MD


Nitin Agarwal, MD
PGY-6 Resident

Nitin Agarwal, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July of 2014. Prior to matriculating into the residency program, Dr. Agarwal received his Doctor of Medicine from Rutgers New Jersey Medical School. His funded research activities focus on improving patient education to optimize patient outcomes. To date, he has published over 200 peer-reviewed articles and 10 book chapters and has spoken at several regional and national conferences, with over 100 oral and poster presentations. His health literacy related research has been published in several high impact factor journals including *JAMA Internal Medicine* and featured by prominent healthcare-oriented news outlets such as Reuters Health. He is also the co-editor of the book *The Evolution of Health Literacy: Empowering Patients through Improved Education*. In October of 2018, his multi-contributor guide for aspiring neurosurgeons, *Neurosurgery Fundamentals*, was released by Thieme Medical Publishers. Dr. Agarwal also maintains an active role in organized neurosurgery advocating for medical student and patient education. His article entitled “Improving Medical Student Recruitment into Neurological Surgery” was featured online by the American Association of Neurological Surgeons. He was appointed as a member of the Young Neurosurgeons Committee of the American Association of Neurological Surgeons (AANS) and serves as Sections Division Coordinator and Top Gun Competition chair. He was also selected as a Council of State Neurological Societies socioeconomic fellow and continues to serve as a past resident fellow mentor as well as an alternate delegate appointee of the Congress of Neurological Surgeons (CNS). In addition, he is an advocate for philanthropic support and has been placed on the board of directors of the Neurosurgery PAC, as a young neurosurgeon member, and served as a resident liaison for the Neurosurgery Research and Education Foundation. In the fall of 2018, he was selected to be a part of the CNS Resident Fellows program for the 2019 to 2020 term. Dr. Agarwal is pursuing an enfolded fellowship in minimally invasive and complex spine surgery at the University of Pittsburgh and plans to complete further training in this subspecialty during post-residency through an approved fellowship with the Committee on Advanced Subspecialty Training (CAST) at the University of California, San Francisco. Outside of neurological surgery, Dr. Agarwal is deeply dedicated to martial arts, specifically the disciplines of Taekwondo, Krav Maga, and Jiu-Jitsu.

Specialized Areas of Interest
Scoliosis and complex spinal deformity; minimally invasive spine surgery; spinal biomechanics; patient education and outcomes research; socioeconomic policy in organized neurosurgery.

Professional Organization Membership
American Association of Neurological Surgeons
American Association of South Asian Neurosurgeons
Council of State Neurological Societies
Congress of Neurological Surgeons
North American Spine Society
Society of Lateral Access Surgery
Society for Minimally Invasive Spine Surgery
Resident Biographies

Nitin Agarwal, MD

Education & Training
BS, Biology, The College of New Jersey, 2010
MD, Rutgers, The State University of New Jersey, 2014

Editorial Service
• Ad Hoc Reviewer:
  Neurosurgery
  Operative Neurosurgery
  The Spine Journal
  World Neurosurgery

Honors and Awards
Neurosurgery Research and Education Foundation Travel Grant, European Association of Neurosurgical Societies Spine Training Course, 2020
Congress of Neurological Surgeons Resident Fellow, 2019-20
Young Surgeon Grant, Society for Minimally Invasive Spine Surgery Annual Forum, 2019
Young Investigator Award, Annual Society of Lateral Access Surgery Meeting, 2019
First Place History E-poster Award, American Association of Neurological Surgeons Annual Scientific Meeting, 2019
Young Surgeon Travel Grant, Annual Meeting: State of Surgery Think Tank, 2019
Socioeconomics, Health Policy, & Law Top Paper of the Year, Congress of Neurological Surgeons Annual Meeting, 2018
Journalistic and Academic Neurosurgical Excellence (J.A.N.E.) Award, AANS/CNS Joint Section on Disorders of the Spine and Peripheral Nerves, 2018
Socioeconomic E-poster Award, First Place, AANS Annual Scientific Meeting, 2017
Charlie Kuntz IV Scholar Award, Spine Summit Outstanding Abstract, 2016
Peter W. Carmel, MD, Award in Neurological Surgery, 2014
Kenneth G. Swan, MD, Memorial Award, NJMS Student Affairs, 2014
NJMS Alumni Association Grant, 2011
Richard Pozen and Ann Silver Pozen Community Scholar, 2011
Armstrong Engineering Scholarship Award, 2007
Oval Society Award, Community Service Distinction, 2007

Media Appearances: 2019-20

Publications: 2019-20
• Refereed Articles:


Resident Biographies

Nitin Agarwal, MD


**Invited Papers:**


**Presentations:**


Resident Biographies


Nima Alan, MD
PGY-5 Resident

Nima Alan, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July of 2015. Prior to matriculating into the residency program, Dr. Alan received his doctorate of medicine with distinction in research and teaching from Case Western Reserve University School of Medicine in Cleveland, Ohio. Dr. Alan has over 30 peer-reviewed journal publications and more than 60 poster and oral presentations in regional, national and international meetings. Dr. Alan’s research interests are in neurophysiology and monitoring, spinal cord injury and spine trauma, deformity surgery, advanced neuroimaging of the spinal cord, and spine stereotactic radiosurgery. Dr. Alan is interested in diversification of neurosurgery residency training, initiating elective rotations in spine stereotactic radiosurgery, and sports neurosurgery. Dr. Alan is pursuing an enfolded fellow-
Nima Alan, MD

ship in complex spine surgery at the University of Pittsburgh Medical Center and plans to complete further training in minimally invasive deformity surgery during post-residency through an approved fellowship with the Committee on Advanced Subspecialty Training (CAST) at the Barrow Neurological Institute. Outside of neurological surgery, Dr. Alan is interested in literary fiction, international traveling, fitness, snowboarding, and tennis.

**Specialized Areas of Interest**
Complex spine, cerebrovascular surgery, microvascular decompression.

**Professional Organization Membership**
American Academy for Advancement of Science
American Association of Neurological Surgeons
American Stroke Association
Congress of Neurological Surgeons
North American Spine Society

**Honors and Awards**
Mayfield Clinical Science Award, AANS/CNS Spine Summit, 2020
Travel Award, Nuvasive Spine Foundation, 2020
CSNS Socioeconomic Fellow, 2019
Traveli Award, Nuvasive Spine Foundation, 2019
Journalistic and Academic Neurosurgical Excellence Award (coauthor), AANS/CNS Spine Summit, 2018
Abstract Presentation Award (coauthor), AANS/CNS Spine Summit, 2018
Seed Grant, Society of Lateral Access Surgeons, 2017
Charlie Kuntz Scholar Award (coauthor), AANS/CNS Spine Summit, 2016
Distinction in Research, Case School of Medicine, 2015
Distinction in Teaching, Case School of Medicine, 2015
Travel Award (AANS conference), Case School of Medicine, 2014
Travel Award (AANS conference), Cleveland Clinic Foundation, 2014
Medical Student Research Fellowship, American Academy of Neurology, 2013
Best Medical Student Abstract Award, AANS Conference, 2012-13
Best Poster in Molecular & Cell Biology, Am. Assoc. for Advanc. of Science, 2012
Best Poster in Physical Medicine and Rehabilitation, Cureus Poster Competition, 2012
Dean’s Summer Research Award, Case School of Medicine, 2011
Best Poster, Master’s Level, Canadian Health Research Institute, 2010
Research Assistant Professional Development Award, University of British Columbia, 2010
Top Student in Neurophysiology, University of British Columbia, 2009
Bachelor’s Degree with Distinction, University of British Columbia, 2009
Undergraduate Student Research Award, Natural Sciences Research Council, 2007
Trek Excellence Scholarship, University of British Columbia, 2007
Wai-Man Leung Memorial Bursary, University of British Columbia, 2007
Summer Scholarship, University of British Columbia, 2006
President’s Entrance Scholarship, University of British Columbia, 2005
Dean’s Honor List, University of British Columbia, 2005-09
Ali Alattar, MD

PGY-1 Resident

Ali Alattar, MD, MAS, joined the University of Pittsburgh Department of Neurological Surgery residency program in July of 2019 after graduating from University of California San Diego School of Medicine. While at UCSD, Dr. Alattar invested in additional training in clinical and biomedical research and earned a Master’s of Advanced Studies in clinical research. Dr. Alattar studied biochemistry at Portland State University and graduated summa cum laude with a Bachelor of Science. During medical school, Dr. Alattar cultivated an interest in neuro-oncology outcomes, with special emphasis on the influence of extent of surgical resection on survival in large national oncology registries. He also studied a novel platform for diagnosis of glioblastoma, the most common form of primary brain cancer, using extracellular vesicles derived from samples of peripheral blood. Dr. Alattar’s research interests include big data, cost-effectiveness, and applying artificial intelligence and machine learning to the analysis of large amounts of image, text, and genomic data. He hopes to contribute to new cancer registries, develop clinical decision support systems, and discover genetic risk factors and molecular subtypes of disease. Dr. Alattar was born, raised, and attended college in Portland, Ore. before moving to San Diego for medical school. In his free time, he enjoys reading novels, cooking, hiking, running, and weightlifting.

Specialized Areas of Interest
Neuro-oncology, pediatric neurosurgery, functional neurosurgery, neurotrauma.

Professional Organization Membership
American Association of Neurological Surgeons
Congress of Neurological Surgeons
Society for Neuro-Oncology

Education & Training
BS, Biochemistry, Portland State University, 2014
MAS, University of California, San Diego, 2019
MD, University of California, San Diego, 2019

Editorial Service
• Editorial Board:
  World Neurosurgery, Reviewer

Honors and Awards
Clinical Research Fellowship, UC San Diego School of Medicine, 2017-2018
National Institutes of Health Summer Research Training Grant, 2015
Summa Cum Laude, Portland State University, 2014
Award for Outstanding Performance in General Chemistry, Organic Chemistry, and Biochemistry, Portland State University, 2011-13
Building Our Future Scholarship Award, Portland State University, 2010-11

Publications: 2019-20
• Refereed Articles:
Resident Biographies


Hanna Algattas, MD

Hanna Algattas, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in June of 2016 after graduating from the University of Rochester School of Medicine. He previously graduated from summa cum laude from Colgate University with a degree in cellular neuroscience with high honors. Prior to matriculation to medical school, Dr. Algattas worked with animal models of Alzheimer's disease at the National Institute of Neurological Disorders and Stroke (NINDS). Dr. Algattas has been involved in research regarding traumatic brain injury (TBI) pathophysiology and management, Chronic Traumatic Encephalopathy (CTE), endoscopic endonasal approaches to craniopharyngiomas, cost-effectiveness in neuro-oncology, and outcome improvement after cranial and spinal surgery. He currently is involved in research regarding outcomes in skull base and endonasal neurosurgery as well as traumatic brain injury. Dr. Algattas was born and raised in Syracuse, N.Y. Interests outside neurosurgery include weightlifting, squash, professional sports, and crossword puzzles.

Specialized Areas of Interest
Skull base neurosurgery; expanded endoscopic endonasal approaches; spine deformity surgery; traumatic brain injury; spinal cord injury; sports medicine neurosurgery.

Professional Organization Membership
American Association of Neurological Surgeons
American Medical Association
Congress of Neurological Surgeons
Young Neurosurgeon’s Committee of AANS

Education & Training
BA, Cellular Neuroscience, Colgate University, 2012
MD, University of Rochester Medical School, 2016

Honors and Awards
Neuroscience Research Foundation/Heindl Foundation Research Grant, NRF; 2020
Young Neurosurgeons Forum Oral Presentation, AANS, 2015
Office of Medical Education Research Award, University of Rochester SOM, 2013
James M. Maury MD Endowed Scholarship, Colgate University, 2012
Resident Biographies

Edward Andrews, MD
PGY-4 Resident

Edward G. Andrews, MD, began his residency with the University of Pittsburgh Department of Neurosurgery in July of 2016. Dr. Andrews attended the University of Pennsylvania, graduating summa cum laude in 2009 with a degree in neuroscience and ancient Egyptian studies. He subsequently earned his medical degree from Sidney Kimmel Medical College at Thomas Jefferson University in 2016, graduating magna cum laude. During his medical school career, he directed the Future Docs High School Program, a pipeline program aimed at exposing underrepresented minority high school juniors and seniors to different career choices in healthcare fields. He also organized and participated in the primary tutoring services on campus, helping medical students struggling with course material and clinical rotations. His research interests include neuroimmunologic changes in mild traumatic brain injury and immunotherapeutic approaches to glioblastomas. He also has an avid interest in resident and medical student education.

Specialized Areas of Interest
Neuro-oncologic neurosurgery.

Professional Organization Membership
American Association of Neurological Surgeons
American Board of Neurological Surgery
American Medical Association
Congress of Neurological Surgeons

Education & Training
BA, University of Pennsylvania, 2005-09
MD, Sidney Kimmel Medical College, 2012-16

Honors and Awards
e-Poster Award, Pediatric Neurosurgery, AANS Annual Meeting, 2018
Physician Champion of Nursing Award, University of Pittsburgh, 2018
William F. Keller Prize, Sidney Kimmel Medical College, 2016
Dean’s List, University of Pennsylvania, 2006-09
Hansen Deng, MD
PGY-1 Resident

Hansen Deng, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July of 2019. Dr. Deng graduated with distinction from the University of California San Francisco School of Medicine, where he was elected into the Alpha Omega Alpha Honor Medical Society. He completed his undergraduate degrees in biology and oil-painting at the University of California Berkeley, where he was elected into the Phi Beta Kappa Society. Traumatic brain injury (TBI) is a complex disorder with many diagnostic challenges. Dr Deng’s research in TRACK-TBI investigates the discriminatory ability of biomarkers to provide precise assessment of injury severity and assist with prognostication of patients following injury. Dr Deng also studies the role that genetic factors can play in secondary pathophysiology of neurotrauma at the Brain Trauma Research Center, with the goal of advancing evidence-based clinical practices in the neurocritical intensive care unit. Dr. Deng serves as a mentor for undergraduate and graduate students with interests in medicine and neurosurgery. He enjoys drawing, playing basketball, and cooking.

Specialized Areas of Interest
Neurotrauma; deformity spine; vascular.

Professional Organization Membership
Alpha Omega Alpha
American Association of Neurological Surgeons
Congress of Neurological Surgeons
National Neurotrauma Society
North American Brain Injury Society
Phi Beta Kappa

Education & Training
BA, Biology and Art (Oil-Painting), University of California Berkeley, 2014
MD, University of California San Francisco, 2019

Honors and Awards
ThinkFirst Injury Prevention Award, American Association of Neurological Surgeons, 2020
Best Clinical Research Abstract, Pediatric Section, CNS, 2019
Steinhart Scholarship Award, UCSF School of Medicine, 2019
MD with Distinction in Clinical and Translational Research, University of California, San Francisco, 2019
Storytelling Prize, UCSF Synapse Student Voices, 2019
Journal of Neuro-Oncology Award, 2017
AANS/CNS Section on Trauma and Critical Care Abstract Finalist, 2017
Dean’s Prize in Research and Scholarship Finalist, UCSF School of Medicine, 2016, 2019
University Grant in Medicine, UCSF School of Medicine, 2015-2019
Sussman Prize in Painting and Exhibition, University of California Berkeley, 2014
Phelan Art Scholarship, University of California Berkeley, 2013
Dean’s Honors, University of California Berkeley, 2012-2014

Publications: 2019-20
• Refereed Articles:


• Presentations:


Resident Biographies


Amir Faraji, MD, PhD
Chief Resident

Amir Faraji, MD, PhD, joined the University of Pittsburgh neurosurgical residency program in July of 2013 and was a chief resident in 2019-20. He graduated from the Medical Scientist Training Program at the University of Pittsburgh School of Medicine in 2012 after completing his PhD in chemistry in 2011 and graduating as valedictorian from the University of Florida in 2005. He recently completed an enfolded fellowship in stereotactic and functional neurosurgery with R. Mark Richardson, MD, PhD and additional training in epilepsy surgery with Jorge A. Gonzalez-Martinez, MD, PhD. Dr. Faraji's research interests focus on developing novel drug delivery systems for the central nervous system, including nanotechnology and convection-enhanced delivery. He is interested in the adoption of new surgical technologies into clinical practice, such as with robotic-assisted cranial and spine surgery. He has further interests in stereotactic radiosurgery, neuro-oncology, peripheral nerve surgery, and neuro-restoration with neural interfaces. In June of 2020, Dr. Faraji completed the seven-year University of Pittsburgh neurological surgery residency program and is headed to Washington University in St. Louis, Mo., where he will complete a prestigious peripheral nerve fellowship. He will then join the faculty at Houston Methodist Hospital in the Texas Medical Center in Houston, Texas.

Specialized Areas of Interest
Neuro-oncology; stereotactic and functional neurosurgery; epilepsy surgery; robotic neurosurgery; general spine surgery; radiosurgery; peripheral nerve surgery.

Professional Organization Membership
Allegheny County Medical Society
American Association for the Advancement of Science
Amir Faraji, MD, PhD

Resident Biographies

American Association of Neurological Surgeons
American Association of Stereotactic and Functional Neurosurgeons
American Chemical Society
American Medical Association
American Physician Scientists Association
Congress of Neurological Surgeons
Pennsylvania Medical Society
Pennsylvania Neurosurgical Society

Education & Training
BS, Chemistry, University of Florida, 2005
PhD, Chemistry, University of Pittsburgh, 2011
MD, University of Pittsburgh, 2012

Editorial Service
• Ad Hoc Reviewer:
  Frontiers in Neuroscience
  Journal of Neurosurgery
  Neurosurgery
  World Neurosurgery

Honors and Awards
Best Operative Technique Abstract, Stereotactic and Functional Neurosurgery Section, Congress of Neurological Surgeons, 2019
Best Presentation Award, Stuart Rowe Society Resident Research Day, 2017
Society of Neurological Surgeons/RUIN Course Resident Award, 2016
MSTP Post-Doctoral Research Fellowship, 2013
United States Delegate, Lindau Nobel Laureates Meeting, 2010
Chemistry Graduate Excellence Fellowship, University of Pittsburgh, 2010
Clinical & Translational Research Pre-Doctoral Research Fellowship, 2009-10
Valedictorian, College of Liberal Arts and Sciences, University of Florida, 2005
University of Florida Research Scholar, 2004-05
Florida Academic Scholars Award, 2001-05
Anderson Scholar, University of Florida, 2003

Publications: 2019-20
• Refereed Articles:
David T. Fernandes Cabral, MD
PGY-3 Resident

David T. Fernandes Cabral, MD, received his medical degree from the José María Vargas School of Medicine at the Universidad Central de Venezuela in Caracas, Venezuela where he graduated at the top of his class. While in medical school, Dr. Fernandes was a teacher assistant in the Department of Anatomy and Neuroanatomy, as well as a research assistant at the Department of Pharmacology. After graduating from medical school, David completed two years of mandatory service in a rural community in Venezuela where he served in a leadership role at the health center and was actively involved in teaching medical students during their rural rotations. In 2015, Dr. Fernandes joined the Fiber Tractography Lab at the University of Pittsburgh as a post-doctoral associate research fellow. Dr. Fernandes has been invited to lecture in white matter connectivity of the human brain at the University of Pittsburgh Department of Psychology, and is currently in charge of teaching the practical sessions in the surgical neuroanatomy course for fourth year medical students at the university. During his free time, David enjoys cooking, travelling, biking, watching movies and spending time with his family and friends.

Specialized Areas of Interest
Skull base surgery, cerebrovascular surgery, surgical neuro-oncology, diffusion-MRI fiber tractography, microsurgical anatomy, complex spine, and teaching.

Professional Organization Membership
American Association of Neurological Surgeons
American Medical Association
AO Spine
Congress of Neurological Surgeons
Venezuelan Medical Association

Education & Training
MD, Universidad Central de Venezuela, 2017

Editorial Service
• Ad Hoc Reviewer:
  World Neurosurgery

Honors and Awards
Best Poster Presentation, Venezuelan Neurosurgery Society, 2012
Research Assistant of the Year, Universidad Central de Venezuela, 2011
Teacher Assistant of the Year, Department of Anatomy and Neuroanatomy, Universidad Central de Venezuela, 2010

Publications: 2019-20
• Refereed Articles:

Daryl P. Fields II, MD, PhD

PGY-2 Resident

Daryl Pinion Fields II, MD, PhD, joined the University of Pittsburgh Department of Neurological Surgery in July of 2018. He completed his undergraduate degree at Saint John’s University (Collegeville, Minn.), and his medical degree, as well as research doctorate, at the University of Wisconsin, Madison. Prior to medical school Dr. Fields spent four years serving as a firefighter and medic. He accredits this experience for inspiring his passion for patient centered care in addition to his desire of advancing the field of neurosurgery through treatment innovation. To this note, his previous research experiences are two fold: 1) development of novel disease models to better understand deficits in movement control and 2) development of pharmacological agents for improved motor rehabilitation following traumatic, degenerative and inflammatory neural conditions. His research has lead to the publication of more than a dozen basic science manuscripts, several national research awards, and a patent for a drug to treat breathing disorders such as obstructive/central sleep apnea. He plans to continue these research pursuits with hopes of improving treatment options for his patients and others. In his free time Dr. Fields enjoys working out, cooking, and catching up with friends.

Specialized Areas of Interest
Spine, trauma and rehabilitation.

Professional Organization Membership
American Academy of Neurological Surgeons
American Academy of Neurology
American Physiological Society
Society for Neuroscience
Pennsylvania Medical Society

Education & Training
BA, Biochemistry, Saint John’s University (Collegeville, Minn.), 2010
MD, University of Wisconsin, Madison, 2017
PhD, Molecular Neuroscience, University of Wisconsin, Madison, 2018

Honors and Awards
Runnerup Presentation Award, Stuart Rowe Society Lectureship Day, 2018
NIH MD/PhD F30 Fellowship, 2015-18
Top Ambulatory Medicine Project, University of Wisconsin, 2017
UNCF/Merck Graduate Fellowship, 2015-17
Bennett Hiner Top Neuroscience Medical Student Award, University of Wisconsin, 2016
Top Neuroscience Presentation Award, University of Wisconsin, 2016
Top Biomedical Science Presentation Award, University of Wisconsin, 2016
Caroline Tum Suden Abstract Award, American Physiological Society, 2016
Society for Neuroscience Abstract Award, 2015
Daryl and Sharon Buss Abstract Award, University of Wisconsin, 2015
Neuromuscular Graduate Fellowship, University of Florida, 2015
Science/Medicine Graduate Fellowship, University of Wisconsin, 2014
Zachary C. Gersey, MD
PGY-3 Resident

Zachary C. Gersey, MD, MS, joined the University of Pittsburgh Department of Neurological Surgery residency program in July of 2017. Having graduated cum laude from University of Florida with a degree in biology, he completed his medical education at the University of Miami Miller School of Medicine. During medical school, Dr. Gersey became immersed in neurosurgery, both in and out of clinic. He was recognized as a student leader and researcher at both the University of Miami Brain Tumor Initiative and the Cerebrovascular Institute. His research experience propelled him to earn his master's degree in translational investigation from the University of Miami through his work in glioblastoma multiforme. Dr. Gersey's research is focused on the molecular targeting of glioblastoma stem cells—a subset of cells theorized to be the cause of tumor recurrence and treatment resistance. His research has led to several awards and distinctions and he plans to continue his work while in Pittsburgh. Dr. Gersey is also involved in community outreach and service, having spent time volunteering in health clinics all over south Florida and also abroad in Central America. His dedication to academics, community, and education led to his election into the Alpha Omega Alpha Medical Honor Society. Dr. Gersey was born in Rochester, N.Y., but moved to Merritt Island, Fla., while in high school. Outside of medicine, Zach enjoys spending time with family and friends, playing soccer and baseball, playing the guitar, and weight lifting.

Specialized Areas of Interest
Neurosurgical oncology; skull base neurosurgery; education in neurosurgery.

Education & Training
BA, Biology, University of Florida, 2011
MA, University of Miami, 2016
MD, University of Miami, 2017

Honors and Awards
Neil Peart Neurosurgery Research Award, Glioblastoma Foundation, 2020
Best Poster Award, Florida Center for Brain Tumor Research, Brain Tumor Summit, 2016
Alpha Omega Alpha, University of Miami, 2016
Clinical and Translational Investigation Scholarship, University of Miami, 2016

Publications: 2019-20
• Refereed Articles:

Ezequiel Goldschmidt, MD, PhD
Chief Resident

Ezequiel Goldschmidt, MD, PhD, was born in Buenos Aires, Argentina. He received his medical degree from The University of Buenos Aires where he graduated Suma Cum Laude. He obtained his PhD focusing on tissue regeneration from the same university and completed a neurosurgery residency program at Buenos Aires Italian Hospital. Dr. Goldschmidt joined the University of Pittsburgh Department of Neurological Surgery residency program in 2015 as a PGY-3. After completing the University of Pittsburgh neurosurgical residency program in June of 2020, Dr. Goldschmidt began serving the prestigious Van Wagenen Fellowship at the Karolinska Institutet in Sweden.
Ezequiel Goldschmidt, MD, PhD

**Resident Biographies**

**Specialized Areas of Interest**
Cranial base surgery; post-surgical healing; neuroplasticity.

**Board Certifications**
Argentinian Boards of Neurological Surgeons

**Professional Organization Membership**
American Association of Neurological Surgeons
Congress of Neurological Surgeons

**Education & Training**
MD, Buenos Aires University School of Medicine
PhD, Buenos Aires University School of Medicine

**Honors and Awards**
William P. Van Wagenen Fellow, 2020
Preuss Award, Congress of Neurological Surgeons, 2018
Self-Assessment in Neurosurgery (SANS) Challenge, 2nd Place, Congress of Neurological Surgeons Annual Meeting, 2017
Best Abstract Award, North American Skull Base Society Annual Meeting, 2016
Charlie Kuntz Scholar Award, AANS/CNS Joint Section on Disorders of the Spine and Peripheral Nerves, 2016

**Publications: 2019-20**

- **Refereed Articles:**


Resident Biographies


• Presentations:

Joseph Scott Hudson, MD
PGY-1 Resident

Joseph Scott Hudson, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July 2019 after graduating with research distinction from the University of Iowa Carver College of Medicine. He also received his undergraduate degree from the University of Iowa with honors in biology, a minor in chemistry, and high distinction. During his undergraduate education, he became heavily involved in the Department of Neurosurgery at the University of Iowa Hospitals and Clinics. His work under the mentorship of David Hasan, MD, in cerebrovascular neurosurgery included basic science investigations into the pathogenesis of intracranial aneurysms, device development, and neurovascular imaging development. During medical school, Dr. Hudson received research support from the Neurosurgery Research and Education Foundation (NREF) as a medical student fellow, subsequently receiving the 2016 NREF best medical student abstract award. His research has led to numerous peer reviewed publications, abstracts, and oral presentations at national neurosurgical conferences. Dr. Hudson is an elected member of the Alpha Omega Alpha medical honor society. Dr. Hudson was born in Waterloo, Iowa. He was raised in Cedar Falls, Iowa and Plankstadt, Germany. His hobbies outside of neurosurgery include spending time with family and friends, golf, professional and collegiate sports, snow skiing, travel, and water sports.

Specialized Areas of Interest
Cerebrovascular neurosurgery; spine surgery; general neurosurgery.

Professional Organization Membership
Alpha Omega Alpha
American Association of Neurological Surgeons
American Heart Association/American Stroke Association
Congress of Neurological Surgeons

Education & Training
BA, Biology, Minor in Chemistry, University of Iowa, 2015
MD, University of Iowa Carver College of Medicine, 2019

Honors and Awards
Award for Excellence in Clinical Neuroscience Research, University of Iowa Carver College of Medicine, 2017
Best Abstract Award, AANS/NREF Medical Student Summer Research Fellowship, 2016
Richard Kessel Scholarship in Medicine, University of Iowa Carver College of Medicine, 2018
Resident Biographies

Joseph Scott Hudson, MD

Melvin Marcus Scholarship for Excellence, University of Iowa Carver College of Medicine, 2018
Trainee Scholar Travel Award, University of Iowa Carver College of Medicine, 2018
Honors Graduate, Biology, University of Iowa, 2015
High Distinction Graduate, University of Iowa, 2015
Dean’s List, University of Iowa, 2011-2015
President’s List, University of Iowa, 2011-2015

Publications: 2019-20
• Refereed Articles:


Justiss A. Kallos, MD
PGY-3 Resident

Justiss Kallos, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in June of 2017 after graduating from the Vanderbilt University School of Medicine. Prior to matriculating for residency, she spent a year as project coordinator for a neuroplasticity lab working to improve stroke rehabilitation outcomes and expand access to rehabilitation services for rural veterans within the U.S. Department of Veterans Affairs in Atlanta, Ga. She also spent a postgraduate year studying at the University of St Andrews as a Robert T Jones, Jr. Memorial Scholar after graduating summa cum laude from Emory University with a degree in neuroscience and behavioral biology. She has a wide array of interests, having been involved in projects assessing perioperative factors that predict outcomes following vascular and skull base operations using traditional and machine learning models, stroke rehabilitation and telemedicine, and social determinants affecting health outcomes. Outside of residency, she enjoys international travel, playing board games, hiking, and spending quality time with family.

Specialized Areas of Interest
Neurotrauma.
Andrew Legarreta, MD
PGY-1 Resident

Andrew D. Legarreta, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July of 2019 after receiving his medical degree from Vanderbilt University School of Medicine. He received his undergraduate degree from Duke University, completing a BA in history. During medical school, Dr. Legarreta studied the effects of sport-related concussion in the high school athlete population. Specifically, he examined predictors of post-concussion syndrome and, separately, structural and functional neuroimaging findings in football players. His peer-reviewed work has been presented at regional and national neurosurgical conferences in oral and abstract form. Dr. Legarreta enjoys playing guitar, international travel, and golf in his free time. He is a native of Buffalo, N.Y.

Specialized Areas of Interest
Cerebrovascular neurosurgery; endoscopic endonasal and skull base neurosurgery; scoliosis and complex spinal deformity; sport-related concussion.

Professional Organization Membership
American Association of Neurological Surgeons
American Medical Association
Congress of Neurological Surgeons

Education & Training
BA, History, Duke University, 2014
MD, Vanderbilt University School of Medicine, 2019

Honors and Awards
Cornelius Vanderbilt Scholarship, Vanderbilt University School of Medicine, 2015-19
Publications: 2019-20
• Refereed Articles:
Resident Biographies

Arka N. Mallela, MD
PGY-2 Resident

Arka N. Mallela, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July 2018 after graduating from the University of Pennsylvania School of Medicine, earning MD and MS degrees in translational research. He received his undergraduate degrees from the Vagelos Scholars Program at the University of Pennsylvania, completing a BA in biophysics, biochemistry, and philosophy and an MS in biological chemistry. Dr. Mallela has a strong interest in the intersection of network theory, neuroimaging, and deep learning. He is currently interested in utilizing these tools to study a variety of neurological diseases, including fetal brain folding, epilepsy, and brain tumors. For his work, Dr. Mallela has received the 2017 American Brain Tumor Association Young Investigator Award and was named a finalist in the 2017 National Neurotrauma Symposium Trainee Competition. In his free time, Dr. Mallela enjoys hiking, movie making, and spending time with his family, wife, and friends.

Specialized Areas of Interest
Epilepsy surgery; neuro-oncology; pediatric neurosurgery; neurocritical care; general neurosurgery.

Professional Organization Membership
American Association of Neurological Surgeons
Association for Clinical and Translational Sciences
Congress of Neurological Surgeons

Education & Training
BS, Biophysics, Biochemistry, Philosophy, University of Pennsylvania, 2013
MS, Biological Chemistry, University of Pennsylvania, 2013
MS, Translational Research, University of Pennsylvania, 2018
MD, University of Pennsylvania Perelman School of Medicine, 2018

Editorial Service
• Ad Hoc Reviewer:
  International Journal of Hyperthermia

Honors and Awards
Walter L. Copeland Grant, Copeland Foundation, 2020
American Brain Tumor Association Young Investigator Award, 2017
Trainee Poster Competition Finalist, National Neurotrauma Symposium, 2017

Publications: 2019-20
• Refereed Articles:

• Presentations:
Michael McDowell, MD  
PGY-6 Resident

Michael McDowell, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July of 2014 after graduating from Columbia University’s College of Physicians and Surgeons medical school. He received undergraduate degrees in biochemistry and Latin dance from Arizona State University in 2005, graduating as valedictorian. During medical school, Dr. McDowell was elected into Alpha Omega Alpha and received funding to pursue a Doris Duke Clinical Research Fellowship investigating the mechanisms by which genetic and environmental factors alter aneurysm morphology. He subsequently received funding from the Brain Aneurysm Foundation to continue his work during residency. Dr. McDowell was heavily involved in teaching and community outreach during medical school and was voted clinician of the year for his contributions to the Columbia Student Medical Outreach clinic in Washington Heights. His current research interests include the alteration of vascular malformations from childhood to adulthood, clinical applications of near infrared spectroscopy, and the study of the outcomes of pediatric skull base surgery. His interests outside of neurosurgery include medical education, dance, and theater. Dr. McDowell is the son of Douglas and Marti McDowell of Iron Mountain, Mich.

Specialized Areas of Interest
Healthcare improvement; Chiari malformation; pediatric neurosurgery; cerebrovascular disease; pediatric skull base surgery; health software development.

Professional Organization Membership
Allegheny County Medical Society  
Alpha Omega Alpha  
American Association of Neurological Surgery  
AANS Section on the History of Neurological Surgery  
AANS Young Neurosurgeons Committee  
AANS/CNS Joint Section on Pediatric Neurosurgery  
Congress of Neurological Surgeons  
Pennsylvania Medical Society House of Delegates  
Radiosurgical Society

Education & Training
BS, Biochemistry, Arizona State University, 2009  
MD, Columbia University College of Physicians and Surgeons, 2014

Editorial Service
• Editorial Board:
  Current Neurovascular Research, Panel Reviewer  
  Stroke, Panel Reviewer

• Ad Hoc Reviewer:
  American Journal of Neuroradiology  
  Journal of Clinical Medicine  
  Journal of Clinical Neuroscience  
  Neuroimaging in Neurology and Psychiatry  
  Operative Neurosurgery  
  SAGE Open Medical Case Reports  
  World Neurosurgery
Michael McDowell, MD

Resident Biographies

**Interdepartmental and Medical Center Activities**
- **University of Pittsburgh:**
  - Advisor, Neurosurgery Interest Group
  - Course Director, Brain and Blade elective course for 2nd year medical students
  - GMEC Residency Accreditation, Reviews, and Quality Subcommittee
  - GMEC Professional Development Subcommittee

**Professional Activities**
- Young Neurosurgery Committee Representative, AANS History Section and AANS/CNS Pediatric Section
- Regional Coordinator, Northeast AANS Medical Student Chapters
- Committee for Transformation for the Allegheny Medical Center

**Honors and Awards**
- Copeland Grant Winner, Pittsburgh Foundation, 2015, 2019
- Gold Medal, Top Gun Surgical Completion, Lumbar Pedicle Screw Placement, American Association of Neurological Surgeons, 2017
- Charlie Kuntz Scholar, AANS/CNS Spine Summit, 2016
- Christopher Getch Chair of Research, Brain Aneurysm Foundation, 2013

**Publications: 2019-20**
- **Refereed Articles:**

- **Letters to the Editor:**
Resident Biographies

Michael McDowell, MD

• Presentations:


Gautam M. Nayar, MD

PGY-2 Resident

Gautam M. Nayar, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July of 2018. After graduating from the University of Florida with a degree in computer science, Dr. Nayar completed his medical education at Duke University School of Medicine. As the Ruth K. Broad Foundation Neurosciences Fellow, he studied neuronal response and processing towards integration of sensory brain-computer interfaces in the laboratory of Miguel Nicolelis, MD, PhD. Dr. Nayar also cultivated an interest in spinal outcomes research focusing on minimally invasive approaches, radiation reduction protocol, and identification of pre-operative risk factors. Dr. Nayar’s work on the clinical efficacy of ultra-low radiation imaging protocols was awarded the 2017 AANS Donald Quest Clinical Science Award. Although raised in Pittsburgh, Dr. Nayar moved to Gainesville, Fla. for high school and college. In his free time, he enjoys hiking, weightlifting, and spending time with his family.

Professional Organization Membership
American Association of Neurological Surgeons
Congress of Neurological Surgeons
North American Spine Society
Society of Lateral Spine Access Surgery
Resident Biographies

Gautam M. Nayar, MD

Education & Training
BS, Computer Science, University of Florida, 2014
MD, Duke University, 2018

Honors and Awards
Donald Quest Clinical Science Award, AANS, 2017

Publications: 2019-20
• Refereed Articles:

• Presentations:

Kamil W. Nowicki, MD, PhD
PGY-4 Resident

Kamil W. Nowicki, MD, PhD, began his residency with the University of Pittsburgh Department of Neurosurgery in June of 2016. He graduated from University of Florida in 2008 with a degree in chemistry with the highest honors and earned his combined medical degree and a PhD in molecular cell biology from the University of Florida College of Medicine in 2016. During his medical school career, he conducted research in the department of neurosurgery under mentorship of Brian L. Hoh, MD, and Edward W. Scott, PhD. In his dissertation research he showed that blockade of shear stress-induced CXCL1 chemokines prevents cerebral aneurysm formation. He was awarded two research grants from the Brain Aneurysm Foundation. He was also the recipient of the Equal Access Clinic award for his work as director of a mobile clinic site while providing care for the underserved population of Gainesville, Fla. in 2012 and 2013. His current research efforts are focused on studying the platelet inflammatory axis in cerebral aneurysm formation and healing. Dr. Nowicki was born in Poland and moved to Gainesville in 2001. His hobbies include soccer, digital photography, and cross-fit.

Specialized Areas of Interest
Chemokines; hemodynamics; intracranial aneurysms; cerebrovascular surgery; biomedical engineering; inflammation; and shear stress.

Professional Organization Membership
American Association of Neurological Surgeons
American Heart Association: Council on Atherosclerosis, Thrombosis, and Vascular Biology
American Medical Association
American Physician Scientist Association
Congress of Neurological Surgeons

Education & Training
BS, Chemistry, University of Florida, Summa cum laude, 2008
PhD, Molecular Cell Biology, University of Florida College of Medicine, 2014
MD, University of Florida College of Medicine, 2016
Resident Biographies

Kamil W. Nowicki, MD, PhD

Editorial Service
• Ad Hoc Reviewer:
  Journal of Neurointerventional Surgery

Patent Applications
PittID-05390 “Small molecule inhibitor therapy targeting platelet-CXCL7-CXCR1/2 axis to prevent aneurysm formation, growth, or rupture” (submitted 5/30/2020, pending)
UFTINV-200015 T17844 “Drug therapy to prevent formation or enlargement or rupture of aneurysms” (submitted 7/11/2019, pending)

Honors and Awards
Best Basic Science Abstract, Cerebrovascular Section, CNS, 2019
Best Presentation Award, Stuart Rowe Society Lectureship Day, 2018, 2019
Walter, L Copeland Grant, Pittsburgh Foundation, 2019
Neurosurgical Topgun Competition 1st Place Tie, Myriad Minimally Invasive Tumor, 2018
Timothy P. Susco Chair of Research Grant Award, Brain Aneurysm Foundation, 2016
Dawn Brejcha Chair of Research Grant Award, Brain Aneurysm Foundation, 2016
Outstanding Academic And Research Accomplishment Award, University of Florida, 2016
College of Medicine Travel Award, University of Florida, 2015
Medical Guild Competition Bronze Award, University of Florida, 2014
Equal Access Clinic Award, University of Florida, 2012-13
Shirley Dudek Demmer Chair of Research Grant Award, Brain Aneurysm Foundation, 2013
Brain Aneurysm Center Chair of Research Grant Award, North Shore University Hospital, 2012
Summa Cum Laude, Bachelor of Science in Chemistry, University of Florida, 2008
Sanibel Symposium Superior Poster Award, University of Florida, 2007
Anderson Scholar of High Distinction, University of Florida, 2006
Florida Bright Futures Scholarship, University of Florida, 2005

Publications: 2019-20
• Refereed Articles:

• Invited Papers:

• Book Chapters:

• Published Abstracts:
Enyinna L. Nwachuku, MD
PGY-5 Resident

Enyinna L. Nwachuku, MD, began his residency with the University of Pittsburgh Department of Neurological Surgery in July of 2015. He graduated from the University of Pittsburgh in 2010 with a degree in neuroscience, and subsequently earned his medical degree from the University of Pittsburgh in 2015. Along with three other colleagues from medical school, Dr. Nwachuku is a co-founder of a national and locally funded, non-profit, after-school organization called The Healthy Minds Academy which is a program geared toward professional development with at-risk youth in the public-school systems of Pittsburgh. In September of 2019, Dr. Nwachuku became the first resident to serve in what is considered to be the first sports medicine fellowship of its kind in the nation. The fellowship included rotations with the Pittsburgh Steelers, Pittsburgh Penguins and other Pittsburgh-area sports organizations. Dr. Nwachuku was born in Nigeria. Interests outside of neurosurgery include cinema, traveling, and global/public health disparities.

Specialized Areas of Interest
Cranial and spine trauma; complex and minimally invasive spine, and neurosurgical sports medicine; and clinical trials research in traumatic brain and spinal cord injury.

Professional Organization Membership
American Association of Neurological Surgeons
Congress of Neurological Neurosurgeons
Pennsylvania Medical Society

Education & Training
BS, University of Pittsburgh, Neuroscience, 2010
MD, University of Pittsburgh, 2015

Publications: 2019-20
• Refereed Articles:
  Deng H, Yue JK, Zusman BE, Nwachuku EL, Abou-Al-Shaar H, Upadhyayula PS, Okonkwo DO, Puccio AM. B-Cell Lymphoma 2 (Bcl-2) and Regulation of Apoptosis after Traumatic Brain Injury: A Clinical Perspective. Medicina (Kaunas) 18;56(6), 2020.


• Presentations:
Alp Ozpinar, MD  
PGY-6 Resident

Alp Ozpinar, MD, a native of Istanbul, Turkey, joined the University of Pittsburgh neurosurgery residency program in July of 2015 after receiving his medical degree from Oregon Health and Science University. While in medical school, Dr. Ozpinar was elected to Alpha Omega Alpha as a junior, and was awarded the School of Medicine Research Award and Outstanding Medical Student Scholarship upon graduation. Dr Ozpinar's research activities focus on degenerative spine and spinal deformity. He has over 50 peer-reviewed journal publications, over 70 poster and oral presentations in regional and national meetings and nine book chapters. His research has been published in several high impact journals including *JAMA* and *Molecular Aspects of Medicine*. Dr. Ozpinar is pursing a fellowship in minimally invasive and complex spine surgery at the University of Pittsburgh. Outside of neurological surgery, Dr Ozpinar is an avid tennis player and occasionally competes in men’s open tennis tournaments. His other hobbies include triathlons, skiing and travel.

**Specialized Areas of Interest**
Degenerative spine; complex spinal deformity; minimally invasive spine surgery; radiosurgery; spinal biomechanics.

**Professional Organization Membership**
Alpha Omega Alpha  
American Association of Neurological Surgeons  
American Medical Association  
Congress of Neurological Surgeons  
Turkish American Doctors Association of Midwest

**Education & Training**
BS, Biomedical Engineering, University of California, Davis, 2009  
MD, Oregon Health and Science University, 2015

**Honors and Awards**
Resident Presentation Award, AANS/CNS Joint Section on Disorders of the Spine and Peripheral Nerves, 2018  
Charlie Kuntz Scholar Award, AANS/CNS Joint Section on Disorders of the Spine and Peripheral Nerves, 2016  
Outstanding Medical Student Scholarship, Oregon Health and Science University, 2015  
School of Medicine Research Award, Oregon Health and Science University, 2015  
Alpha Omega Alpha, 2014  
National Dean’s List, 2009

Matthew Pease, MD  
PGY-5 Resident

Matthew Pease, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July of 2015 after graduating from the University of Southern California’s Keck School of Medicine. He received his undergraduate degree in economics from Duke University in 2010. Prior to matriculating to medical school, Dr. Pease explored a variety of research topics including animal models of addiction through a Howard Hughes research fellowship, learning modules through fellowship at the National Institutes of Health, and game theory models of group conflict. During medical school, Dr. Pease earned an American Association Medical Student Research fellowship to investigate the epigenetics...
Resident Biographies

Matthew Pease, MD

of pituitary adenomas. He continues his interests in economics and brain tumor research during residency. Outside of neurosurgery, Dr. Pease enjoys hiking, college basketball and football, and theater.

Specialized Areas of Interest
Brain tumors.

Professional Organization Membership
American Association of Neurological Surgeons
Congress of Neurological Surgeons

Education & Training
BA, Economics, Duke University, 2010
MD, University of Southern California, 2015

Honors and Awards
Congress of Neurological Surgeons Data Science Fellowship, 2020
Runner-Up Presentation Award, Stuart Rowe Society Lectureship Day, 2017

David Salvetti, MD
Chief Resident

David J. Salvetti, MD, began his residency with the University of Pittsburgh Department of Neurosurgery in July 2013. He graduated from Vanderbilt University in 2009 with a BE in biomedical engineering, and then attended the University of Virginia School of Medicine, graduating in 2013. During both undergraduate and medical school, Dr. Salvetti was involved in neurosurgery research ranging from software development to the clinical outcomes of Gamma Knife surgery. During residency his research has focused on the clinical outcomes of elective spine surgery. After completing his neurological surgery residency at the University of Pittsburgh in June of 2020, Dr. Salvetti accepted a position with the Virginia Brain And Spine Center in Winchester, Va.

Specialized Areas of Interest
Complex and minimally invasive spine surgery.

Education & Training
BE, Biomedical Engineering, Vanderbilt University, 2009
MD, University of Virginia, 2013

Honors and Awards
Charlie Kuntz Abstract Award, CNS Spine Summit, 2016
Best Presentation Award, Stuart Rowe Society Lectureship and Resident research Day, 2015

Publications: 2019-20
- Refereed Articles:
Resident Biographies

Roberta K. Sefcik, MD  
*PGY-3 Resident*

Roberta K. Sefcik, MD, began her residency with the University of Pittsburgh Department of Neurosurgery in June of 2017. She graduated from Carnegie Mellon University in 2011 where she pursued an interdisciplinary degree in psychology and music performance, focusing on bagpipe performance. She was admitted to the Humanities and Medicine Program and the Patient-Oriented Research Training and Leadership Program at the Icahn School of Medicine at Mount Sinai in New York where she received her medical degree and a master of science in clinical research in 2017. Dr. Sefcik was born and raised in Dunedin, Fla.

**Specialized Areas of Interest**
Cerebrovascular surgery

**Education & Training**

- **BA**, Psychology/Music Performance, Carnegie Mellon University, 2011
- **MS**, Clinical research, Icahn School of Medicine at Mount Sinai, 2017
- **MD**, Icahn School of Medicine at Mount Sinai, 2017

**Honors and Awards**

- Distinction in Research, Icahn School of Medicine at Mount Sinai, 2017
- Phi Beta Kappa, 2011.

Jeremy Stone, MD  
*PGY-6 Resident*

Jeremy Stone, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July of 2014. He completed his undergraduate work at Case Western Reserve University, attaining magna cum laude honors with dual degrees in biology and psychology. A native of Hawaii, Dr. Stone returned home to the University of Hawaii John A. Burns School of Medicine to pursue his medical degree. He was recognized as a leader in his class, taking on the role of president of the American Medical Association Chapter and serving as delegate to the Hawaii Medical Association. He also led many community service outreach projects. Dr. Stone's academic achievement was acknowledged with election into the Alpha Omega Alpha Honor Medical Society. Dr. Stone's research interests include vascular neurosurgery, traumatic brain injury systems-based improvement, evaluation of surgical outcomes in spinal deformity, and molecular mechanisms underlying neurodegenerative disease. He completes his CAST-accredited fully enfolded endovascular fellowship training June of 2020. Outside of the hospital and research lab, Dr. Stone enjoys spending time with his wife, three kids and first grandchild, hiking and playing sports.

**Specialized Areas of Interest**
Vascular/endovascular; tumor; spine.

**Professional Organization Membership**

- Alpha Omega Alpha
- American Association of Neurological Surgeons
- Congress of Neurological Surgeons
- Phi Beta Kappa

**Education & Training**

- **BA**, Biology/Psychology, Case Western Reserve University, 2009
- **MD**, University of Hawaii John A. Burns School of Medicine, 2014
Jeremy Stone, MD

Resident Biographies

Editorial Service
• Ad Hoc Reviewer:
  Neurosurgery

Honors and Awards
Medical Education LEAP Award for Patient Safety and Quality Improvement, UPMC, 2017, 2020
Oral Presentation Award, Second Annual Graduate Medical Education Quality and Safety Symposium, University of Pittsburgh, 2019
Best Resident Research Presentation Runner Up, Stuart Rowe Society Lectureship, University of Pittsburgh, 2019
Frank and Mary McDowell Award for Excellence in Surgery, University of Hawaii John A. Burns School of Medicine, 2019
Windsor and Mary Cutting Excellence in the Basic Sciences Award, University of Hawaii John A. Burns School of Medicine, 2014
Bernard Yim Award for Top Performance in Internal Medicine Clerkship, American College of Physicians, University of Hawaii John A. Burns School of Medicine, 2013

Publications: 2019-20
• Refereed Articles:


• Invited Papers:

• Presentations:


Resident Biographies

• Presentations:


Invited Lectures: 2019-20
• Local/Regional:


Zussman BM, Stone JG. "Radial Approach in Neurointervention the UPMC Experience." University of Pittsburgh Medical Center Neuroscience Nursing Conference, UPMC Shadyside, Pittsburgh, Pa., March 6, 2020.

Stone JG. "Radial Approach in Neurointervention the UPMC Experience." University of Pittsburgh Medical Center Resident Education Webinar Series, Pittsburgh, Pa., April 7, 2020.

Daniel Tonetti, MD
PGY-6 Resident

Daniel A. Tonetti, MD, joined the Department of Neurological Surgery residency program in July of 2014. He graduated with honors from Drexel University with BS and MS degrees in chemical engineering. Prior to matriculation into medical school, he was employed within the pharmaceutical industry in both drug discovery and vaccine manufacturing. Dr. Tonetti earned his medical degree from the University of Pittsburgh in 2014, where he was elected by his peers president of his class and was elected to Alpha Omega Alpha as a junior. Dr. Tonetti is pursuing a Committee on Advanced Subspecialty Training (CAST) approved enfolded fellowship in neuroendovascular surgery at the University of Pittsburgh. His current research interests include the evaluation of outcome parameters after treatment for neurovascular disease, stroke therapies, and traumatic brain injury. Outside of neurological surgery, Dr. Tonetti is interested in medical education, running, soccer & backpacking. He is a native of Keedysville, Md.

Specialized Areas of Interest
Cerebrovascular neurosurgery; endovascular neurosurgery; stereotactic radiosurgery; complex spine; neurotrauma.

Professional Organization Membership
Alpha Omega Alpha Medical Honor Society
American Association of Neurological Surgeons
Congress of Neurological Surgeons
Pennsylvania Neurosurgical Society
Resident Biographies

Daniel Tonetti, MD

Education & Training
BA, MS, Chemical Engineering, Drexel University, 2010
MD, University of Pittsburgh, 2014

Honors and Awards
Theodore Kurze Senior Prize for Excellence in Neurological Surgery and Clinical Neurosciences, University of Pittsburgh, 2014

Publications: 2019-20

• Refereed Articles:

• Book Chapters:
Xiaoran Zhang, MD
PGY-4 Resident

Xiaoran (Zel) Zhang, MD, MS, joined the University of Pittsburgh Neurological Surgery residency program in June of 2016 after graduating from the University of Pittsburgh School of Medicine. Dr. Zhang obtained a combined BS/MS degree from the Department of Microbiology, Immunology, and Molecular Genetics at University of California, Los Angeles. His master’s thesis was titled “Role of Vitamin D in the Toll-induced Antimicrobial Responses.” During medical school, Dr. Zhang was selected to participate in the Clinical Scientist Training Program and was awarded a master’s level certificate in clinical research. Additionally, he studied the mechanisms of immune escape in isocitrate dehydrogenase mutant gliomas. He was awarded The Theodore Kurze Senior Prize for excellence in Neurological Surgery and Clinical Neurosciences. Dr. Zhang is a native of Henan, China.

Specialized Areas of Interest
Neuro-oncology; cerebrovascular; and neurotrauma.

Professional Organization Membership
American Association of Neurological Surgeons
Congress of Neurological Surgeons

Education & Training
BS/MS, Microbiology, Immunology, and Molecular Genetics, UCLA, 2012
MD, University of Pittsburgh, 2016

Honors and Awards
The Theodore Kurze Senior Prize for Excellence in Neurological Surgery and Clinical Neurosciences, University of Pittsburgh, 2016

Publications: 2019-20
• Refereed Articles:


Resident Biographies

Benjamin M. Zussman, MD
Chief Resident

Ben Zussman, MD, began his residency with the University of Pittsburgh Department of Neurosurgery in July 2013. He served as a fellow of the Council of State Neurosurgical Societies and was a participant in the UPMC/Katz Business School Marshall Webster Physician Leadership Program. Dr. Zussman also founded and maintained the educational website neurovascularcases.com. After completing his residency, Dr. Zussman accepted a position with the Wellstar Medical Group in Roswell, Ga.

Specialized Areas of Interest
Vascular neurosurgery, spine surgery

Education & Training
BA, Haverford, 2009
MD, Jefferson Medical College, 2013

Publications: 2019-20
• Refereed Articles:


2020 Graduating Chief Residents

Faraji • Goldschmidt • Salvetti • Zussman
Research

Overview

The goal of the Department of Neurological Surgery at the University of Pittsburgh is to improve the care and treatment of patients with neurological disease. This goal is being achieved partly through the implementation and administration of state-of-the-art basic and translational research. Our department—with more than 40 faculty members and investigators—endeavors to be at the forefront of medical research. Numerous advances have already been achieved—research translated into practice.

Annually, the department has been highly ranked in total research funding, a direct result of the success and quality of our research and development. During this past fiscal year, COVID-19 had a significant, adverse impact on research funding. Our faculty and residents still were involved in almost 150 research projects having a total average annual budget award of almost $10 million.

Ongoing research includes the disciplines of molecular biology, neurophysiology, neurochemistry, neuroanatomy, neuroradiology and other neuroscience arenas. Specific questions addressed include research into the acute and chronic care following neurotrauma, neural recovery and plasticity, the neurobiologic and therapeutic response in neuro-oncology, the underlying mechanisms and treatment of epilepsy and movement disorders, cell death and radiation injury, and cerebrovascular physiology and modeling. The department provides an outstanding research environment for fellows, residents, and students seeking training in neurosurgical research.

Intramural research support for junior faculty and residents is available through the Walter L. Copeland Fund. The Walter L. Copeland Fund was established at The Pittsburgh Foundation in 1961, with instructions that the entire annual proceeds support cranial research in the Department of Neurosurgery at the University of Pittsburgh. More than $2 million has been granted for various research projects. In November 2001, the neurosurgical space on the ninth floor of Scaife Hall were dedicated as the Walter L. Copeland Laboratory for Neurosurgical Research.

The Walter L. Copeland Laboratory

The Walter L. Copeland Laboratory serves as a central facility for research and development within the Department of Neurological Surgery. Located on the ninth floor of Scaife Hall, the laboratory was dedicated on November 29, 2001 by L. Dade Lunsford, MD. The laboratory houses several research disciplines and core facilities which provide resources and services for a wide range of neurosurgery faculty, residents, visiting fellows, and students. Core services in the areas of biochemistry, histology and immunohistochemistry are offered in this facility. Neurotrauma, brain tumor, brain imaging, and neuroanatomical research are the primary initiatives being conducted in the laboratory. A significant amount of this work is funded by The Walter L. Copeland Fund of The Pittsburgh Foundation, a fund that has provided resources for research at the University of Pittsburgh since 1961.

The Laboratory for Clinical Neurotrauma Research is located in the Copeland Laboratory. Under the direction of David O. Okonkwo, MD, PhD, and co-director, Ava M. Puccio, RN, PhD, the team conducts innovative clinical research with a focus on biomarkers as well as the evaluation of neurotherapeutics for traumatic brain injury.

The Surgical Neuroanatomy Laboratory—under the direction of Paul Gardner, MD—and the Fiber Tractography Laboratory—under the direction of Fang-Cheng (Frank) Yeh, MD, PhD—are also located in the Copeland Laboratory. Residents and visiting fellows train in neuroanatomy and the development of minimally invasive endoNeurosurgical approaches to the brain. New routes to various brain locations are developed using in vitro models.
Research

Overview

The Fiber Tractography Lab is focused on the application of HDFT for presurgical planning and intraoperative navigation to facilitate brain function preservation and improve resection rates in patients with complex brain lesions. The laboratory’s work is also centered on studying the structure and connectivity of the fiber tracts forming the “normal” human brain, and their structural alteration in patients with brain tumors, vascular lesions, stroke, and neurodegenerative diseases.

Wendy Fellows-Mayle, PhD, is coordinator of the Copeland Laboratory.

Neurotrauma Research

C. Edward Dixon, PhD, directs the Department of Neurological Surgery’s Brain Trauma Research Center (BTRC) at the University of Pittsburgh. The BTRC is a multidisciplinary research program aimed at improving outcome following severe traumatic brain injury. Research conducted both at our Center and at other brain injury research programs clearly demonstrates the potential for improving outcomes using therapies designed to treat biochemical derangements that occur following impact to the brain. In order to identify the most critical of these sequelae of brain injury and to find newer therapies that are effective in treating them, the BTRC has established several basic science head injury laboratories and clinical research projects.

David O. Okonkwo, MD, PhD, leads the department’s efforts as director of the Neurotrauma Clinical Trials Center (NCTC). Clinical brain injury research is wide spanning and includes clinical trials funded by federal agencies and industry to study new therapies, novel brain monitoring, advanced neuroimaging, and biomarkers. The center also houses the National TBI Biospecimens Repository. This repository, under the direction of Ava Puccio, RN, PhD, is the largest centralized collection of biological samples from traumatic brain injury patients in the United States. The Department of Neurological Surgery has pioneered efforts using hypothermia and cerebral blood flow monitoring in the treatment of severe head injury and has conducted landmark investigations into the mechanisms of induction and recovery of head trauma and secondary injury.

The Safar Center for Resuscitation Research is directed by Patrick Kochanek, MD, of the Department of Critical Care, and has a strong collaborative and productive relationship with several members of the Brain Trauma Research Center. Dr. Dixon and Shaun Carlson, PhD, serve as associate directors of the Safar Center. The mission of the Safar Center is to improve understanding of the mechanisms of secondary injury after traumatic brain injury, cardiopulmonary arrest, severe hemorrhage from whatever cause, and to contribute to the development and implementation of novel and increasingly more effective therapies.

Brain Tumor Research

• Basic Science Advances

Our brain tumor basic science research program is a world-class effort focused on delivering novel brain tumor therapies from the laboratory to the bedside. Areas of active investigation include immunotherapy, signal transduction pathways that contribute to the growth of tumor cells, oncolytic viruses, rare tumor exome sequencing, and the development of preclinical animal models for the treatment of brain tumors.

At the core of our program is a commitment to personalized medicine and the development of patient-specific therapies. This commitment begins in the operating room, where a portion of most tumor samples is retrieved for laboratory investigation. These specimens are critical to the development of translational targets for brain tumor therapy. This initiative has led to the banking and study of hundreds of unique tumor samples, facilitating personalization of brain tumor care for future generations of patients.
Brain tumors are inherently immunosuppressive. Each tumor develops unique mechanisms to escape natural anti-tumor immune responses. We have recently discovered a unique immune escape mechanism that involves silencing of immune recognition genes. Importantly, we have discovered that a new class of tumor drugs, called 'hypomethylating agents', can awaken the expression of these genes and allow effective immune responses in IDH mutant gliomas. A Phase I clinical trial is currently being designed based on these findings and is currently being refined by the Alliance for Clinical Trials in Oncology consortium in preparation for a multicenter clinical trial.

Additionally, our program has also recently begun efforts aimed at personalized brain tumor therapy by studying humanoid brain organoid tumor models, a biologically accurate model that simulates a patient's condition in the laboratory. These organoids are subsequently used to evaluate the biological and genetic evolution of individual brain tumors and, subsequently, to generate personalized therapies based on these findings. The desire to develop truly personalized medicine strategies is at the heart of these efforts.

Another exciting area of research in our department involves the development of genetically engineered oncolytic herpes-simplex viruses (oHSV) that can selectively kill proliferating glioma cells but not normal brain cells. Promising preclinical studies in mouse models indicate that this strategy is highly effective for the treatment of glioblastoma. Several patents have been generated and licensed based on this work, and studies are ongoing to evaluate safety testing in preclinical models in anticipation of oHSV clinical trials in the near future.

Previous work in our brain tumor program identified new vaccine strategies for the treatment of gliomas. Researchers in our group developed glioma-associated antigen peptide vaccines to boost tumor-specific immune responses. Phase I clinical trials of these vaccines demonstrate robust induction of antigen-specific immune responses and some clinical activity in both adult and pediatric patients with glioma. These trials are ongoing at the University of Pittsburgh Cancer Institute and Children's Hospital of Pittsburgh. Recent studies have identified patterns of gene expression in peripheral blood mononuclear cells that are associated with response and resistance to peptide-based vaccination in pediatric low-grade gliomas. Future studies will evaluate whether these features are also seen in other subgroups of childhood brain tumors incorporated on our vaccine trials.

Another strategy in brain tumor research is to inhibit the pathways that promote tumor growth or to stimulate those that promote tumor cell killing. The poor response of malignant gliomas to conventional therapies, such as cytotoxic chemotherapy or radiotherapy, reflects resistance of these tumors to undergoing apoptosis in response to DNA damage or mitogen depletion. Through a large-scale screening study, we have identified several exploitable targets, which when inhibited induce tumor cytotoxicity. We have been examining pharmacological agents to inhibit these targets, alone and in combination with agents that induce apoptotic signaling in these tumors.

The clinical research branch of our Brain Tumor Program currently runs "personalized" clinical studies based on patients' gene markers, such as human leukocyte antigen (HLA)-A2 (for immunotherapy studies), epidermal growth factor receptor (EGFR) variant III and chromosome 1p/19q co-deletion. In addition, the program offers a host of molecularly targeted treatment approaches for children whose brain tumors have genomic alterations that make them ideally suited for specific novel-agent trials. These include studies of MEK inhibitors (e.g. Selumetinib) for children with BRAF-altered low-grade gliomas, which are being conducted by the PBTC and more recently, the Children's Oncology Group.
Similarly, members of our group are studying rare skull base tumors such as chordoma by performing whole exome sequencing to search for novel genetic alterations in these tumors that could lead to a better understanding of their oncogenesis as well as targets for treatment. In addition, our surgeons and pathologists have identified a molecular panel that can help predict chordoma clinical behavior and prognosis. This panel is now applied on a regular basis to our patients to provide a personalized approach for current and future treatment.

• Clinical Care Advances

Currently, clinical care of patients with skull base tumors, primary brain tumors and metastatic brain tumors related to systemic cancer represent a major focus for our department’s activities. During the last 38 years, the Center for Image Guided Neurosurgery has provided care to more than 20,000 patients with such tumors as an adjuvant or alternative minimally invasive treatment strategy. One of the most important adjuvant strategies to control brain tumor progression is optimization of radiation delivery techniques. Using technologies such as Gamma Knife® radiosurgery at UPMC Presbyterian (over 16,400 patients and more than 650 published articles) and linear accelerator radiation technologies at UPMC Shadyside, methods to enhance the efficacy and safety of radiation delivery have been pioneered. The International Radiosurgery Research Foundation and corporate entities have funded UPMC to perform radiosurgery for recurrent malignant gliomas coupled with bevacizumab as part of a phase 2 clinical trial. Long term outcome assessments have been completed for patients with metastatic brain cancer, a condition where radiosurgery often has replaced conventional surgery and radiation therapy as the initial management.

Working in concert with these advanced radiosurgery and radiation technologies, the UPMC Center for Cranial Base Surgery is the oldest skull base center in North America. They have been a source of innovation for decades, helping develop new and less invasive approaches, such as the endoscopic endonasal and transorbital approaches, to limit the impact of surgery for these challenging tumors.

Since 1975 the department has been noted as a source of innovation in brain tumor diagnosis and management. In 1981 the first dedicated CT scanner was installed in a unique operating room at UPMC Presbyterian to facilitate minimally invasive surgical techniques. Updated in 2009, this facility also serves a site to explore less invasive strategies for tumor removals such as endoport resection using guiding technologies coupled with endoscopic removal. Working hand in hand with our skull base program innovative combined strategies for tumor biopsy or removal followed by adjuvant radiosurgery, chemotherapy, or immunotherapy has offered new advances in patient care resulting in ever longer high-quality outcomes. Our pediatric program has also been enhanced by the opening of an intraoperative MRI suite, which facilitates the goal of achieving safer and more extensive resections in challenging childhood brain tumors.

Innovative imaging techniques are being developed and applied to better understand brain tumors and their structural relationship with surrounding white matter tracts. High-Definition Fiber Tractography (HDFT) provides a superior presurgical evaluation of the fiber tracts for patients with complex brain lesions, allowing us to reconstruct fiber tracts and design a less invasive trajectory into the target lesion. We are currently investigating its potential for not only presurgical planning and intraoperative navigation but also for neurostructural damage assessment, estimation of postsurgical neural pathway damage and recovery, and tracking of postsurgical changes, neuroplasticity, and responses to rehabilitation therapy. The ultimate goal is to facilitate brain function preservation and recovery in patients undergoing complex brain tumor surgery.
Magnetoencephalography (MEG) Research
The aim of MEG research, directed by Avniel Singh Ghuman, PhD, is to facilitate, develop, and advance clinical and basic neuroscience research using magnetoencephalography. To this end, Dr. Ghuman is helping to develop new research applications for MEG in collaboration with researchers throughout the community.

MEG is the most powerful functional neuroimaging technique for noninvasively recording magnetic fields generated by electrophysiological brain activity, providing millisecond temporal resolution and adequate spatial resolution of neural events.

MEG is currently being used to study the healthy brain—both in adults and during development—in order to understand the neural basis of cognitive processes, including reading, vision, audition, motor control, semantic memory, executive functioning, emotional processing, and working memory. Furthermore, groups in the community are also using MEG to understand how neural processing is disturbed in a host of pathologies, including TBI, schizophrenia, spinal cord injury, HIV-AIDS, epilepsy, autism spectrum disorders, Alzheimer’s disease, and Parkinson’s disease. The MEG currently supports both presurgical clinical services and seven major (R01 or equivalent) NIH grants.

Laboratory of Cognitive Neurodynamics
The Laboratory of Cognitive Neurodynamics, under the direction of Avniel Ghuman, PhD, studies how our brain turns what falls upon our eyes into the rich meaningful experience that we perceive in the world around us. Specifically, the goal of these studies is to examine the spatiotemporal dynamics of how neural activity reflects the stages of information processing and how information flows through brain networks responsible for visual perception. The lab is particularly interested in the dynamic neural representation of faces, bodies, objects, words, and social and affective visual images. This work by the Laboratory of Cognitive Neurodynamics is supported by a Biobehavioral Research Award for Innovative New Scientists from the National Institute of Mental Health and a brain initiative grant from the National Science Foundation.

Neuroapoptosis Research
The focus of the Neuroapoptosis Laboratory at the University of Pittsburgh Department of Neurological Surgery, under the direction of Robert Friedlander, MD, is the study of the basic mechanisms of apoptosis, as mediated by the caspase apoptotic family in neurologic diseases. In addition, discovering novel approaches to ameliorate the impact of cell death in a variety of neurological diseases is a central theme of the Neuroapoptosis Laboratory. The role of synaptic mitochondrial vulnerability, specifically as it relates to synaptic degeneration, has been a recent focus.

The lab is evaluating the impact of apoptotic cell death, and in particular, that mediated by the caspase cell death family on the pathogenesis of neurodegenerative diseases. Neurodegenerative diseases presently being investigated are Huntington’s Disease (HD), Alzheimer’s Disease (AD) and Amyotrophic Lateral Sclerosis (ALS). Given that ageing plays a role in all of these diseases, the impact of normal and pathological ageing is also being evaluated. Activation of the caspase cell death cascade appears to play an important role in a variety of neurodegenerative diseases. Researchers have demonstrated that inhibition of the Caspase-1 (also known as ICE) apoptotic gene slows the progression and delays mortality in transgenic mouse models of ALS and Huntington’s disease. Furthermore, delivering caspase inhibitors directly into the brain of these transgenic mice prolongs their survival. This was the first time that any intervention had been demonstrated efficacious in a HD model. Adding relevancy to these findings, researchers have also demonstrated that caspase-1 is activated in the brain and spinal cord of humans with HD
Research

Overview

and ALS respectively. They also have demonstrated that Minocycline demonstrates neuroprotection in a mouse model of HD.

Apoptotic cell death plays a significant role in stroke as well as traumatic brain and spinal cord injury. Researchers are evaluating the impact Caspase family activation has on apoptotic cell death in these conditions. The relation of the caspase family and free radical production is also being investigated as well as targeted caspase-mediated pharmacoprotection.

Using in vitro models, researchers are evaluating both the mechanisms involved in the activation of Caspases, as well as the post-Caspase activation pathways involved in cell death. The role of inflammatory pathways in neurodegeneration continues to be a focus of research. Researchers are also evaluating the basic mechanisms of cell death, and especially as they relate to neurologic diseases.

An additional recent focus of the Neuroapoptosis laboratory has been the demonstration that neuronal melatonin is synthesized exclusively in mitochondria. This has significantly altered the understanding of the biology of this important signaling molecule. Given that the laboratory first demonstrated that melatonin receptors are located on the mitochondrial outer membrane, this suggest melatonin is made in the mitochondrial where it is secreted and then binds to its high affinity receptor. This “automitocrine” pathways modulates mitochondrial stability and neuroprotection. We have also created a new mouse model where the rate limiting step of melatonin synthesis has been knocked out. This model has features of accelerated ageing and is an important tool in our ongoing studies.

Neurodegeneration Research

Robert Friedlander, MD, is investigating the neuropathology and mechanisms of neurodegeneration in adult-onset neurological diseases. Pre-clinical drug trials in mouse models of neurological disease act as a conduit of therapeutic agents for direct translation to human clinical trials in Huntington’s disease and amyotrophic lateral sclerosis patients. A major goal of current clinical research is to identify parallels in peripheral and central biomarker detection of disease and manifestations of neuronal dysfunction with translation to potential disease-modifying therapies that are being developed and evaluated in the clinical setting, especially in early stage disease. The goal is to create a data set of multiple markers that can be used with multivariate techniques to develop a unique biochemical signature relating to neurological diseases and to evaluate correlative biomarkers and biomarkers in response to therapy.

Fiber Tractography Laboratory

High-Definition Fiber Tractography (HDFT) is an advanced MRI-based non-invasive imaging technique used to study the intrinsic structure and connectivity of the living human brain, both in normal subjects and neurosurgery/neurology patients.

The Fiber Tractography Lab—under the current direction of Fang-Cheng (Frank) Yeh, MD, PhD—is focused on the application of HDFT for presurgical planning and intraoperative navigation to facilitate brain function preservation and improve resection rates in patients with complex brain lesions. Dr. Yeh’s work is also centered on studying the structure and connectivity of the fiber tracts forming the “normal” human brain, and their structural alteration in patients with brain tumors, vascular lesions, stroke, and neurodegenerative diseases. These are the main areas of research:

• Neuroanatomy of Fiber Tracts

Nearly two decades ago, Sir Francis Crick, neuroscientist, discoverer of the DNA molecule and 1962 Nobel Prize for Medicine, wrote: “to interpret the activity of living human brains,
their neuroanatomy must be known in detail. New techniques to do this are urgently needed, since most of the methods now used on monkeys cannot be used on humans.* Today, HDFT allows doctors and scientists to investigate the intrinsic structure of the brain with unprecedented detail, which will invariably facilitate a better understanding of brain functioning.

Studies in the Fiber Tractography Lab have contributed to elucidate the structure, connectivity, and potential functional role of the Middle Longitudinal Fascicle, Superior Longitudinal Fascicle and Arcuate Tract. We have also completed studies on the superior fronto-occipital fascicle, the claustro-cortical connections, and the dentate-rubro-thalamic tract.

Innovative studies using data from the Human Connectome Project are being completed to further elucidate the complex anatomy of the brainstem pathways, inferior longitudinal fascicle, and cingulum.

• Presurgical Assessment of Fiber Tracts and Surgical Planning
HDFT provides a superior presurgical evaluation of the fiber tracts for patients with complex brain lesions, including low grade and high grade gliomas. Presurgical studies are built upon precise and accurate neuroanatomical knowledge, which allows doctors to reconstruct perilesional or intraläsional fiber tracts, design the less invasive trajectory into the target lesion, and apply more effectively intraoperative electrical mapping techniques for maximal and safe tumor resection in eloquent cortical and subcortical regions.

Our clinical experience applying HDFT has been reported in *Neurosurgery, Journal of Neurosurgery,* and *Neuro-oncology* among others; we are actively investigating its potential for not only presurgical planning and intraoperative navigation but also for neurostructural damage assessment, estimation of postsurgical neural pathways damage and recovery, and tracking of postsurgical changes and responses to rehabilitation therapy.

The latest innovation in the lab is HDFT reconstruction of cranial nerves for presurgical evaluation in skull base surgery, with very promising results. The ultimate goal is to facilitate brain function preservation and recovery in patients undergoing complex brain surgery.

• Fiber Tract Integrity and Damage Progression in Neurodegenerative Disorders
Researchers are currently studying patients with ALS and Huntington Disease aiming to obtain quantifiable measures of white matter tract integrity that can be correlated with the speed of disease progression and with clinical measures. The ultimate goal is to find an accurate biomarker of the disease that can be monitored and serve as a reference for treatment response.

*Surgical Neuroanatomy Laboratory*

The Surgical Neuroanatomy Lab (SNL) has a dual educational and research role aiming to improve surgical techniques and outcomes by mastering knowledge of relevant surgical neuroanatomy. Under the joint direction of Paul Gardner, MD, and George Zenonos, MD, in the Department of Neurological Surgery, and Carl Snyderman, MD, MBA, and Eric Wang, MD, in the Department of Otolaryngology, the lab follows our clinical philosophies of teamwork and innovation.

Many national and international students, residents, and fellows have conducted training and research at the SNL during the last years. The working philosophy at the SNL is that of Albert L. Rhoton, Jr., MD, handed down from Juan Fernandez-Miranda, MD: meticulous and exquisite anatomical microdissections to better understand the intricacies of the complex anatomy of the human brain and skull base.
The lab has four main research/educational areas: endoscopic skull base anatomy, microsurgical neuroanatomy, new approach development, and white matter anatomy/brain connectivity/surgical planning.

• Endoscopic Skull Base Anatomy
The Endoscopic Endonasal Approach (EEA) has revolutionized skull base neurosurgery. The EEA has anatomical and technical advantages over open skull base approaches for the treatment of selected lesions. EEA is not minimally invasive but designed to be maximally effective for the treatment of a wide variety of ventral skull base lesions. The Surgical Neuroanatomy Laboratory at the University of Pittsburgh has pioneered anatomical work on the area of skull base endoscopy, and its goal is to continue providing landmark contributions to the skull base community. Meticulous knowledge of the ventral skull base anatomy as seen from the endoscopic perspective is critical to apply endonasal endoscopic surgery in an effective and safe manner.

• Microsurgical Neuroanatomy
Conventional skull base approaches are being compared with novel endoscopic endonasal approaches to aid in understanding indications and limitations of different but complementary skull base approaches. Contemporary skull base surgeons should combine expertise in open and endoscopic skull base approaches to select the most appropriate approach and technique for each particular case. Emphasis is made on the circumferential conceptualization of the skull base and the selection of “anatomically-favorable” surgical routes.

• New Approach Development
Following our philosophy of constant evaluation and innovation between the anatomy lab and the operating room, the SNL is used to develop and examine new approaches or expand known approaches to help define modern skull base surgery. Examples include the expansion of the lateral orbitotomy to the cavernous sinus and middle fossa and the development of the contralateral transmaxillary approach (CTM).

• White Matter Anatomy
Dissection of the white matter fiber tracts provides a unique insight into the complex intrinsic architecture of the brain and builds up an essential knowledge for operating on intraxial tumors. A unique feature of our white matter studies is the combination with advanced imaging techniques, such as High-Definition Fiber Tractography (HDFT), to facilitate greater understanding of brain connectivity “in-vivo” and in neurosurgery patients.

Brain Tumor Evolution & Therapy Lab
The Laboratory of Brain Tumor Evolution & Therapy, under the direction of Baoli Hu, PhD, is interested in the genetic and epigenetic events contributing to the evolution of brain tumors. The long-term goal of the lab is to achieve a better understanding of brain tumor biology and to develop more effective diagnoses and therapeutic strategies for the treatment of brain cancer.

Cancer is increasingly being viewed as an ecosystem where the cancer cells dynamically evolve and spatiotemporally communicate with surrounding cells and environmental factors. Deciphering this evolutionary complexity allows us to better understand brain tumor initiation, progression, recurrence, and drug resistance. The Brain Tumor Evolution & Therapy Lab is focusing on glioma and medulloblastoma, the most common malignant brain tumors in adults and children, respectively. Specific projects are as follows:
• Modeling the evolution and diversity of brain tumors using human-in-mouse system
Intratumor genetic heterogeneity and phenotypic diversity are the hallmarks of glioma and medulloblastoma, which predict the risk of tumor development, progression and response to treatment. To delineate crosstalk mechanisms of these factors, we have been developing human-in-mouse model systems based on malignant transformation of human neural/ce- realber stem cells driven by subtype-specific genetic/epigenetic alterations. These models can faithfully recapitulate the molecular diversity, cellular heterogeneity, and histology seen in patient tumors. In addition, these models enable precise system-level comparisons of prema- lignant and malignant states of these stem cells, which deepens our understanding of tumor evolutionary dynamics in the molecular and cellular level. The key regulators in this process are validated as diagnostic biomarkers and therapeutic targets for clinical application.

• Interrogating consequences of stem cells plasticity within brain tumor microenvironment
Emerging evidence suggests that glioma/medulloblastoma stem cells may contribute to tumor evolution and anti-therapy. We previously found that glioblastoma stem cells (GSCs) differentiate into endothelial-like cells (GdECs), which recruit host endothelial cells (ECs) to form an invasive niche, resulting in tumor invasiveness and recurrence. We are continu- ing our efforts to gain a better understanding of the molecular mechanisms of these cancer stem cells, and how they communicate with their surrounding cells (e.g. endothelial cells, microglia/macrophages, astrocytes, etc.), which allows us to develop novel and more effec- tive therapies by targeting critical components of the tumor microenvironment.

• Illuminating mechanisms governing cancer cells invasion and dissemination in brain
The major challenge in the clinical management of glioblastoma is that cancer cells exten- sively infiltrate into the surrounding tissue, leading to nearly universal recurrence. Group 3 medulloblastoma is characterized by frequent metastasis at diagnosis and the worst prog- nosis among all the subgroups. We aim to elucidate molecular mechanisms of de novo invasion and treatment-induced invasion (e.g. TMZ, bevacizumab, etc.), which enables us to identify “drivers” mediating cancer cells invasion and to dissemination and to aid in the development of new therapies.

Brain Tumor Biology and Therapy Laboratory
The Brain Tumor Biology and Therapy Laboratory, under the direction of Sameer Agnihotri, PhD, studies pediatric and adult high-grade gliomas (HGG) and diffuse intrinsic pontine gliomas (DIPG). The lab has a focus on several topics:

• It is now appreciated that HGG glioma comprises of several molecular subgroups and that the genetics of pediatric and adult HGG are distinct. Therefore a “one size that fits all” approach to therapy will not be successful. The Agnihotri Laboratory interests include using next-generation sequencing technology to identify and validate driver alterations of various HGG with a focus on DIPG and non-histone mutated “RTK” Glioblastoma (GBM).

• A defining hallmark of glioblastoma and DIPG is altered tumor metabolism. The metabolic shift towards aerobic glycolysis with reprogramming of mitochondrial oxidative phosphorylation, regardless of oxygen availability, is a phenomenon known as the Warburg effect. In addition to the Warburg effect, glioblastoma tumor cells also utilize the tricarbox- ylic acid cycle/oxidative phosphorylation in a different capacity than normal tissue. The Agnihotri Laboratory investigates the metabolic dependencies of brain tumors and if they can provide therapeutic vulnerabilities.

• The lab uses the genomic and metabolic information to build better representative brain tumor pre-clinical models for testing of novel therapies. Working closely with a clinical team use of these accurate models are essential to start early phase clinical trials.
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**Pediatric Neurosurgery ImmunoOncology Laboratory**
The Pediatric Neurosurgery ImmunoOncology Laboratory (PNIO) at the University of Pittsburgh, under the direction of Gary Kohanbash, PhD, seeks to develop novel immuno-oncology approaches to treat deadly pediatric central nervous system tumors. With over a decade of experience in translational brain tumor immunology and involvement in numerous clinical trials, the laboratory has a specific focus on high-grade and low-grade gliomas, and ependymomas.

It is now known that immune cells can traffic into the central nervous system (CNS) and mediate anti-tumor responses. However, owing to its immune-privileged status and delicate brain structures, safety and efficacy must be considered in a different manner than tumors occurring outside of the CNS. With significant developments in next-generation sequencing, novel targets targeting pediatric CNS tumors are being identified.

The PNIO seeks to bridge the gaps between bioinformatics, preclinical studies, and patient care. Specific emphasis in the PNIO involve improving peptide vaccine immunotherapy through the following projects:

- Identification of novel targetable tumor antigens and neoantigens.
- Employing combination therapies using checkpoint inhibitors such as anti-PD1 and anti-TIGIT with peptide vaccine immunotherapy.
- Understanding how tumor genetics create a hostile environment for T-cell responses at the tumor site.
- Enhancing expression of molecules that make the tumor visible to the immune system.
- Non-invasive immunoPET of activated T-cells and Tumor-Associate Myeloid Cells (TAMCs) during IO therapy.
- Identification of biomarkers for CNS IO clinical trials.
- Single-cell RNA-sequencing to identify immune-cell and tumor cross-talk.

**Sen Brain Trauma Laboratory**
The focus of the Sen Brain Trauma Laboratory, directed by Nilkantha Sen, PhD, at the University of Pittsburgh Department of Neurological Surgery is to elucidate the underlying molecular and cellular mechanisms responsible for numerous secondary mechanisms associated with traumatic brain injury (TBI) which leads to cognitive dysfunction and other long-term post-traumatic disorders including anxiety, depression and visual impairments. Our study provides a novel platform to design more effective therapeutic interventions to improve neurobehavioral outcomes following TBI.

Traumatic brain injury (TBI) is one of the leading cause of morbidity and mortality in humans and it affects more than 1.7 million Americans each year. The economic burden of taking care of TBI-patients exceeds more than 78 billion in 2014. The most serious aspect of TBI is that of cognitive impairment as evidenced by animal and clinical studies focusing on synaptic plasticity and memory. In addition, depression and anxiety-like behavior are a common problem after TBI, with a recent study in one cohort of TBI patients finding that 53.1% had at least one episode of major depressive disorder in the year following injury. The enduring neurobehavioral deficits resulted from several factors including the mitochondrial dysfunction, lack of neurotrophic factors, impairment in neurogenesis, axonal myelination, and the deficiency in synaptic pruning after TBI.

Recent findings suggest that an inactivation of a key protein kinase Akt is responsible for cell death and an activation of a transcription factor, Foxo3a causes an induction of AQP4 which contributes to edema following TBI. In another effort, research has shown that administra-
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tion of an HIF1α activator, DMOG regulates angiogenesis and provides neuroprotection following TBI. An induction of ER stress and oxidative stress is known to contribute memory impairment following TBI. However, the mechanism was not elucidated before. Research at the Sen Lab has shown that phosphorylation of an ER stress marker, PERK inactivates transcriptional activity of CREB and degrades PSD95 that results in a reduction in synaptic density and memory impairment. These studies provide a new insight into understanding a few aspects of TBI; however, the Sen Lab continues to study the underlying mechanisms responsible for other secondary mechanisms following TBI. In particular, the Sen Lab is in the process of identifying the central mechanism which can regulate multiple factors which contribute significantly long-term outcomes following TBI.

In addition to these efforts, the laboratory has been studying the role of gaseous neurotransmitters such as hydrogen sulfide (H2S) and nitric oxide (NO) in the pathology associated with brain injury or neurodegeneration. Recently, research has shown that an aberrant nitrosylation of GAPDH protein contributes to tauopathy while sulfhydration of the same protein contributes to the synaptic dysfunction upon an induction of inflammation in the diseased brain. Since both nitrosylation and sulfhydration of GAPDH can be targeted by a small compound CGP3466B, we are in the process of testing this compound in a large scale.

National TBI Biospecimens Repository

A national repository of biological samples from patients who have sustained traumatic brain injuries (TBIs) has been established in the Department of Neurological Surgery at the University of Pittsburgh. This biorepository supports the Transforming Research and Clinical Knowledge in Traumatic Brain Injury (TRACK-TBI) study, a multi-center initiative funded by the National Institutes of Health (NIH) that is intended to revolutionize clinical care for brain-injured patients. A central goal of the TRACK-TBI biorepository is to identify blood-based biomarkers that can assist hospital-based clinicians in diagnosing TBIs and allow industry partners in the laboratory to identify new, effective treatments. Three thousand participants who have sustained a TBI are being recruited into the TRACK-TBI study, and a large, high-quality database of clinical, imaging, biomarker, and outcome data is being generated.

In collaboration with the TRACK-TBI coordinating center at the University of California San Francisco (led by Geoff Manley, MD) and our 17 U.S. partner sites, David Okonkwo, MD, PhD, and Ava Puccio, RN, PhD, at the University of Pittsburgh received a large supplemental award from the U.S. Department of Defense to establish the TRACK-TBI biorepository. Following laboratory renovations and certification in February 2016, the Department of Neurological Surgery at the University of Pittsburgh became the official new home of the TRACK-TBI biospecimens repository.

The TRACK-TBI biorepository is already the largest centralized collection of biological samples from TBI patients in the US. For a complex disorder like TBI, which has global incidence but lacks definitive clinical classification for diagnosis and therapy, multicenter collaboration is key for progress in research. Only with large numbers of patients and samples will researchers be able to address the many variations of TBIs. Similar to other disease processes, such as cardiovascular disease and cancer, diagnoses must be matched with a biomarker of injury and genetic markers for treatment directives.

• “Front-Runner” Biomarkers for Diagnoses

The partnership with the TRACK-TBI effort has already borne fruit, with an early indication from the pilot work on a biomarker of interest, glial fibrillary acidic protein (GFAP), a brain-specific protein released into serum as a pathophysiological response to TBI. Based on the initial TRACK-TBI sample set (215 patients), the measurement of GFAP in blood has been
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shown to be effective in identifying patients with a high likelihood of having abnormal pathology seen on a CT scan, and was recently approved by the FDA for clinical use in identifying patients unlikely to have lesions on head CT when measured in serum in the acute phase after injury. Other biomarkers of interest, now undergoing further study, include ubiquitin C-terminal hydrolase L1 (UCHL-1) and neuroinflammatory markers.

Through the support of the NIH and the Department of Defense, and in partnership with the national TRACK-TBI study, investigators at the University of Pittsburgh Department of Neurological Surgery are generating an international resource statistically powered to validate new, clinically relevant TBI biomarkers.

Cerebral Aneurysm Research Lab
Cerebral aneurysms are common vascular lesions seen in up to five percent of the population, that, when ruptured, can lead to catastrophic consequences with up to 50 percent mortality and morbidity. The cerebral aneurysm research lab aims to further the understanding of molecular pathways underlying cerebral aneurysm formation in order to induce repair and prevent rupture. Current research efforts are directed by resident Kamil W. Nowicki, MD, PhD, under the joint mentorship of Robert M. Friedlander, MD, and Bradley Gross, MD. Techniques and models used in the lab depend heavily on molecular cell biology, animal surgeries and biomedical engineering to study immune cell behavior in response to chemokines and their interactions with hemodynamic shear stress. Current projects include:

• Role of Platelets in Cerebral Aneurysm Formation and Healing
This project is actively exploring the role of platelets and inflammatory cytokines released by platelets in cerebral aneurysm formation. Current efforts are directed on using small molecule inhibitors in preventing aneurysm formation. This work resulted in a patent application PittID-05390 “Small molecule inhibitor therapy targeting platelet-CXCL7-CXCR1/2 axis to prevent aneurysm formation, growth, or rupture.

• Role of Hemodynamic Shear Stress in Cerebral Aneurysm Formation
This study utilizes a novel in vitro model that simulates flow conditions within human aneurysms to induce inflammation and secretory chemokine response. In previous work, the authors showed that hemodynamic shear stress induces aneurysm formation via interleukin-8 and CXCL-1 mediated neutrophil inflammatory response. That work resulted in a patent application UFTINV-200015 T17844 “Drug therapy to prevent formation or enlargement or rupture of aneurysms.” In a follow-up paper, they were able to show that this inflammatory response results in M1/M2 macrophage imbalance, driving aneurysm formation.

• Biomarker Discovery and Platform Development
Future study will focus on biomarker discovery to arrive at a blood test for cerebral aneurysm formation.

• Novel Endovascular Therapeutic Agents
New ongoing collaboration with Seungil Kim, PhD, and William Wagner, PhD, from the University of Pittsburgh Department of Biomedical Engineering that is moving from in vitro to in vivo phase. This project is exploring novel pH-responsive embolic agents for endovascular treatment of cerebral aneurysms.

Spinal Cord Stimulation Laboratory
The Spinal Cord Stimulation Laboratory, under the direction of Marco Capogrosso, PhD, broadly studies the interactions between electrical stimulation and the dynamics of spinal circuits. Specifically, laboratory activities are focused on three areas of interest.
• **Area 1:** The development of computational models to support the design of effective neurotechnologies for the restoration of sensory and motor function after neural damage or disease. We use computational neuroscience tools, Finite Element Methods and deep learning strategies to decipher the computational principles underlying the interaction of artificial electrical stimulation with spinal circuits. Specifically, we aim to design artificial inputs to spinal circuits to restore sensorimotor functions in sensori-motor disorders.

• **Area 2:** Electrophysiology of spinal circuits and mechanisms of neuromodulation. What is neuromodulation and how it is affecting the structure and dynamics of the nervous system? We perform electrophysiology in animal models such as rats and monkeys to understand how the spinal cord and the brain reacts to electrical stimulation. We aim to combine results from computer models to experimental data for the design of novel neurostimulation technologies.

• **Area 3:** Clinical applications of spinal cord stimulation. We apply the results of computational and animal studies in translational clinical trials in patients that suffer from motor disorders such as stroke and spinal cord injury. Specifically, we aim to test new implantable technologies to improve motor and sensory functions in people with arm paralysis.

**Cortical Systems Laboratory**
The Cortical Systems Lab, under the direction of Jorge A. Gonzalez-Martinez, MD, PhD, is a neuroscience laboratory studying brain electrophysiology, cognition and language in patients undergoing epilepsy and movement disorder surgery. The main goal of our work is to better understand the neurophysiology of cortical systems in human subjects who undergo stereo-electroencephalograph (SEEG) or deep brain stimulation. Our ultimate goal is to develop new methods for brain mapping and therapeutic options for patients with medically refractory epilepsy, including neuromodulatory/resective procedures and the understanding of the neural mechanisms related to the organization of seizures, language and cognitive functions. The laboratory is highly integrated with the University of Pittsburgh Epilepsy Center and the Carnegie Mellon University Department of Biomedical Engineering.

• **Epilepsy Monitoring Unit (EMU)**
The laboratory clinical arm is the epilepsy monitoring unit, part of the University of Pittsburgh Epilepsy Center. The epilepsy center at the University of Pittsburgh is one of the leading epilepsy surgery programs in the world, with more than 5,000 adult patient-visit annually. The program offers the opportunity for comprehensive evaluation in a self-contained, eight-bed, adult epilepsy monitoring unit (EMU). The EMU features the latest technology including state-of-the-art, all digital video EEG equipment in private rooms. Operating around the clock, seven days a week, the unit is staffed by a dedicated team of nurses and EEG technologists specializing in epilepsy and overseen by staff epileptologists. The unit is part of the Comprehensive Epilepsy Center, a multi-disciplinary group of neurosurgeons, neurologists neuroradiologist, neuropsychologist, nurses, residents and fellows who coordinate the care and research related topics for patients with medically refractory epilepsy. Patient Management Conference Meetings (PMCs) are performed weekly, on Mondays, where all aspects of patient care are discussed in an academic and teaching environment. Approximately 50 to 60 invasive monitoring procedures (SEEG) are performed per year in our center.

**Molecular Tumor Biology and Personalized Precision Therapy Lab**
The Molecular Tumor Biology and Personalized Precision Therapy Lab, under the direction of Pascal Zinn, MD, PhD, focuses on patient-centered care for brain and spinal tumors. Every patient is unique and so is every tumor; therefore, a personalized precision approach is fundamental to the treatment of tumors. Utilizing humanoid brain disease avatars or so-
called brain organoid models, Dr. Zinn replicates the patient’s condition in the laboratory and thus studies how tumors form and how tumors can be treated using tumor genetics precision approaches. Furthermore, Dr. Zinn is developing personalized biologically-adaptable and patient-tailored, virus-based therapies for brain cancer.
Investigator Research Summaries

**Hussam Abou-Al-Shaar, MD**  
*PGY-2 Resident*

Dr. Abou-Al-Shaar, along with the skull base team, is looking at the outcomes of patients who underwent endoscopic endonasal surgery for prolactinomas, chordomas, among other diseases. Additionally, they are investigating the role of combined transcranial and endoscopic endonasal approaches for various skull base lesions to determine their efficacy and limitations.

**Ali Alattar, MD**  
*PGY-1 Resident*

- **Glioblastoma Database**  
  Dr. Alattar is a contributor to a large database of glioblastoma patients from UPMC over the past several years. The investigators are collecting demographic, clinical, genomic, and radiographic information on these patients with the goal of summarizing UPMC’s experience with resection of glioblastomas. Dr. Alattar is spearheading the effort to create a remotely accessed server for storage, access, and semi-automated segmentation and analysis of radiographic images of glioblastoma patients. The aim of this project will be to correlate quantitative radiographic parameters with genetic signatures, extent of resection, progression, and survival.

- **Esthesioneuroblastoma**  
  Dr. Alattar is studying the population of patients with esthesioneuroblastoma who received expanded endonasal resection of their tumors. The aim of this study is to describe this population of patients, how they were treated, and how treatment patterns have changed over the lifetime of skull base neurosurgery at UPMC.

- **Craniopharyngioma**  
  In the craniopharyngioma project, Dr. Alattar is the main statistical analyst in a study investigating the relationship between residual and recurrence of craniopharyngioma’s resected by EEA at UPMC.

- **Gyrification**  
  Dr. Alattar is studying the mechanism of formation of large-scale folds in the brain such as the Sylvian fissure and contrasting this mechanism of formation to our current understanding of the mechanism of formation of small folds. A high-definition atlas of fetal MRIs is used to demonstrate differential growth in volume and surface area of various lobes of the brain and correlate our findings with underlying patterns of genetic expression.

**Hanna Algattas, MD**  
*PGY-4 Resident*

Dr. Algattas’ recent research interests and projects include evaluating the role for the endoscopic endonasal approach in resection of craniopharyngiomas with intraventricular extension and two IRB-based protocols. His IRB study focuses on evaluating the role of a heart rate variability monitor (i.e. Apollo Biostrap) on performance and stress management of neurosurgery residents and the second evaluates the impact of COVID-19 sanctioned restrictions on the neurotrauma presentations in the Pittsburgh metropolitan area and the impact on health care delivery.
Katherine M. Anetakis, MD  
Assistant Professor

Dr. Anetakis is currently focusing on the concept of “Last Electrically Well,” using changes in intraoperative neurophysiology data that are consistent with large vessel occlusions to expedite imaging and treatment, with an eventual goal of creating a unique stroke code algorithm to optimize stroke outcomes in post-operative patients.

Marco Capogrosso, PhD  
Assistant Professor  
Director, Spinal Cord Stimulation Laboratory

- **Project 1: Spinal Cord Stimulation for the Recovery of Motor Function**  
Dr. Capogrosso obtained IRB approval to start a clinical trial in people with arm and hand paralysis in consequence of severe sub-cortical stroke. He will initiate patient recruitment for this trial as soon as situation with COVID-19 allows it. In this trial he will implant human subjects with spinal cord leads in the cervical spine. He will test the ability of electrical stimulation of the human cervical spinal cord to recruit arm and hand muscles selectively and enable the production of functional arm movements in people with arm paralysis.

- **Project 2: Effects of Electrical Stimulation on the Neural Function of Spinal Circuits**  
Dr. Capogrosso obtained agreement from the DLAR to access space for performing acute electrophysiology experiments in nonhuman primates. These experiments aim at testing how electrical stimulation of the spinal cord and peripheral nerve can be used to direct neural activity in the sensorimotor circuits in the spinal cord. Specifically, he aims to verify with intra-spinal and intra-cortical recordings, that spinal cord stimulation can influence the activity of spinal interneurons and motoneurons without affecting normal circuit function.

- **Project 3: Computer Models of Spinal Cord Stimulation**  
Dr. Capogrosso is coupling deep learning methodologies with realistic modelling of spinal circuits to build computational models of the spinal circuits. He aims at developing a framework that can predict the effects of stimulation parameters on the ability to execute arm and hand movements with spinal cord stimulation after paralysis with computer simulations. Such environment would allow to minimize the use of animals in research as well as speedup transition to clinical trials of experimental technologies. He will validate models with experiments performed in project 2 above.

Diane L. Carlisle, PhD  
Assistant Professor

In the past year, Dr. Carlisle used patient-specific induced pluripotent stem cells (iPSCs) to investigate mitochondrial function of neural progenitors and neurons from sporadic and familial ALS patients as well as from Huntington’s Disease patients. She differentiated iPSCs into neural progenitors and mature neurons and isolated mitochondria for analysis. Dr. Carlisle found proteomic and functional differences between neurons and controls from neurodegenerative disease patients.
**Research**  
*Investigator Research Summaries*

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**Donald J. Crammond, PhD**  
Associate Professor  
Associate Director, Movement Disorder Surgery

Dr. Crammond's major clinical research interest is the study of basal ganglia and cerebral cortical interactions related to the control of movement in movement disorders including Parkinson’s disease, Dystonia and Essential Tremor. This is accomplished by recording neurephysiological data from micro-electrode single-unit (MER) and local field potential (LFP) recordings in the basal ganglia simultaneously with Electrocorticography (ECoG) and LFP from sensorimotor cortex, to examine the physiological relationship between basal ganglia and cortical structures. This research examines how these cortical and subcortical neural structures are involved in different aspects of movement planning and movement execution by having human subjects perform various controlled behavioral tasks. Currently, a speech task is being utilized to study the novel aspects of speech and language representations in the human basal ganglia. As we understand more about basal ganglia physiology and cortical-basal ganglia interactions, we hope this will also help us to improve the targeting for optimal DBS placement within the basal ganglia to treat movement disorder patients and to eventually decrease the incidence of post-operative speech deficits. Dr. Crammond is a co-investigator for a NINDS/UO1 funded research project investigating the role of the basal ganglia as well as basal ganglia and sensorimotor cortex interactions in various aspects of language coding and speech production.

Dr. Crammond’s ongoing clinical research interest is to review clinical outcome data to determine the impact of various modalities of intra-operative neurophysiological monitoring (IONM) to prevent and/or reduce iatrogenic injury and to use neurophysiological mapping of the basal ganglia and cerebral cortex to map motor and language functions in various neurosurgical procedures in awake patients. For example, to map and locate eloquent cortical areas in tumor resection and in epilepsy surgeries.

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**C. Edward Dixon, PhD**  
Neurotrauma Chair Professor  
Vice Chair, Research  
Director, Brain Trauma Research Center

Dr. Dixon directs the Department of Neurological Surgery’s Brain Trauma Research Center (BTRC) at the University of Pittsburgh. The BTRC is a multidisciplinary, multid部artmental research program aimed at improving outcome following severe traumatic brain injury. Research conducted both at the center and at other brain injury research programs clearly demonstrates the potential for improving outcomes using therapies designed to treat biochemical derangements that occur following impact to the brain. In order to identify the most critical of these sequelae of brain injury and to find newer therapies that are effective in treating them, the BTRC has established several basic science head injury laboratories and clinical research projects. A new area of research is the application of diffusion MRI tractography and network analysis to determine the effects of single or repetitive concussions and simulated blast (shock tube) exposures on the integrity of dopaminergic pathways. The role of presynaptic SNARE proteins is being studied as a novel mechanism of neurotransmission deficits after experimental traumatic brain injury. In collaboration with investigators in the University of Pittsburgh Department of Neurology, the effects of enriched environment therapy in a transgenic mouse model of Alzheimer’s disease are being studied.
Dr. Gardner’s recent projects include refinement of a molecular prognostication panel evaluation for clival chordoma. Ninety-two tumors were evaluated for genetic alterations using FISH, LOH and IHC studies. The panel, developed along with Georgios Zenonos, MD, was refined using a multivariate analysis and a resultant, proposed division of tumors with clinical management pathways was recently published. This panel is being applied prospectively as part of a study incorporating it into regular clinical practice. This panel is also being investigated for use by the Chordoma Foundation to identify patients with aggressive, poor prognosis tumors who would be candidates for early chemotherapy trials.

Dr. Gardner continues evaluation of clinical cohorts of patients with skull base tumors to show impact and outcomes of treatment, largely endoscopic endonasal surgery.

Dr. Gardner also has a continued role as investigator for Peripheral Nerve Matrix (PNM), an extracellular matrix-derived product for nerve repair. The company (Renerva) formed about this product is working toward both large animal and clinical studies which will attempt to bring the product closer to FDA approval.

Dr. Gardner has also entered into a multi-institutional study with the University of Minnesota to further study the genetic and epigenetic makeup of chordomas and chondrosarcomas. These efforts will dramatically further the pathway toward personalized treatment of these and other rare tumors.

Dr. Gerszten continues to investigate the expanding role of radiosurgery for the treatment of both malignant as well as benign tumors of the spine. Ongoing research includes the incorporation of spine radiosurgery into minimally invasive and percutaneous spine procedures. Dr. Gerszten successfully developed and performed the first ever use of radiosurgery as an ablative tool for extracranial targets in an animal model. This study allowed for the evaluation of the clinical and histopathological effects of high dose radiosurgery on the rat dorsal root ganglion. The goal of these investigations is to evaluate the use of radiosurgery as a viable treatment option for neuromodulation of pain of spinal origin. This year, Dr. Gerszten continued his translational research investigations into the use of radiosurgery for extracranial neuromodulation. Studies were performed that included the development of more comprehensive techniques to safely and accurately deliver high dose radiosurgery to the dorsal root ganglion in animal models. Work was carried out in order to determine if lower doses could be equally as effective in modulating spinal pain generators.

Dr. Gerszten’s clinical research focuses on the adoption of minimally invasive surgical treatments for disorders of the spine. Such minimally invasive techniques allow for decreased morbidity while improving outcomes in neurosurgical patients. Dr. Gerszten continues to expand and systematically analyze the clinical outcomes and safety profiles associated with the use of new spinal implant devices. This includes the expanding indications for percuta-
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Investigator Research Summaries

Neuros cement augmentation procedures. Other clinical research has documented the safety and efficacy of minimally invasive sacroiliac joint fusions using titanium screw implants for sacroiliac joint dysfunction.

Avniel Singh Ghuman, PhD
Associate Professor
Director, Cognitive Neurodynamics Lab

Over the past year, the Dr. Ghuman’s lab has made a number of new and ongoing discoveries. Using intracranial recordings in epilepsy patients, the lab has found a novel, dynamic model for how information is represented in the brain, providing a potential solution for an important enduring neuroscientific debate. In addition, the lab has made substantial progress in understanding how faces are processed in the real world, recording neural activity while patients go about their day and have conversations with their friends and family. Summaries of these projects follow.

An enduring neuroscientific debate concerns the extent to which neural representation is restricted to networks of patches specialized for particular domains of perceptual input, or distributed outside of these patches to broad areas of cortex as well. A critical level for this debate is the localization of the neural representation of the identity of individual images, such as individual-level face or written word recognition. To address this debate, intracranial recordings from 489 electrodes throughout ventral temporal cortex across 17 human subjects were used to assess the spatiotemporal dynamics of individual word and face processing within and outside cortical patches strongly selective for these categories of visual information. Individual faces and words were first represented primarily only in strongly selective patches and then represented in both strongly and weakly selective areas approximately 200 milliseconds later. Both strongly and weakly selective areas contributed non-redundant information to the representation of individual images. These results can reconcile previous results endorsing disparate poles of the domain specificity debate by highlighting the temporally segregated contributions of different functionally defined cortical areas to individual level representations. Taken together, this work supports a dynamic model of neural representation characterized by successive domain-specific and distributed processing stages.

Using machine learning and AI to analyze multiple hours of neural recordings while epilepsy patients have natural, real world conversations with their friends and family, Dr. Ghuman’s lab has been able to decode who subjects are looking at, reconstruct the faces of the people they are looking at, and even predict who they will look at next. Efforts are ongoing to understand what aspects of brain activity code for these different kinds of information about real world social interactions. These initial successes suggest that the lab will be successful in developing novel paradigms and computational frameworks to address a profound question that has not been properly studied – what is the neural basis of real world social interactions?

Stephanie Greene, MD
Associate Professor
Director of Vascular Neurosurgery, UPMC Children’s Hospital of Pittsburgh
Director of Perinatal Neurosurgery, UPMC Children’s Hospital of Pittsburgh

Dr. Greene is involved in several moyamoya studies including one identifying a noninvasive, radiation-free method of quantifying vascular reserve and a patient’s risk of stroke, both pre- and post-operatively. Another study seeks to standardize the anesthetic management of these patients to minimize their perioperative stroke risk. Large series of patients with cav-
ernous malformations and Chiari I malformation are being analyzed in preparation for publication. The outcomes of myelomeningocele patients with regard to shunt infection, shunt malfunction, and tethered cord syndrome are being described in separate publications. A study analyzing the outcomes of breech presentation in myelomeningocele is in progress. A study aiming to identify shunt malfunction in patients with slit ventricle syndrome continues to enroll patients. Several manuscripts describing the outcomes of standard post-natal treatment of congenital isolated aqueductal stenosis are nearing completion. Fetal surgery for isolated aqueductal stenosis is progressing toward humanitarian use: the shunt design has been patented, and initial studies are nearly complete.

Jorge A. Gonzalez-Martinez, MD
Professor of Neurological Surgery
Director, Epilepsy & Movement Disorders Program, Department of Neurological Surgery
Co-Director, Epilepsy Center at University of Pittsburgh
Director, Cortical Systems Laboratory at University of Pittsburgh Medical School

• Developing a Network-Based Approach for Medically and Surgically Intractable Epilepsy. (This research project is a collaboration between Aix-Marseille University and the University of Pittsburgh)

Medically refractory epilepsy (MRE) is a devastating disease affecting around 50 million people worldwide. In MRE patients, surgery is a feasible and hopeful alternative for seizure freedom. Seizure freedom is achieved through complete resection or ablation of the Epileptogenic Zone (EZ). The localization and anatomical extent of the EZ are essential for surgical success and frequently invasive monitoring (IM) is necessary. Stereo-encephalography (SEEG) is a presurgical IM method that directly records local field potentials with accurate anatomical precision in brain areas that are suspected of being involved in the EZ. Measuring time and space characteristics of the discharges from multiple areas gives access to the EZ organization. The usual tools used in signal processing reach their limits where large-scale network architecture is at stake, making the distinction between the EZ (essential for seizure organization) and propagation zone (PZ – part of the epileptic network but not essential for seizure organization) a difficult task. Mechanistic computational models offer a means to establish causality of etiopathogenic pathways and can be used to systematically explore, map and simulate the precise localization and extent of the EZ and, ultimately, guide successful surgeries. Computational models offer the possibility of simulating such complex electrical dynamics and generating plausible time and space series. By comparing in silico with in vivo SEEG signals and their functional connectivity, we will achieve direct predictions of the precise extent of the EZ and anticipate seizure outcome after surgical interventions. Dr. Gonzalez-Martinez hypothesize that large-scale epileptic network disorders can be mathematically modeled using a network-based computational approach and precise and successful surgical interventions can be simulated. The combination of SEEG methodology with novel computational methods of brain network modeling provides the opportunity to safely and successfully identify the differences between the epileptogenic and propagation networks, departing from the current methods of diagnosis and treatment. Dr. Gonzalez-Martinez’s overarching goal is to develop an effective and computational network-based method that will guide safer and more efficient surgeries by more precise and individualized predictions the extent of the EZs. He will base the method on established clinical/electrophysiological biomarkers of epileptogenic network activity extracted from non-invasive data and intracerebral recordings, and surgical simulations by in silico focal subtractions of cortical areas within the mapped network. Preliminary data show promising results and a grant application resubmission is in process.
Joseph Scott Hudson, MD
PGY-2 Resident

Dr. Hudson’s research over the past year revolved around the neurosurgical management of cerebrovascular disease. He has coauthored peer reviewed articles both comparing existing methods intracranial aneurysm imaging, as well as describing a novel MRI based screening tool to detect unstable aneurysms at risk of rupture. He has coauthored several peer reviewed articles pertaining to the endovascular management of extracranial and intracranial atherosclerotic disease. In addition, Dr. Hudson has leveraged UPMC’s robust clinical volume to study endovascular thrombectomy outcomes as well as the effectiveness of a newly developed clot aspiration catheter. Finally, he has articles in press regarding advancements in endovascular technique for treating difficult intracranial aneurysms. Dr. Hudson remains interested in the molecular pathogenesis of intracranial aneurysms. He is currently utilizing the combined experience of the department’s cerebrovascular surgeons to ask if non invasive molecularly targeted medicines may help control the formation and rupture tendency of intracranial aneurysms.

Esther Jane, PhD
Research Assistant Professor

Aurora kinases are key regulators of cell mitosis and have been implicated in the process of tumorigenesis. In recent years, the Aurora kinases have attracted much interest as promising targets for cancer treatment. High expression levels of Aurora A and Aurora B were significantly associated with advanced tumor stage and poor patient survival in brain tumor patients. Inhibition of Aurora kinase activity with the drug VX680 (also referred to as MK-0457) inhibited cell growth in vitro and led to cell accumulation in the G2/M phase. Dr. Jane’s findings suggest that VX680 inhibits the growth of glioma cells by targeting the proliferation of tumor cells. Aurora kinases and their downstream cell cycle proteins have an important role and may be potent prognostic markers and therapy targets for this disease.

Adam S. Kanter, MD
Associate Professor
Chief, UPMC Presbyterian Spine Service
Director, Minimally Invasive Spine Program
Co-Director, Spine Fellowship Program

• Cervical Spondylotic Myelopathy Surgical Trial (CSM-S Trial)
The study aims to determine differences in clinical, radiographic, and economic outcomes comparing anterior versus posterior spinal procedures.

• Spinal Laminectomy versus Instrumental Pedicle Screw (SLIP II)
The goal of the study is to determine the comparative effectiveness of decompression alone versus decompression and fusion for patients with degenerative grade I spondylolisthesis and symptomatic lumbar spinal stenosis. Supported by the Lahey Clinic, Inc. via Alan L. and Jacqueline B. Stuart Spine Research Center.

• A Prospective Multicenter Study Evaluating the Clinical and Radiographic Outcomes of Thoracolumbar Spine Surgery When Comprehensive Sagittal Alignment Surgical Planning is Used
The objective of this study is to validate the utility and effectiveness of comprehensive surgical planning in restoring and preserving sagittal alignment through the collection of clinical and radiographic outcomes. Supported by NuVasive, Inc.
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• NIH Adjacent Segment Mechanics in Cervical Arthrodesis Patients
This study aims to determine to what extent patient-specific factors, iatrogenic factors, and biomechanical factors influence cervical spine mechanics after single-level and two-level arthrodesis.

Gary Kohanbash, PhD
Assistant Professor
Director, PNIO Laboratory

Over the past year, Dr. Kohanbash’s Pediatric Neurosurgery ImmunoOncology Laboratory has focused on three primary areas:

• Non-Invasive Molecular Imaging Strategies to Monitor Immunotherapy
Dr. Kohanbash’s NIH-funded work on imaging myeloid cells, which are believed to block immunotherapy from being effective against brain tumors, was published in *Molecular Imaging and Biology*. He hopes this work will lay a foundation for better patient stratification and monitoring of patients on specific immunotherapies.

• Development of T-Cell-Based Therapies for Pediatric Brain Tumors
With funding from the Brain Tumor Funders’ Collaborative (BTFC), Dr. Kohanbash has generated new data this year, using cutting edge single-cell RNAseq. This data will be used for identifying T-cell receptors which may be used as a therapy for pediatric high-grade gliomas and DIPG. This work is an extension and advancement of the department of Neurological Surgery's long-standing vaccine trials for brain tumor patients.

• Large-Scale Immune-Tanscriptomic Analysis of Pediatric Brain Tumors
In partnership with the Childhood Brain Tumor Tissue Consortium (CBTTC) Dr. Kohanbash has received RNAseq data from one of the largest cohorts of pediatric brain tumor samples ever collected. He has begun analyzing this data and has purchased a new data processing server to allow for robust transcript-based analysis of the immune system across pediatric brain tumors.

Michael J. Lang, MD
Assistant Professor

Dr. Lang’s current research efforts focus on clinical outcomes research in endovascular and microvascular treatment of cerebrovascular disease. In particular, he has established in the past year a multidisciplinary cerebral revascularization team for evaluation and treatment of moyamoya disease and intracranial occlusive ischemic disease. Following from this clinical effort, is the establishment of a longitudinal research effort to assess radiographic and clinical measures associated with these disease processes, including comparative analyses of CT Perfusion and SPECT imaging.

Daniela Leronni, PhD
Research Instructor

The goal of Dr. Leronni’s research is to identify targets for gene therapy of neurodegenerative diseases, such as HD and ALS. She continues to study the protective role of the hormone melatonin in the brain and the receptor-mediated mechanisms triggered by melatonin in neurons. In fact, melatonin has two well-known receptors (MT1 and MT2), classically characterized as cell surface receptors. Recently the receptor MT1 was identified on the mitochondria outer membrane by Dr. Robert Friedlander’s research group. Dr. Leronni, as a
Research
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member of Dr. Friedlander research group, continues to study the different mechanisms at the basis of this dual localization and the differential roles of the receptors in two different subcellular compartments.

In the past year, Dr. Leronni generated molecular biology tools that allowed her to identify the post-translational modification required for the correct plasma membrane localization of the receptor, but not for its mitochondrial localization. She also found that the same post-translation modification can be found in MT2, suggesting a dual sub-cellular localization and a dual function of this receptor as well. In addition, she continues to collaborate with other researchers to study the mitochondrial signaling cascade triggered by melatonin and its receptors in brain of mice models.

Witold Lipski, PhD
Research Instructor

- Speech Encoding in the Human Subthalamic Nucleus
  Efforts are currently underway to develop a unified model of speech production based on neural activity within the basal ganglia, cortical activity, and measures of connectivity between these structures.

- Development of Physiological Biomarkers for Optimizing Therapeutic Deep Brain Stimulation Contact Selection in Parkinson’s Disease Patients
  Analysis of deep brain stimulation electrode placements in Parkinson’s disease patients and associated clinical outcomes led to a finding that placement within the anterior sensorimotor STN improves perceptual and acoustic-aerodynamic voice-related outcomes. This shows that there is a topography within the STN for the control of airflow in speech, and suggests a strategy for improving voice outcomes.

Arka N. Mallela, MD
PGY-2 Resident

- Fetal Brain Folding
  By analyzing developmental patterns in fetal MRI, Dr. Mallela and colleagues have demonstrated that multiple different processes fold the human brain, as opposed to the conventional explanation of a single mechanism (Mallela et al. 2020). Currently, his work focuses on 1) understanding differences in genetic expression patterns in the developing lobes and 2) understanding how the insula is morphologically and developmentally different from the other lobes.

- Deep Learning in Clinical Neurosurgery
  Dr. Mallela is interested in utilizing deep learning techniques to probe clinical datasets in epilepsy and neuro-oncology to develop predictive tools and to analyze intraoperative data and events. He is working on adapting recurrent and convolutional neural networks to the neurosurgical context.

Michael McDowell, MD
PGY-6 Resident

Dr. McDowell’s recent work related to applying endoscopic endonasal surgery for pediatric conditions has demonstrated that patients have superior outcomes when applied as part of the care of patients with certain midline conditions such as chordomas. He has further shown the efficacy and safety profile of endoscopic endonasal surgery even in very young
patients under the age of six. Patients continue to be recruited for enrollment in near infrared spectroscopy research that has begun to show promising results in our ability to predict intracranial pressure without the need for an intracranial device. Dr. McDowell’s group recently published the largest study on pediatric arteriovenous malformations in the literature and demonstrated that the use of multimodality treatments including resection, radiosurgery, and embolization result in a high rate of functional outcomes. Further, he has demonstrated the need for long term follow-up due to the fact that recurrences, while rare, tend to happen many years after initial treatments.

**Ajay Niranjan, MD, MBA**
Professor, Neurological Surgery
Associate Director, Center for Image-Guided Neurosurgery
Director, UPMC Brain Mapping Center

Dr. Niranjan’s ongoing research includes clinical outcome of stereotactic radiosurgery and use of high definition Imaging for functional radiosurgery.

**Kamil W. Nowicki, MD, PhD**
PGY-4 Resident

Dr. Nowicki has been actively involved in the laboratory exploring the role of platelets and inflammatory cytokines in cerebral aneurysm formation. His most recent efforts have focused on using small molecule inhibitors in preventing aneurysm formation and have resulted in two patent applications. His future endeavors will concentrate on a blood test for cerebral aneurysms.

**David O. Okonkwo, MD, PhD**
Professor
Director, Neurotrauma Clinical Trials Center
Director, Scoliosis and Spinal Deformity Program
Special Advisor, UPMC Enterprises

- **Transforming Research and Clinical Knowledge in Traumatic Brain Injury (TRACK-TBI)**
  TRACK-TBI is an 18-site consortium that is rapidly changing the landscape for TBI care and research through more precise TBI diagnosis, prognosis, and treatment. Dr. Okonkwo is a principal investigator of the effort.

- **Comprehensive Biomarker Panel for Trauma-Related Dementia: Mechanistic Links Among Axonal Injury, Neuroinflammation, and Neurodegeneration**
  This project a DOD-funded study with a goal to establish a comprehensive neuroimaging and biomarker panel of trauma-related dementia, so that the pathophysiologic mechanisms underlying persistent trauma-induced cognitive impairments may be better understood and targeted for therapy.

- **Brain Oxygen Optimization in Severe Traumatic Brain Injury-Phase 3 (BOOST-3)**
  (BOOST-3) is a major randomized prospective clinical trial for severe TBI patients. The first randomized controlled trial of brain tissue oxygen monitoring in severe TBI (BOOST-2) demonstrated improvement in brain physiology through multimodal neuromonitoring. BOOST-3 will determine if there is evidence of clinical efficacy of a treatment protocol based on PbtO2 monitoring compared to treatment based on ICP monitoring alone.
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Matthew Pease, MD
PGY-5 Resident

Dr. Pease won the Congress of Neurological Surgeons’ 2020 Data Science Fellowship. He will be working with Rivka Colen, MD, using machine learning in imaging analysis, or radiomics, to attempt to predict which type of brain tumor a patient has: glioblastoma, primary central nervous system lymphoma, or metastatic disease. The hope is that patients can avoid brain biopsies to confirm diagnosis.

Ian F. Pollack, MD
A. Leland Albright Distinguished Professor
Vice Chair, Academic Affairs
Chief, Pediatric Neurosurgery
Co-Director, Neurosurgical Oncology
Professor of Clinical and Translational Science

Dr. Pollack’s group has continued to evaluate the role of molecularly targeted therapies for childhood brain tumors with different patterns of genomic alterations. Using pharmacological screening strategies, they have identified agents and agent combinations that had synergistic activity in inhibiting the growth of high-grade and brainstem gliomas. Recognizing that responses to such agents are often transitory in these highly aggressive tumors, they have developed a series of “drug-resistance” tumor model systems, paired with treatment naïve counterparts. They have leveraged this unique resource to build a strong collaboration with the Drug Discovery Institute and the Systems Biology Program, through which they have characterized a heretofore unrecognized mechanism by which pediatric and adult gliomas develop resistance to initially active agents or agent combinations. Using siRNA and pharmacological inhibition, they have demonstrated ways in which this inhibition can be counteracted, which may hold promise for new therapeutic strategies for these tumors. At present, Dr. Pollack’s group is working to validate the generalizability of our observations in different molecularly defined glioma models and with different therapeutic agents, to determine if resistance relies on a common signaling pathway or is the product of different pathways in different tumors in response to different agents. Their preliminary observations suggest the former, which opens a wide niche for therapeutic development. Accordingly, they plan to pursue these in vitro observations in in vivo model systems over the coming year.

Dr. Pollack’s group has also continued their NIH-funded activities that focus on immuno-therapy for pediatric brain tumors. During the last year, they applied RNA sequencing of peripheral blood mononuclear cells in a low-grade glioma cohort to characterize gene expression patterns associated with favorable response to vaccine therapy. They also identified expression patterns that were associated with lack of response. Future efforts will be directed at examining whether these response-associated expression patterns are observed in high-grade glioma and ependymoma cohorts, or are unique to low-grade gliomas. Accrual continues on their ongoing clinical trials for recurrent low-grade gliomas and ependymomas.

Daniel R. Premkumar, PhD
Research Assistant Professor

Glioblastomas are highly invasive primary tumors with poor prognosis despite current therapies. Individual targeted therapies have failed to offer long-term survival benefits, although combinations of rationally selected inhibitors may have significant therapeutic applicability for these tumors. Most of the commonly used anti-cancer drugs nonspecifically target fundamental cellular processes of DNA metabolism and cell division, complicating efforts
to elucidate specific molecular determinants of differential treatment response. However, the emerging use of ‘rationally targeted’ agents, which disrupt specific oncogenic signaling processes, has provided an opportunity to elucidate the molecular basis for differential clinical sensitivity and, possibly, to implement strategies that match individual patients with cancer to specific drug therapies to which they are more likely to respond.

Dr. Premkumar has examined several promising signaling-based strategies designed to enhance the applicability of results for the therapy of malignant gliomas by increasing chances to identify approaches with sufficient activity against a broad panel of glioma cell lines, or in a genotypically defined subset of tumors, to warrant translation into a clinically useful therapy. For instance, studies by Dr. Premkumar’s group and others have also shown aberrant, constitutive activation of NF-κB and Akt as common features of malignant gliomas, supporting their functional role in contributing to apoptosis resistance and refractory growth despite cytotoxic chemotherapy, irradiation, and molecularly targeted therapies. Dr. Premkumar’s team also focuses on the transcriptional/translational regulation of genes that play critical roles in malignant glioma resistance development for conventional chemotherapy.

**Nilkantha Sen, PhD**  
Associate Professor

White matter injury is one of the critical features of traumatic brain injury that results in memory impairment in TBI patients. In the last year, Dr. Sen has made significant progress in connecting neuroinflammation and white matter injury in traumatic brain injury. In addition, he has elucidated the underlying mechanism how an induction of intracellular hydrogen sulfide contributes to tauopathy in Alzheimer’s Disease.

**Tanusree Sen, PhD**  
Research Assistant Professor

Dr. Sen is currently working on gasotransmitter nitric oxide (NO) and hydrogen sulfide (H2S) mediated mitochondrial dysfunction, cell death, dendritic spine damage, and memory loss after traumatic brain injury and in Alzheimer’s Disease; especially in the context of adaptive and innate immune signaling molecules. In addition, she is in a process to understand the cellular and molecular mechanism of how neuron, microglia, oligodendrocyte, and T cells in the brain interconnect and regulates TBI pathology. Dr. Sen is working to understand whether the immune cells from the peripheral tissues contributes to brain immunological response following TBI. In TBI patients the existence of peripheral immune cells has been identified but their role in the pathogenicity has not been studied well. The major objective of this project is to understand how these cells enter into the brain and how/whether do they function independently or in association with the residential cells in the brain. As an advancement to this project, she recently showed that PERK phosphorylation, a characteristic feature of ER-stress is responsible for an increase in neuronal IFNβ, which, in turn, activates microglial cells and subsequently manifests the infiltration of T cells to induce neuroinflammation and subsequently white matter injury.

In a separate project, Dr. Sen is working on the function of transcription factor p63 in TBI pathology. Preliminary data indicate that a transcription factor, p63 which is a family member of the tumor suppressor, p53 contributes to the pathological outcomes of TBI in several layers. Besides, she is in a process to understand the cellular and molecular mechanism of how p63 regulates the oxidative/ER stress, alteration in mitochondrial structure and function, and cognitive impairment.
Jeremy Stone, MD  
PGY-6 Resident

Over the past two decades, interventional cardiology emboldened radial artery access for coronary angiography culminating in a radial-first recommendation by the American Heart Association. This recommendation resulted from a preponderance of large, prospective, randomized, multicenter trials showing reduced bleeding complications, improved patient satisfaction, and even a mortality benefit when radial access is utilized compared to traditional femoral artery access for cardiac catheterization.

Neuroendovascular surgery has been slower to adopt radial artery access due to a lack of comparable studies. Overcoming the learning curve of an alternative surgical approach, perceived limitations of accessing a smaller artery, navigating the aortic arch from a different vector, and challenges with regard to changing the culture among the many multidisciplinary staff within the angiography suite may all dissuade endovascular neurosurgeons who have already mastered the transfemoral approach. Motivated by a desire to both improve patient satisfaction and push our field forward, our group transitioned over the last year to a radial-artery-first strategy for diagnostic cerebral angiography. Throughout the process of transitioning to radial artery access for neuroendovascular procedures, we prospectively analyzed our success, identified limitations, and published on overcoming the learning curve. Consistent with cardiology data, we found the radial learning curve can be overcome within 30 to 50 cases, and high success can be achieved quickly when approaching the supra-aortic arteries via the right wrist.

With this institutional baseline established, we recently completed a prospective evaluation comprehensively comparing radial and femoral artery access for diagnostic cerebral angiograms. We compared our ability to successfully answer the diagnostic goal of the angiogram, patient safety, procedure times, and patient and staff satisfaction. Notably, we showed equivalent efficacy, radiation dose, contrast agent use, sedating medication use, procedure times, and minor complication rates between the two access approaches. Though procedure times were equivalent, recovery room time was significantly lower in wrist-access patients and discharge home time was faster for our outpatients. Patients overwhelmingly preferred wrist access over groin access with less access site pain, back pain, embarrassment, anxiety, and overall discomfort. Overall patient satisfaction was rated as significantly higher with wrist access compared to groin access.

Within months of transitioning our practice, patients referred for cerebral angiography were coming to the suite requesting wrist access for their procedures. Today, not only can we grant that request, we can confidently do so with the backing of scientific data supporting the safety and efficacy.

Mingui Sun, PhD  
Professor

• Single-Unit, Leadless EEG Sensor for Emergency Medicine

Many patients arriving at the Intensive Care Unit (ICU) are in the state of coma due to a severe injury or disease. Non-Convulsive Seizures (NCS) and Non-Convulsive Status Epilepticus (NCSE) are critical neurophysiological conditions which do not have overt clinical signs. These conductions can be diagnosed only with EEG monitoring. Unfortunately, approximately 2% of the patients in the ICU undergo continuous EEG monitoring. Primary reasons for the underuse of this technology is due to the complexity in setting up EEG equipment in busy, human resource constrained ICU. Dr. Sun is developing a self-contained EEG sensor in
the size of a U.S. quarter with no electrode leads. By simply pressing the EEG sensor against
the unprepared scalp and twisting slightly, the device can grasp the skin firmly and start
acquiring and transmitting EEG wirelessly to a bedside monitor, a smartphone, a tablet, or a
Bluetooth enabled device within an ambulance. With these unique features, the aforemen-
tioned problem can be solved.

• A Home-Based Wearable System Early Pneumonia Detection during a Pandemic Event
The COVID-19 pandemic has widely spread over the world, causing millions of confirmed
infections and hundreds of thousands of deaths. Besides lacking a vaccine and a therapeutic
means specifically targeting the novel virus, Dr. Sun believes that the lack of an advanced
technology for people to self-monitor their own physiological status at their homes has also
contributed to the severity of this pandemic. His rich experiences in wearable technology,
physiological monitoring, and clinical experience in COVID-19 patient care affords him the
leverage to rapidly develop and deploy a low-cost, home-based wearable system to monitor
infectious pneumonia for older adults, people with existing conditions, workers exposed to
risky environments, travelers, military personnel, and all other individuals in needs.

Fang-Cheng Yeh, MD, PhD
Assistant Professor
Director, High-Definition Fiber Tractography Lab

• Differential Tractography as a Track-Based Biomarker for Neuronal Injury
Diffusion MRI tractography has been used to map the axonal structure of the human brain,
but its ability to detect neuronal injury is yet to be explored. Dr. Yeh has reported differential
tractography, a new type of tractography that utilizes repeat MRI scans and a novel tracking
strategy to map the exact segment of fiber pathways with a neuronal injury. He has examined
differential tractography on multiple sclerosis, Huntington’s disease, amyotrophic lateral
sclerosis, and epileptic patients. The results showed that the affected pathways shown by dif-
ferential tractography matched well with the unique clinical symptoms of the patients, and
the false discovery rate of the findings could be estimated using a sham setting to provide a
reliability measurement. This novel approach enables a quantitative and objective method
to monitor neuronal injury in individuals, allowing for diagnostic and prognostic evaluation
of brain diseases.

• Structural Analysis and Optimization of Convolutional Neural Networks with a Small
Sample Size
Deep neural networks have gained immense popularity in the Big Data problem; however,
the availability of training samples can be relatively limited in specific application domains,
particularly medical imaging, and consequently leading to overfitting problems. This “Small
Data” challenge may need a mindset that is entirely different from the existing Big Data
paradigm. Here, under the small data scenarios, Dr. Yeh has examined whether the network
structure has a substantial influence on the performance and whether the optimal structure
is predominantly determined by sample size or data nature. To this end, he has listed all
possible combinations of layers given an upper bound of the VC-dimension to study how
structural hyperparameters affected the performance. Results showed that structural opti-
mization improved accuracy by 27.99%, 16.44%, and 13.11% over random selection for a
sample size of 100, 500, and 1,000 in the MNIST dataset, respectively, suggesting that the
importance of the network structure increases as the sample size becomes smaller. Further-
more, the optimal network structure was mostly determined by the data nature (photo-
graphic, calligraphic, or medical images), and less affected by the sample size, suggesting
that the optimal network structure is data-driven, not sample size driven.
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<td>Transforming Research and Clinical Knowledge in Geriatric Traumatic Brain Injury (TRACK GERI)</td>
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<td>University of Cincinnati</td>
<td>Ian Pollack</td>
<td>Children's Brain Tumor Tissue Consortium</td>
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<td>Gary Kohanbash</td>
<td>Interrogating Anti-Tumor T-Cells to Develop Adoptive Cell Transfer (ACT) Immunotherapy for Pediatric High-Grade Gliomas and DIPG</td>
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<td>Chromologic</td>
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<td>CereTRec: A Cerebral Trauma Recovery Drug Delivery System</td>
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<td>Development and Validation of Spreading Depolarization Monitoring for TBI Management (SDIII)</td>
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<td>Hypothermia for Patients Requiring Evacuation of Subjural Hematoma: Effect on Spreading Depolarizations</td>
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<td>David Okonkwo</td>
<td>SDII - Development and Validation of Spreading Depolarization Monitoring for TBI Management</td>
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<td>Sergei Baranov</td>
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<td>Abisheck Jauhari</td>
<td>Melatonin regulate mtDNA mediated inflammation in Huntington Disease</td>
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<td>Use of Photopolymers for Cranial Base Reconstruction in Endoscopic Endonasal Surgery</td>
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<td>Biomarkers in Chronic Subdural Hematoma: A prospective study</td>
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<td>SGI-110 in combination with peptide vaccine immunotherapy for diffuse intrinsic pontine glioma</td>
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<td>Jessica Barrios-Martinez</td>
<td>Porting high-definition fiber tracking to neurosurgical navigator for mapping critical fiber pathways in tumor patients</td>
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<td>Justiss Kallas</td>
<td>Comparison of Latrogenic Subcortical Injury Caused by Balloon Dilation versus Standard Cannulation in a Rat Model</td>
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<td>Small molecule platelet inhibitors for prevention of cerebral aneurysm formation</td>
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<td>Michael McDowell</td>
<td>Epigenetic subclassification of cranial base chondrosarcoma</td>
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<td>Nikantha Sen</td>
<td>The role of cell cycle in neuroinflammation after TBI</td>
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<td>Rajaneesh Gupta</td>
<td>The role of SLC26A11 in neuronal swelling in memory impairment following TBI</td>
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<td>The Ras pathway presents unique therapeutic opportunities in pediatric brain tumors</td>
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<td>Altered intrasynaptic Properties and Impaired Neurotransmission After Blast Injury</td>
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<td>The Role of Pulsatility in the Management of Hydrocephalus: A Pilot Study</td>
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<td>Svitlana Yablonska</td>
<td>Huntington’s N-terminal region regulates mitochondrial targeting and toxicity through phosphorylation</td>
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<td>Function of the melatonin synthesized in neuron after ischemic/reperfusion injury</td>
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<td>HAPTIX - Spinal Root Sensory Feedback for Intramuscular Myoelectric Prostheses</td>
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<td>Comprehensive Biomarker Panel for Trauma-Related Dementia (Military CTE)</td>
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<td>LITES TO2 - Analysis</td>
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<td>Linking Investigations in Trauma and Emergency Services (LITES) Network</td>
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<td>Elekta</td>
<td>Hideyuki Kano</td>
<td>Long-Term Prospective Outcome Research for Gamma Knife Radiosurgery in Patients with AVM, Primary or Metastatic Brain tumors</td>
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<td>Leadless EEG Sensor for Emergency Medicine</td>
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<td>Rapid Saliva Test for Diagnostics of Neuro-Cognitive Disorder due to TBI (NCDT)</td>
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<td>Saliva Biomarkers for Predicting Outcome in Pediatric and Adult TBI Patients</td>
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<td>An Innovative Passive Dietary Monitoring System</td>
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<td>Lahey Clinic</td>
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<td>Cervical Spondylotic Myelopathy Surgical Trial (CSM-S Trial): Cost Reimbursable</td>
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<td>Spinal Laminectomy versus Instrumental Pedicle Screw (SLIP II)</td>
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<td>Mass. General Hospital</td>
<td>Witold Lipski</td>
<td>Subthalamic and corticosubthalamic coding of speech production</td>
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<td>John McCormick Foundation</td>
<td>Diane Carlisle</td>
<td>Dysregulated Intracellular Transport - Novel Mechanisms in ALS Pathogenesis</td>
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<td>Therapeutic Targeting of Metabolic Vulnerabilities in DIPG (DIPG)</td>
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<td>Prevalence of Brain Health Versus Neurodegeneration Retirees in Professional Football</td>
<td>$27,347</td>
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<td>The Study of Women’s Health Across the Nation—SWAN V (SWAN V)</td>
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<td>Adjacent Segment Mechanics in Cervical Arthrodesis Patients</td>
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<td>Enhanced Bedside Microdialysis for TBI</td>
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<td>Avniel Ghuman</td>
<td>Connectomics of Brain Aging and Dementia</td>
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<td>Understanding the synaptic, cellular and circuit events of MEG &amp; EEG using a vertically translational cross-species</td>
<td>$14,191</td>
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<td>Inside the social precepton network: dynamics, connectivity, and stimulation</td>
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<td>Neurocognitive basis of attention and eye movement guidance in real world scenes</td>
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<td>Novel Role And Mechanisms Of Histone Deacetylases In Traumatic Injury</td>
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<td>Alpha-Synclein and Synaptic Vesicle Dysfunction after Traumatic Brain Injury</td>
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<td>Structural and Functional Dysconnectivity in Dopamine/Acetylcholine Circuitry in Repetitive Mid TBI</td>
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<td>Traumatic brain injury and aging: targeting the cholinergic system for deficits in sustained attention and executive function</td>
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<td>Role of UCHL1 in Axonal Injury and Recovery after TBI</td>
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<td>The Role of RNA Binding Motif 5 in Traumatic Brain Injury</td>
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<td>Lipid Imaging In Traumatic Brain Injury By High Resolution GCIB-Secondary Ion Mass Spectrometry</td>
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<td>Elizabeth Tyler-Kabara</td>
<td>A Biomimetic Approach Towards a Dexterous Neuroprosthesis</td>
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<td>Context-dependent processing in sensorimotor cortex</td>
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<td>Construction of a high-resolution human tractography atlas and its related toolbox</td>
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<td>Auditory Cortex Connectivity in Emerging Psychosis</td>
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<td>CD11b antibody fragments as PET imaging probes for glioma-associated myeloid cells</td>
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<td>Arming Oncolytic HSV Vectors to Induce Anti-GBM Immune Responses in Syngeneic Mice</td>
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<td>Peptide Vaccine immunotherapy for children with recurrent low-grade astrocytomas</td>
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<td>Targeting Extracellular Signaling-Regulated Kinase 5 (ERK5) in Brain Tumors and their Microenvironment</td>
<td>$16,902</td>
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<td>Mingui Sun</td>
<td>Automatic Recognition of Diet, Physical Activity and Sedentary Behavior Using a Smart Wearable Device</td>
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<td>Nilkantha Sen</td>
<td>Development of therapeutic strategy against TBI based on hydrogen sulfide</td>
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<td>Molecular mechanisms underlying vision impairment after TBI</td>
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<td>Partha Thirumala</td>
<td>An Unique patient population for clinical trials against noise-induced hearing loss</td>
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<td>Melatonin biosynthesis in neuronal mitochondria</td>
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<td>Insufficient mitochondrial protein turnover downregulates mitophagy and promotes caspase-dependent retraction of neurites in Huntington’s disease</td>
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<td>Targeting extracellular signaling-regulated kinase 5 (ERK5) in brain tumors and their microenvironment</td>
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<td>SV2A as a Therapeutic Target for Improved Neurotransmission after Traumatic Brain Injury</td>
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<td>Interdisciplinary Mentoring and Research in Women’s Cardiovascular Health</td>
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<td>Imaging pathophysiology in aging and neurodegeneration</td>
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<td>A Cerebrovascular basis for sex differences in AD risk</td>
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<td>Menopausal Vasomotor Symptoms as a Marker of Brain Aging</td>
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<td>NCS-FO: Collaborative Research: Decoding and Reconstructing the Neural Basis of Real World Social Perception</td>
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<td>Navy</td>
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<td>TRACK-TBI: Repositories - Transforming Research and Clinical Knowledge in TBI (TRACK-TBI)- High Definition Fiber Tracking Neuroimaging, Biospecimen and Data Informatics Repositories</td>
<td>$182,353</td>
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<td>Neubase</td>
<td>Robert Friedlander</td>
<td>Evaluate HD-GPNAs as potential therapeutics in multiple models of Huntington’s Disease: murine neuronal cell lines, human neural progenitors, and R62 mouse HD model</td>
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<td>Biomarker Panel for Inflammation and Tau in Concussed Athletes</td>
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<td>Decosahexaenoid Acid and Presynaptic Mechanisms in Mild Traumatic Brain Injury</td>
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<td>Randomized Control Trial of a Precision, Vestibular Treatment in Adolescent Patients following Sport-related Concussion</td>
<td>$610</td>
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<td>Levetracetam as a Therapy for Synaptic Dysfunction after Repetitive Mild Traumatic Brain Injury</td>
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<td>Randomized Trial of Early Hemodynamic Management of Patients following Acute Spinal Cord Injury - TEMPLE</td>
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<td>PACT: PA Consortium of TBI</td>
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<td>Collaborative Neuropathology Network Characterizing Outcomes of Traumatic Brain Injury (CONNECT-TBI)</td>
<td>$3,098</td>
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<td>St. Jude Child Res Hospital</td>
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<td>Pediatric Brain Tumor Consortium - YR21</td>
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<td>SanBio</td>
<td>David Okonkwo</td>
<td>A Double-Blind, Controlled Phase 2 Study of the Safety and Efficacy of Modified Stem Cells (SB623) in Patients with Chronic Motor Deficit from Traumatic Brain Injury (TBI)</td>
<td>$223,601</td>
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<td>Seattle Children’s Hospital</td>
<td>Ian Pollack</td>
<td>Prevention of Cerebrospinal Fluid (CSF) shunt infections</td>
<td>$32,406</td>
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<td>Stanford University</td>
<td>Fang-Cheng Yeh</td>
<td>Language Connectivity Pathways and Neuroplasticity in Aphasic Stroke Patients</td>
<td>$144,844</td>
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<td>UPMC</td>
<td>Robert Friedlander</td>
<td>A new model of neuronal melatonin defect to identify novel anti-aging and neuroprotective therapies</td>
<td>$52,942</td>
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<tr>
<td>USA Med Res &amp; Mat Cmd</td>
<td>Ava Puccio</td>
<td>HDFT Biological Diagnosis of TBI Providing Actionable Clinical Report of Quantified Damage</td>
<td>$3,235</td>
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<td>USA Med Res &amp; Mat Cmd</td>
<td>David Okonkwo</td>
<td>A Precision Medicine Approach Based on Discrete Time Windows for Predicting Outcomes of Polytrauma Patients</td>
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## Research

### Research Grant Summary

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<tr>
<th>Source</th>
<th>Investigator</th>
<th>Title</th>
<th>Total Budget Award</th>
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<td>USA Med Res &amp; Mat Cmd</td>
<td>David Okonkwo</td>
<td>HDTF Biological Diagnosis of TBI Providing Actionable Clinical Report of Quantified Damage</td>
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<td>USA Med Res &amp; Mat Cmd</td>
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<td>A Precision Medicine Approach Based on Discrete Time Windows for Predicting Outcomes of Polytrauma Patients</td>
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<td>Veterans Administration</td>
<td>C. Edward Dixon</td>
<td>Chronic Lithium Therapy for Traumatic Brain Injury</td>
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<td>IPA Agreement: CDDF Project (Young)</td>
<td>$21,280</td>
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<td>IPA ERIK HOLETS</td>
<td>$9,485</td>
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<td>Veterans Administration</td>
<td>C. Edward Dixon</td>
<td>IPA Agreement (Y.Li) - Chronic Lithium Therapy for Traumatic Brain Injury</td>
<td>$49,308</td>
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<td>IPA Nikantna Sen - RMS Acct: SUN2</td>
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<td>IPA Tanusree Sen - RMS Acct: SUN2</td>
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<td>Vivioni</td>
<td>Ava Puccio</td>
<td>Non-Invasive Intracranial Pressure Assessment Using a Compact, Portable Monitor (IPASS)</td>
<td>$18,815</td>
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<tr>
<td>Vivioni</td>
<td>David Okonkwo</td>
<td>Non-Invasive Intracranial Pressure Assessment Using a Compact, Portable Monitor (IPASS)</td>
<td>$839</td>
</tr>
</tbody>
</table>
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  UPMC Children’s Hospital of Pittsburgh
  UPMC East
  UPMC Hamot
  UPMC Horizon
  UPMC Magee-Womens Hospital
  UPMC McKeensport
  UPMC Mercy*
  UPMC Northwest
  UPMC Passavant
  UPMC Pinnacle
d  UPMC Presbyterian*
  UPMC St. Margaret
  UPMC Shadyside
  UPMC Susquehanna
  UPMC Western Maryland
  * Level 1 trauma facility

• Non-UPMC Hospitals:
  Armstrong
  Excela Health System (Latrobe Area & Westmoreland Regional Hospitals)
  Indiana Hospital
  Monongahela Valley Hospital
  Trinity
  VA Pittsburgh Healthcare System

• Outpatient Offices:
  Seven (fully staffed sites; 20 time share sites covering western Pennsylvania)

Residency
Four chief residents matriculate annually

Major Service Lines
Community based general neurosurgery
Complex instrumented spine including scoliosis
Endoneurovascular interventional radiology
Epilepsy & movement disorders
Human neural prosthetics program
Image-guided neurosurgery (frame based, frameless, intraoperative CT scan)
Neurophysiology intraoperative monitoring
Pain management
Pediatric neurosurgery
Skull base lesions; EEA
Surgical neuro-oncology
Stereotactic radiosurgery

PSD Clinical Productivity (fy 2020)
Major Procedures: 8,813
Total Charge Volume: 111,866
Work RVUs: 353,686.2

Pitt Research Productivity (fy 2020)
Directs: $7,302,117
Indirects: $2,304,239
Grant Projects: 147

UPP Financial Productivity (fy 2020)
Gross charges: $95,660,626
Net patient revenue: $20,584,917
Collection percentage: 21.52%