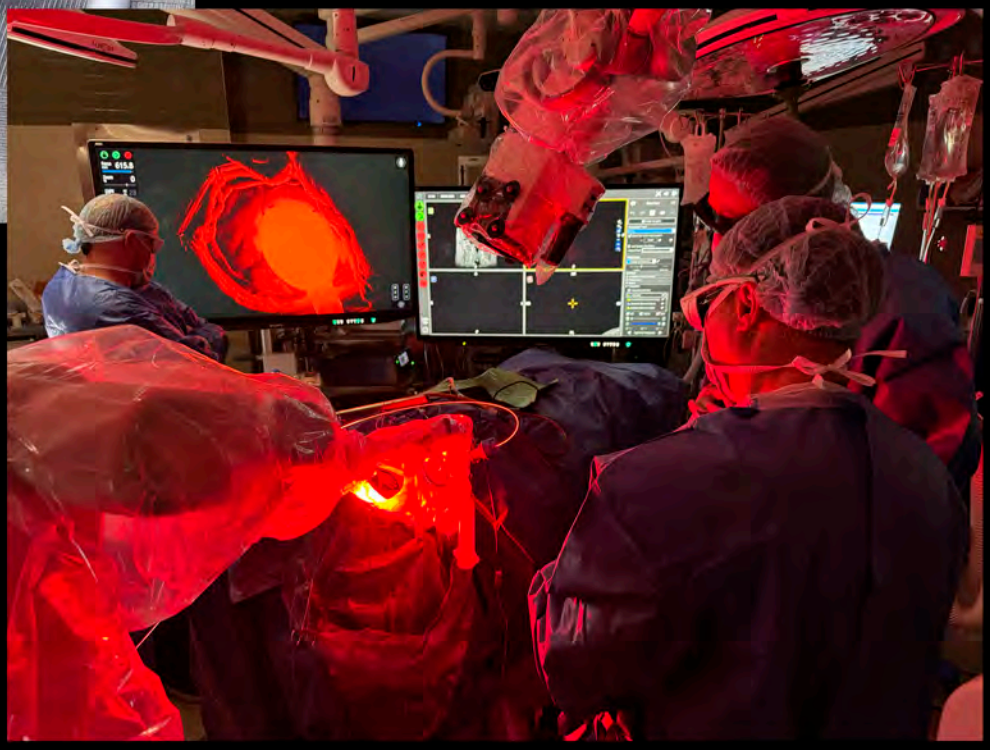
University of Pittsburgh

Department of Neurological Surgery

2025

Annual Report



University of Pittsburgh

UPMC
LIFE CHANGING MEDICINE

2025 Department of Neurological Surgery Annual Report

University of Pittsburgh

Table of Contents:

Faculty, Residents and Staff....3

- Faculty....4
- Residents....5
- Advance Practice Providers....6
- Department Administration....6
- Maroon Receives Ellis Medal of Honor....7

Department Overview....9

- History....10
- Goals/Mission....12
- Organization....12
- Our Centers of Excellence....12
- Accomplishments of Note....30
- Focused Ultrasound Unit Dedicated....35

Education Programs....37

- Undergraduate Level....38
- Medical Students....38
- Residency Program....41
- N3-PREP....47
- Fellowships....48
- Professional Courses....50
- Special Lectureships....51
- John J. Moossy Award Established....54

Faculty Biographies....55

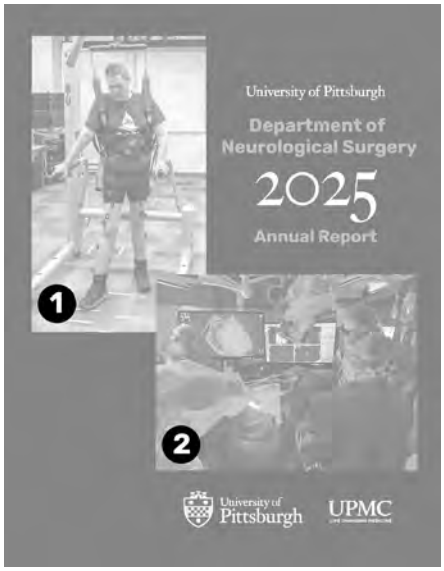
- Lunsford Honored with CNS Laurel Award....211

Resident Biographies....213

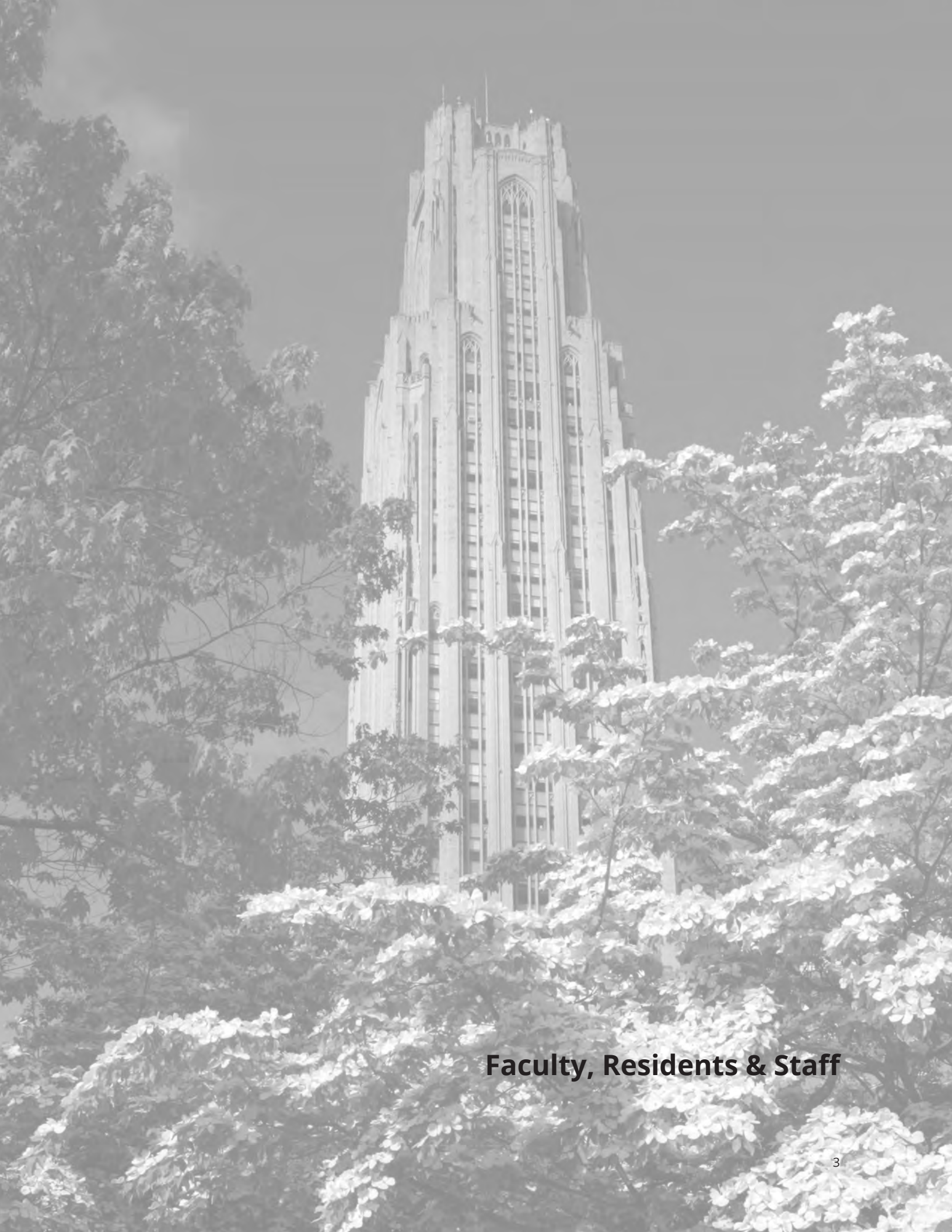
- Department Honors Graduating Residents....244

Research....245

- Walter Copeland Laboratory....246
- Neurotrauma Research....247
- Brain Tumor Research....248
- Magnetoencephalography (MEG) Research....252
- National TBI Biospecimens Repository....252
- SCS Helps Restore Motion in SMA Patients....254
- Giorgio Foundation/Pitt Advance NF1 Research....256



On the Cover: *(1) A study participant with spinal muscular atrophy walks independently aided with a body weight support system thanks to an implanted device stimulating the lumbar spinal cord, thanks to research led by Marco Capogrosso, PhD, (see page 256); (2) The first intraoperative photodynamic therapy treatment of a glioblastoma tumor in the United States was performed at the UPMC Center for Image-Guided Neurosurgery under the direction of Costas Hadjipanayis, MD, PhD, (read more on CIGNS on page 19).*



Faculty, Residents & Staff

Faculty

• Chair and Professor:
Robert M. Friedlander, MD, MA

• Professors:
C. Edward Dixon, PhD
Paul A. Gardner, MD
Peter C. Gerszten, MD, MPH
Jorge A. González-Martínez, MD, PhD
Costas G. Hadjipanayis, MD, PhD
D. Kojo Hamilton, MD
L. Dade Lunsford, MD
John J. Moossy, MD
Ajay Niranjan, MD, MBA
David O. Okonkwo, MD, PhD
Ian F. Pollack, MD
Mingui Sun, PhD
Parthasarathy D. Thirumala, MD

• Associate Professors:
Kalil G. Abdullah, MD
Taylor Abel, MD
Nitin Agarwal, MD
Sameer Agnihotri, PhD
Jeffrey Balzer, PhD
Diane L. Carlisle, PhD
Donald J. Crammond, PhD
Avniel Ghuman, PhD
Bradley Gross, MD
Baoli Hu, PhD
Gary Kohanbash, MD
Ava Puccio, PhD, RN
Fang-Cheng (Frank) Yeh, MD, PhD
Georgios Zenonos, MD
Pascal O. Zinn, MD, PhD

• Assistant Professors:
Edward Andrews, MD,
Katherine M. Anetakis, MD
James Cushing Bayley, MD
Thomas J. Buell, MD
Marco Capogrosso, PhD
Shaun W. Carlson, PhD
David T. Fernandes Cabral, MD
Luke C. Henry, PhD
Zhimin Huang, PhD
John H. Kanter, MD
(joined faculty August 1, 2025)
Robert Kellogg, MD
Michael J. Lang, MD
Antony MichealRaj, PhD
Cody Nesvick, MD
Martin G. Piazza, MD
Natalie Sandel Sherry, PsyD, ABPP-CN

• Clinical Professors:
Matt El-Kadi, MD, PhD
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

Faculty and residents at 2025 resident graduation held at Pittsburgh Golf Club, June 21, 2025.

• Clinical Assistant Professors:
Ahmed Awad, MD
Robert L. Bailey, MD
J. Brad Bellotte, MD
Lindsay Bhandari, MD
Bryan Bolinger, DO
John A. Braca III, MD
Ahmed E. Doomi, MD
Kathryn Hoes, MD
David L. Kaufmann, MD
Benjamin B. Lee, MD, PhD
Vinayak Narayan, MD
Charles E. Romero, MD
Jeremy G. Stone, MD
Fadi Sweiss, MD
Bart Thaci, MD
Sheela Vivekanandan, MD

• Research Associate Professor:
Yue-Fang Chang, PhD

• Research Assistant Professors:
Shawn R. Eagle, PhD
Esther Jane, PhD
Pravat Kumar Mandal, PhD
Subrahmanya Vallabhapurapu, PhD

2025 Graduating Residents
Hussam Abou-Al-Shaar, MD
Ricardo Fernández-de Thomas, MD
Daryl P. Fields II, MD, PhD
Arka N. Mallela, MD
Gautam Nayar, MD

Residents
(As of July 1, 2025)

• PGY-7:
Ali A. Alattar, MD
Hansen Deng, MD
Joseph Scott Hudson, MD
Andrew D. Legarreta, MD

• PGY-6 (Chief Residents):
Prateek Agarwal, MD
Jeffrey R. Head, MD
Rachel C. Jacobs, MD
David J. McCarthy, MD

• PGY-5:
Sharath K. Anand, MD
Andrew M. Faramand, MD
Sakibul Huq, MD
Anthony J. Schulien, MD

• PGY-4:
Joe H. Garcia, MD
Willman H. Shuman, MD

• PGY-3:
Hussein H. Abdallah, MD
Stephanie M. Casillo, MD
Albin A. John, MD
Oliver Y. Tang, MD

• PGY-2
Jordan Petit, MD
Madi Remick, MD
Jessica Ryvlin, MD
Nikhil Sharma, MD
Gina Watanabe, MD

• PGY-1
Ritesh Karsalia, MD
Najib Muhammad, MD
Abhinav Pandey, MD
Rohit Prem Kumar MD
Sangami Pugazenthi, MD

Advanced Practice Providers
Michelle Acosta, DPAS, PA-C
Alicia Olsen Bergell PA-C
Sarah LaRue Bulloch, PA-C
Lauren Carroll, PA-C
Shannon Casey, CRNP
Kayla Churman, PA-C
Annette Clements, CRNP
Samantha Coda, PA
Theodora Constantine, MPAS, PA-C
Alissa Conway, PA-C
Amanda Costanza, PA-C
Abigail Crum, MPAS, PA-C
Kassandra Deane, PA-C
Jada Dooley, CRNP
Jenna Doty, PA-C
Amanda Driscoll, PA-C
Mackenzie Ebersole, PA-C
Julia Freyer, PA-C
Amanda Gans, PA-C
Grace Gesiskie, PA-C
Nicole Gray, PA-C

Nicholas Grice, PA-C
Samantha Gulick, PA-C
Chrisanne Hennicke, PA-C
Cecilia Jewell, PA-C
Kelly Jones, PA-C
Elizabeth Mae Kirk, PA-C
Sarah Kwiatkowski, FNP-C
Lucille Lewis, MPAS, PA-C
Kate Liberto, PA-C
Sara Lucas, MPAS, PA-C
Kathleen Mannion, PA-C
Hope Maromonte, MPAS, PA-C
Samantha McKown, PA-C
Kristin Mellon, PA-C
Kelsey Michenko, PA-C
Isabel Palamone, MSPAS, PA-C
Alexis Papay, PA-C
Anne Parisi, CRNP
Hailey Patsy, PA-C
Amanda Perrico, PA-C
Hannah Pierre, CRNP
Camryn Reynolds, PA-C
Destiny Seay, CRNP
Suzie Semroc, PA-C
Kristina Setzenfand, CRNP
Gina Shaffer, PA-C
Edward Shaffer, PA-C
Kaila Simcoviak, PA-C
Brianna Stuparitz, PA-C
Jessica Sullivan, PA-C
Sarah Tappe, CRNP
Brooke Testa, PA-C
Erin Thomson, PA-C
Svetlana Trofimova, PA-C
Jenna Turnley, PA-C
Louisa Urgo Shin, PA-C
Casey Weibel, PA-C
Hallie Williams, PA-C
Nathan Winterburn, PA-C
Rachel Wrigley, MPAS, PA-C
Dominque Young, PA-C

Department Administration

• Executive Administrator:
Stacey Lang

• Assistant Administrator:
Drake Watters

• Financial Administrator:
Tara Horr

• GME Academic Manager:
Melissa Lukehart

• Operations Director:
Patrick Nicholas

• Advanced Practice Director:
Michelle Acosta

Maroon Receives Ellis Medal of Honor

Joseph C. Maroon, MD, Heindl Scholar in Neuroscience at the University of Pittsburgh and renowned sports and health medicine expert, was honored as an Ellis Island Medal of Honor recipient, May 10, 2025, at a special black-tie gala in Ellis Island's Great Hall in New York. The honor, officially recognized by both Houses of Congress as one of our nation's most prestigious awards, celebrates "Americans who are selflessly working for the betterment of our country and its citizens."

Presented by New York's Ellis Island Honors Society (EIHS) since 1986, the award "commemorates the indefatigable spirit of those who immigrated to the United States during the Ellis Island era. The medal is presented annually to those who have shown an outstanding commitment to serving our nation either professionally, culturally or civically."

In a letter informing Dr. Maroon of his award, EIHS chair Nasser J. Kazeminy noted, "your work in brain trauma, including the development of the ImPACT test, has transformed football and other contact sports, and saved countless athletes from irreversible mental, physical, and psychological damage. Your pioneering work in longevity medicine, prostate cancer, Alzheimer's, and Parkinson's diseases has helped improve health outcomes for an entire generation of Americans."

It is believed that Dr. Maroon is the first neurosurgeon recognized by EIHS. Ironically, his grandparents, from both sides, arrived at Ellis Island from Poland and Lebanon in the early 1900s and were made citizens in the same Great Hall where the ceremony took place. "We have come full circle," he quipped.

EIHS "heralds the importance of immigration to America's prosperity and celebrates the contributions immigrants and their progeny have made to our nation. The society was founded on the conviction that the diversity of the American people is what makes this nation great. EIHS honors the contributions made by immigrants and their descendants throughout American history."

Past recipients of the award include Presidents Ronald Reagan, Bill Clinton and Joe Biden; Supreme Court justices William Rehnquist and Sandra Day O'Connor; Nobel Prize laureates Elie Wiesel and Malala Yousafzai; philanthropists David and Susan Rockefeller; sports icon Muhammad Ali; and countless other "leaders of industry, education, the arts, sports and government. All whom have made freedom, liberty and compassion a part of their life's work." ■

Joseph Maroon, MD, at Ellis Medal of Honor Gala.

Department Overview

Stuart Niles Rowe

Dorothy Klinke Nash

Sidney Goldring

Anthony F. Susen

History

Neurological surgery in the city of Pittsburgh began in 1936 with the arrival of Stuart Niles Rowe, 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 in Pittsburgh based on the many, loosely affiliated community hospitals in the area. His goal was to establish a strong neurosurgery service in Pittsburgh. He also had a strong interest in research and wrote several pioneering papers on the neurosurgical treatment of pain, brain abscess and cerebral trauma.

Rowe's plans were put on hold during World War II as he volunteered for military service, serving as an Army lieutenant colonel, treating casualties triaged to a southern England military hospital. Upon his return to Pittsburgh at the end of the war, he again led the neurosurgery service at the university, which was then a section under the Division of General Surgery. Rowe then restarted his mission to unify the neurosurgical service in the Pittsburgh area. He also began to train residents, a journey that would eventually produce one of the strongest neurosurgical training programs in the country.

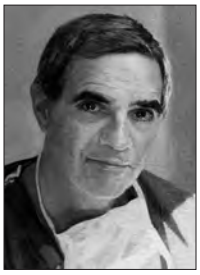
During this time, a landmark moment in the history of neurosurgery occurred with the hiring of Dorothy Klenke Nash, MD, the first woman to practice neurosurgery in the United States. A graduate of the elite Bryn Mawr (Pa.) College in 1921 and the Columbia College of Physicians and Surgeons in 1925, Nash received training in both neurology and neurosurgery under the guidance of Byron Stookey at Bellevue (N.Y.) Hospital in the late 1920s. She moved to Pittsburgh in 1936, but did not gain a hospital appointment until a chance meeting with Morris Abel Slocum, MD, then chief of general surgery at St. Margaret Hospital. At the time, Nash was volunteering as a phlebotomist at a local blood bank. While donating blood, Slocum learned of Nash's background in neurosurgery and quickly appointed her acting chief of neurosurgery at St. Margaret. She later joined Rowe at Presbyterian University Hospital, paving the way for other women in the field. Rowe placed his service under Nash's care while he served during World War II.

Rowe began the first formal neurosurgery residency program at West Penn Hospital in 1949. Another program was also established at Mercy Hospital in the same year under the direction of Floyd Bragden, MD, who arrived in Pittsburgh three years after Rowe. The two programs were consolidated under the University of Pittsburgh at Presbyterian University Hospital in 1952, where it continues to this day.

With Rowe's own training firmly based in academic neurosurgery, he sought to acquire residents with a commitment to research, teaching and independent thought. 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.

In 1964, Henry Bahnson, MD, the chair of General Surgery, appointed Sidney Goldring, MD, of St. Louis as the first chief of the Division of Neurological Surgery. After two years, Dr. Goldring returned to St. Louis where he was named professor and chair of neurosurgery at Washington University.

Upon Goldring's departure, Anthony F. Susen, MD, was named the second chief of the Division of Neurological Surgery. Susen—trained at Bowman Gray Medical School and Harvard—had joined the university in 1953 as a clinical instructor and worked with Rowe into the 1960s. He held the same belief as Rowe that residency training programs should stress thorough literature review and independent research as well as exceptional techniques. Susen was also the first pediatric neurosurgeon in the Pittsburgh area and, at the time, was the only pediatric-focused neurosurgeon between Chicago and New York. Under his direction, other facilities including Children's Hospital of Pittsburgh and the Veterans Administration Medical Center, became part of the service.



Peter Jannetta

In 1971, Peter Joseph Jannetta, MD, was appointed the first chair of the University of Pittsburgh Department of Neurological Surgery. 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.

L. Dade Lunsford

In 1997, L. Dade Lunsford, MD, was selected as the second department chair. 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 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 U.S. to offer this minimally invasive form of brain surgery. The department now has two such devices and is a world leader in Gamma Knife treatment and education, having treated nearly 18,000 patients.

Amin Kassam

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, assistant professor of neurological surgery and co-director of the Minimally Invasive endo-Neurosurgery Center, as interim chairman of the department. Dr. Kassam was subsequently appointed chair by Dr. Levine in May of 2007. In June of 2009, Dr. Kassam resigned as chairman and left the department.

Robert Friedlander

On June 1, 2010, Robert M. Friedlander, MD, a noted cerebrovascular and neuro-oncologic surgeon and researcher, 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 neurosurgical 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

A complete faculty list is available on page 4.

A complete resident list is available on page 5.

The main offices of the Department of Neurological Surgery at the University of Pittsburgh are housed on the fourth floor of UPMC Presbyterian in the Oakland section of the city of Pittsburgh. The current full-time faculty includes 14 professors, 15 associate professors and 15 assistant professors. In addition, there are 22 clinical faculty, five research faculty, 28 residents at various levels of training, and more than 60 advanced practice providers. The support staff includes more than 200 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.

Our Centers of Excellence

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 and spinal cord injury. The neurotrauma service works closely with integral colleagues from the Trauma Division, Critical Care Medicine, Neurophysiology, Neuroradiology, and Physical Medicine and Rehabilitation to provide the most sophisticated treatments available for brain and spinal cord injury 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 (NCTC) 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.

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.

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, moyamoya disease, and cavernous malformations. With a group of highly subspecialized physicians, center faculty prospectively assess patients and provide broad state-of-the-art treatment options. Central to the center's mission is the belief that patients should have access to the entire spectrum of techniques. As such, the center's experts evaluate cases and provide recommendations with the goal of minimizing risks and maximizing long-term efficacy.

The center is directed by Michael J. Lang, MD, and also includes Robert Friedlander, MD, Paul A. Gardner, MD; Bradley A. Gross, MD; and Georgios Zenonos, MD. Dr. Gross also serves as director of endovascular neurosurgery for the center.

Challenging cases are reviewed prospectively in weekly multidisciplinary cerebrovascular conferences. Complex cases are analyzed systematically, in order to fully vet the microsurgical, endovascular, radiosurgical, and medical options for each case. Combined with assessment of patient clinical profiles by our dedicated multidisciplinary preoperative clinic, recommendations are made to prioritize long-term patient health and safety. This setting also provides exceptional educational opportunities for fellows and residents as they advance their training.

The Cerebrovascular Center is proud to provide care for patients with hemorrhagic disease, such as aneurysms, arteriovenous malformations, and cavernous malformations, for some of the most complex and vulnerable patients in the country. Endovascular neurosurgeons participate in nationwide clinical trials to evaluate developing technologies such as flow diverting stents and intra-saccular flow diversion. Dr. Gross is a contributor to a first-of-its-kind national consortium to advance the understanding of dural arteriovenous fistulas (dAVFs), a rare and uniquely challenging vascular malformation. Advanced imaging techniques developed at UPMC, such as high-density fiber tracking (HDFT), facilitate the safe resection of cavernous malformations in critical areas of the brain, such as the brainstem. Under Dr. Lang, the center has pioneered novel approaches to brain aneurysms by directly combining microsurgical and endovascular techniques. The center has been able to offer definitive treatment to patients otherwise deemed incurable. As such, the Cerebrovascular Center is able to provide one of the busiest and fully immersive training programs in the country for residents and fellows pursuing education in cerebrovascular surgery.

The Cerebrovascular Neurosurgery Center works in close collaboration with the UPMC Stroke Institute in the treatment of ischemic cerebrovascular disease—staffed by neurologists with additional training in vascular neurology. The center's endovascular neurosurgeons and interventional neurologists perform acute interventions for ischemic strokes at one of the highest rates in the country and are involved in innumerable trials advancing the field. The Cerebrovascular Center provides comprehensive evaluation of patients with carotid stenosis. Patients are evaluated in multidisciplinary fashion to choose from an array of surgical options including carotid endarterectomy (CEA), carotid artery stenting (CAS), and transcarotid revascularization (TCAR). For patients with more complex, cerebral ischemic disease, Dr. Lang has developed one of the busiest cerebral revascularization practices in the country, offering cutting-edge cerebral bypass techniques, vascular transpositions, and other unique treatment options.

Ongoing research efforts at the Comprehensive Cerebrovascular Center continue to advance the field of vascular neurosurgery. Under Dr. Gross, UPMC served as one of the largest enrollers in the recently published EMBOLIZE trial, which has confirmed the benefits of treating chronic subdural hematomas (CDH) with endovascular embolization to reduce the need for surgical drainage and/or retreatment. The center continues to participate in clinical trials to evaluate the most cutting edge treatments for brain aneurysms, and is helping to advance the use of neural stimulation to improve patient recovery after stroke.

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.

The service has now grown to providing more than 9,000 IONM cases per year at all UPMC pavilions, as well as supporting UPP and non-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 neurological injury. In addition, CCN faculty have established two annual IONM courses and a formal, clinical 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; Katherine Anetakis, MD; Benjamin B. Lee, MD, PhD, and Lindsay Bhandari 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, Susquehanna, Western Maryland and Pinnacle. In addition, the CCN provides professional and technical services at Excela Health System, Indiana Regional Hospital and Trinity Health System. The CCN faculty can 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 in real-time 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 (dcsMEP) electroencephalography (EEG) and electromyography (EMG). Direct peripheral nerve recordings (CNAP and CMAP) are also 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 can 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, with its surgical applications 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, Eric Wang, MD, and Garret W. Choby, MD, 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.

Neurotology expertise is provided through collaboration with the neuro-otology division of the Department of Otolaryngology, led by Peter Santa Maria, PhD, along with Greg Basura, MD, PhD, and Philip Perez, MD, to provide complex care for lateral skull base pathologies. Additional pediatric skull base expertise is provided by Cody Nesvick, MD in neurosurgery and Amanda Stapleton, MD, in otolaryngology, caring for all types of pituitary and skull base tumors in children. This combined team concept of adult skull base and pediatric surgeons provides a unique group expertise.

Finally, radiosurgery plays a key role in skull base disease, leading to regular collaboration with Costas Hadjipanayis, MD, PhD, director of the UPMC Center for Image-Guided Neurosurgery, Ajay Niranjan, MD, and 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 5,000 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 of options for cutting-edge treatment of skull base disease. In addition, the Center for Cranial Base Surgery has also been designated as a Pituitary Tumor Center of Excellence by the UPMC Health Plan, setting the standard for pituitary tumor treatment in the region. This designation is based on high volume practice with regular metrics which uphold a high standard of care for the entire UPMC system.

Drs. Gardner, Snyderman, Zenonos, Wang and Choby, along with oculoplastic surgeon Tonya Stefko, MD, from the Department of Ophthalmology, and Drs. Santa Maria and Perez 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. Research activities are coordinated by Benita Valappil, MPH, clinical research director, and include participation in multicenter trials, banking of tumor tissue for genetic and molecular research, and maintenance of clinical research database. The UPMC Cranial Base Center continues to push the field of skull base surgery forward with a combination of clinical innovation and basic science research. Via collaboration with bench researcher at UPMC and other institutions, the center is developing new ways to understand and treat skull base tumors, using outcomes-based data combined with in depth molecular and genetic tumor sequencing to provide individualized care for skull base disease.

Supported by expert advanced practice practitioners Rachel Wrigley, Jada Dooley, Shannon Casey, Destiny Seay and a highly experienced subspecialty nursing team, patients are evaluated and guided through even the most complex, multidisciplinary care, provided to patients throughout the region, across the United States and around the globe.

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 and research destination for surgeons and other health care professionals looking to learn more about these techniques. Faculty teach three CME courses yearly 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.

The center has also been designated as a "Multidisciplinary Team of Distinction" by the North American Skull Base Society. This designation is based on meeting NASBS membership criteria for multidisciplinary participation.

Epilepsy, Movement Disorders and Psychiatry Surgical Program

The Epilepsy, Movement Disorders and Psychiatry Surgical Program, under the direction of Jorge A. González-Martínez, MD, PhD, at the University of Pittsburgh encompasses the treatment of medically intractable epilepsy, movement disorders and psychiatry disorders. These pathological neurological conditions 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. Dr. González-Martínez has expertise in both adult and pediatric patients. Pediatric patients are treated at the UPMC Children's Hospital of Pittsburgh, one of the best pediatric hospitals in the country, as noted in *U.S. News and World Report*.

UPMC also houses the region's foremost centers for the comprehensive neurosurgical treatment of all types of adult and pediatric epilepsy, including epilepsy caused by lesions visible on MRI (mesial temporal sclerosis, cortical dysplasia, neurodevelopmental brain tumors, cavernous malformations, etc.) and epilepsy where the seizure onset location is not obvious and must be localized by intracranial monitoring, including stereo-electroencephalography (SEEG). Part of the University of Pittsburgh Comprehensive Epilepsy Center, the surgery program is one of the busiest—and most renowned—programs offering the latest less invasive, innovative and conventional surgical treatments, including responsive neurostimulation, laser thermal ablation, deep brain stimulation and incisionless endoscopic nasal resections in patients with temporal lobe epilepsy.

Dr. González-Martínez, 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, many procedures are performed under robotic guidance. In addition of developing and implementing the SEEG method in North America, Dr. González-Martínez is also a pioneer in robotic surgery, having performed more than 1,000 procedures using this technique. The University of Pittsburgh has the largest experience in robotic neurosurgery in the country and was one of the first institutions in adopting the novel technology.

In addition to clinical activities, The Epilepsy, Movement Disorders and Psychiatry Surgical 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, Carnegie Mellon University Department of Biomedical Engineering, John Hopkins University and Aix Marseille University in France. The program's research activities are led by Dr.

González-Martínez and his research team and conducted through the University of Pittsburgh Cortical Systems Laboratory.

Human Neural Prosthetics Program
The Human Neural Prosthetics Program—under the surgical direction of Jorge A. González-Martínez, MD, PhD—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 with spinal cord injury. 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 principal 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 principal 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 the program's research team to include the University of Chicago. The program joins Sliman Bensmaia, PhD, and Nicholas Hatsopoulos, PhD, to expand the program's 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. Program faculty 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.

Neuroprothetics and spinal cord stimulation expert Marco Capogrosso, PhD—director of the department's Spinal Cord Stimulation Laboratory—provides unparalleled support through his research efforts in spinal cord injury (SCI) and limb motor control.

In June of 2021, the program was awarded a $6.37 million National Institutes of Health grant to study how population dynamics in motor cortex change with behavioral context and how they are shaped by sensory feedback. Through this proposal, researchers hope to gain a better understanding of how motor cortical activity generalizes across static and dynamic behaviors as well as the potential to drive plasticity within cortical circuits that communicate sensorimotor information, which has relevance for understanding skill learning and improving rehabilitation after injury.

As research in spinal cord injury continues, Dr. Capogrosso is also working with Peter Gerszten, MD, and Robert Friedlander, MD, to verify if SCS should not only be seen as a therapy for SCI alone, but more generally as an intervention to tackle dysfunction of the corticospinal tract-motoneuron-sensory afferent circuit in the spinal cord, the building block of movement. They have subsequently started two parallel clinical trials: the first is to explore the effects and mechanisms of SCS for the recovery of upper limb motor control after stroke and the second trial is exploring the effects and mechanisms of SCS for the treatment of motor deficits in patients with spinal muscular atrophy, a genetic disease of the Ia-motoneuron system. The group recently reported the preliminary findings of their stroke trial demonstrating that SCS improved strength, dexterity, and motor control in the first two participants suffering from moderate and severe chronic stroke. While they continue to collect data on preliminary safety and efficacy in both trials, they are simultaneously conducting a battery of imaging and electrophysiology tests in order to study the mechanisms of SCS outside the application of SCI. Drs. Capogrosso, Friedlander and Gerszten hope to be able to show that SCS is a disease modifying intervention for dysfunctions of the spinal sensorimotor units and, therefore, could be applied to a variety of disorders of this simple but critical neural unit in motor control. Hopefully, this research program will contribute to the global efforts to defeat paralysis in all its forms.

Center for Image-Guided Neurosurgery

The Center for Image-Guided Neurosurgery (CIGNS) directed by Constantinos Hadjipanayis, MD, PhD, incorporates the expertise of individuals in neurosurgical oncology, Gamma Knife stereotactic radiosurgery, stereotactic and functional neurosurgery, neuro-oncology, radiation oncology, and neuroradiology. Ajay Niranjan, MD, MBA, is associate director of the center and L. Dade Lunsford, MD, is director emeritus. The goal of the center is to provide quality patient care using minimal access or minimally invasive stereotactic and radiosurgical technology, MRI-guided focused ultrasound, and image-guided brain tumor surgery that includes fluorescence-guided surgery, use of a robotic-assisted exoscope for microneurosurgery, robotic-assisted stereotactic biopsies of brain tumors, and endoscopic colloid cyst removal. The CIGNS is actively involved with clinical trials that include intraoperative photodynamic therapy (PDT), intraoperative detection of brain tumors, and new studies of a personalized vaccine-based immunotherapy approach and a focused ultrasound treatment in combination with immunotherapy for brain tumor patients.

The CIGNS is a leader in advanced imaging of the brain that incorporates magnetoencephalography (MEG). 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. The CIGNS was also the first North American center to initiate a clinical program for Gamma Knife stereotactic radiosurgery in 1987 and continues to be an international 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 2024, the center upgraded one of its units to the latest generation Gamma Knife,

Esprit, which incorporates advanced robotics, expands the role of radiosurgery to include cranial vertebral junction targets, provides greater patient access, and enhances patient safety. Both the existing ICON® Gamma Knife and the new Esprit system incorporate a cone beam CT imaging system to facilitate a mask stereotactic fixation system for selected patients.

Gamma Knife technology represents one of the most advanced and minimally invasive methods to treat patients with brain tumors, skull-based tumors, arteriovenous malformations (AVMs), and pain or movement disorders. Over 18,000 patients have undergone Gamma Knife stereotactic radiosurgery at UPMC Presbyterian since 1987. In addition, spinal radiosurgery using several radiosurgical systems is offered under the direction of neurosurgeon Peter Gerszten, MD, who serves as the Peter E. Sheptak Endowed Professor at the University of Pittsburgh.

In June 2025, the CIGNS established a new therapeutic device to its armamentarium for disorders of the brain that incorporates focused ultrasound and use of a sophisticated new MRI. The minimally invasive and incisionless technology termed, ExAblate Neuro, is the first focused ultrasound system in western Pennsylvania. This device represents the next generation of image-guided neurosurgery and is FDA-approved for lesional thalamotomy for essential tremor. The new focused ultrasound technology will also be used in research studies for patients with brain tumors in combination with novel therapeutic agents. The ExAblate Neuro system will be used in research studies with Alzheimer's and epilepsy patients as well. Jorge González-Martínez, MD, PhD, and Dr. Niranjan, will be actively treating patients with the ExAblate Neuro system for essential tremor in addition to Dr. Hadjipanayis who will be engaged in research studies on brain tumors.

A major focus of the CIGNS is sophisticated imaging of the brain to localize important functions of the brain (speech, motor, vision, and sensory functions). In 2021, UPMC installed the new MEGIN TRIUX® Neo magnetoencephalography (MEG) unit to perform functional brain mapping in patients with brain tumors, epilepsy, trauma, and degenerative brain disorders. The MEG is routinely used in the CIGNS for presurgical planning and determination of important regions of the brain to avoid for safer surgery by neurosurgical oncologists and epilepsy surgeons. Dr. Niranjan is the operations director of MEG and Andre Pereira is the lead technologist. He continues to pursue cutting edge MEG research that seeks to develop more specific paradigms to pinpoint the anatomic areas of speech, visual, motor, and sensory function.

The CIGNS is 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, neuro-otologists, 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—during the early COVID pandemic—the center offered online Gamma Knife training courses. Course participants from around the world become "temporary" students at the University of Pittsburgh for one week. Instruction is possible using more than 35 lectures, videos, and course materials. Hands on training in collaboration with Elekta, Inc. allows students to turn their personal computers temporarily and remotely into radiosurgery planning workstations. Courses as of 2025 are now hybrid courses where participants can study remotely but also have the option of traveling to Pittsburgh for hands-on training in person.

CIGNS also participates in the training of selected fellows who compete for the Leksell Gamma Knife Society three-month fellowship in Pittsburgh. Finally, neurosurgery residents at UPMC spend a three-month dedicated block for study during their third year of training to complete certification in brain radiosurgery, typically participating in more than 150 cases during the rotation.

In addition, the center conducts numerous clinical, long-term outcome research projects (typically producing 20+ peer reviewed publications each year). CIGNS 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 United States, Asia, Africa, Europe, and Asia. Multiple retrospective clinical trials have been published or are underway. More than 10,000 articles have now been published worldwide in the field of stereotactic radiosurgery. The University of Pittsburgh has the highest number of studies, having been cited more than 100 times.

Each year, more than 600 patients undergo Gamma Knife radiosurgery at the CIGNS, making it one of the busiest centers in the world. Each year, center faculty publish approximately 20 clinical research studies, now exceeding more than 800 combined peer reviewed publications and over 1,500 publications when book chapters and presentations are included.

In 2022, the third edition of *Intracranial Stereotactic Radiosurgery* was released by CRC Press, with Dr. Lunsford, and Jason Sheehan, MD, co-director of the Gamma Knife Center at the University of Virginia—and former fellow at the University of Pittsburgh—serving as editors.

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. The CAST-approved fellowship has two tracks, one for candidates interested in a functional focus (movement disorders, pain, and epilepsy with study supervised by Dr. González-Martínez) and one for candidates focusing on neurosurgical oncology and radiosurgery (supervised by Drs. Hadjipanayis, Lunsford and Niranjan). The functional track includes epilepsy and movement disorder experience plus three months on the radiosurgery service. The radiosurgery track includes nine months on the radiosurgery service and three months on the functional service. Currently, all PGY-3 residents spend three months each on the Gamma Knife service each year. In addition, there is now a CAST-accredited neurosurgical oncology fellowship incorporating GK radiosurgery into the curriculum in addition to surgical resection of primary brain, skull-based, and spinal tumors at UPMC Presbyterian and UPMC Shadyside.

The multidisciplinary CIGN includes the clinical and research efforts of radiation oncologists John Flickinger, MD; Serah Choi MD, PhD; Andrew Zureich, MD; Saad Sheikh, MD; Christopher Wilke, MD; Yoshio Arai, MD. The participating medical physics group consists of Greg Bednarz, PhD, Michael Hadjuk, PhD, and Kelin Wang, PhD. The APPs include Lana Trofimova, PAC, and Louisa Urgo Shin, PAC, who provide patient care assistance for the CIGNS program. Five full-time dedicated, and very talented, nurses headed by Miranda Crum, BSN, and assisted by RNs Mark Geminetti, Zarina Corwin, Brittany Binando and Brenda Unghajer who provide pre, intra, and post radiosurgery care to more than 600 patients every year. They are all specifically trained in conscious sedation techniques to provide comfort and attentive care to patients.

Kelly Powell, Dana Adams, and Julie Martin are an extremely capable administrative team that ensures prompt patient approvals and care.

Neurosurgical Oncology Program

The University of Pittsburgh Department of Neurological Surgery neurosurgical oncology program—led by Costas Hadjipanayis, MD, PhD; Kalil G. Abdullah, MD; James Bayley, MD; and Pascal Zinn, MD, PhD—is comprised of a multidisciplinary team of researchers, physicians, and healthcare professionals dedicated to conducting cutting-edge research, delivering state-of-the-art clinical care, and developing innovative treatments for brain tumor patients. The program is one of the largest clinical and most productive basic/translational brain and spine tumor programs in

the country, encompassing research across the adult and pediatric science spectrum and supported heavily in funding from the NIH and other generous foundations.

One of the program's key strengths lies in its collaborative approach. Researchers and clinicians from diverse fields, including neurosurgery, radiation oncology, neuro-oncology, neuropathology, and neuroradiology, work together to tackle the complex challenges associated with brain and spine tumors. This multidisciplinary collaboration fosters a comprehensive understanding of tumor biology, enables faster translation of discoveries into clinical practice, and ultimately improves patient care with clinical trials.

As an international referral program for adult brain and spine tumors, the program ranks among the top 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 UPMC 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, radiology, neuropathology, 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 neurosurgery. Education, support, and counseling for family members are important parts of the program.

Neurosurgical oncology care at the University of Pittsburgh Department of Neurological Surgery includes subspecialized neurosurgeons providing the best treatments available for patients with both benign and malignant tumors of the brain and spine. Neurosurgical oncologists are dedicated to discovering novel and effective therapies for these diseases through clinical trials and translational bench-to-bedside trials based on scientific breakthroughs developed in the program's laboratories.

Neurosurgical oncology at UPMC is one of the most robust and innovative programs in the world, with one of the largest volumes of patients treated on an annual basis. The program has been a leader in the implementation of cutting-edge technologies such as stereotactic radiosurgery (SRS) using the Gamma Knife, LINAC-based stereotactic radiosurgery, and image-guided brain tumor resection. Important new and innovative technologies such as the robotic-assisted surgical exoscope, MR-guided laser interstitial thermal therapy (LITT), and fluorescence-guided surgery (FGS) are routinely employed within the brain tumor program. The use of advanced imaging modalities, such as high-definition white matter fiber tract imaging (tractography) and magnetoencephalography (MEG), has also facilitated better outcomes for selected patients with tumors. In addition, awake craniotomy techniques with brain mapping tumor are routinely used to maximize safe removal of brain tumors.

An important multidisciplinary effort towards enhancing the workflow for complex awake brain tumor surgery at UPMC includes the addition of pre-, intra-, and postoperative neuropsychological testing by Natalie Sherry, PhD, and Luke Henry, PhD. Preoperative functional imaging, including magnetoencephalography (MEG), led by Ajay Niranjan, MD, director of the UPMC Brain Mapping Center, as well as intraoperative high-definition fiber tracking (HDFT) by Frank Yeh, PhD, director of the High-Definition Fiber Tractography Lab, have permitted the identification of important functional pathways in the brain to avoid during brain tumor surgery. The integration of the world class intraoperative neuromonitoring program led by Parthasarathy Thirumala, MD, along with, Jeffrey Balzer, MD, Katherine Anetakis, MD, and Donald Crammond, PhD, permits maximal safe removal of tumors.

The medical neuro-oncology team is an important component of the program's patient care efforts and is comprised of multiple active neurooncologists led by Jan Drappatz, MD, including Megan Mantica, MD, Shirley Ong, MD, Hetal Mistry, MD, and Michal Nisnboym-Ziv, MD. This team provides outstanding care to brain tumor patients, and has multiple clinical trials open to accrual at the UPMC Hillman Cancer Center. The neuro-oncology 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.

The radiation oncology program, led by John Flickinger, MD, Serah Choi, MD, Andrew Zureick, MD, Saad Sheikh, MD, Steve Burton, MD, and Christopher Wilke, MD, provides comprehensive expertise in clinical care of a wide spectrum of benign and malignant diseases affecting the brain and spine. The leading-edge treatments used include Gamma Knife radiosurgery, LINAC based stereotactic radiosurgery, radiation therapy using a variety of technological treatment planning including 3D conformal radiation therapy and intensity modulated radiation therapy (IMRT). In collaboration with Peter Gerszten, MD, spine stereotactic body radiation therapy (SBRT) is used to treat patients with oligometastatic, and previously irradiated spinal metastases. This therapeutic approach offers a treatment option in situations where no viable options were previously available.

Another notable aspect of the neurosurgical oncology program is its commitment to education and training. The University of Pittsburgh provides robust training opportunities for aspiring neurosurgeons, neuro-oncologists, and researchers, fostering the development of the next generation of neurosurgical oncology specialists. A new CAST-approved neurosurgical oncology fellowship is now available for UPMC neurosurgical trainees. The program offers fellowship training in medical neuro-oncology. The fellowship is accredited through the United Council for Neurologic Subspecialties, directed by Megan Mantica, MD, and supported through a generous donation by the Karp family, in memory of Henry "Hank" Karp. It aims to inspire future neuro-oncologists to lead research and care innovations in the U.S. and around the world. This dedication to education helps to build a strong foundation for future advancements in brain tumor research and treatment.

Overall, the neurosurgical oncology program at the University of Pittsburgh Department of Neurological Surgery has established itself as a leading center for brain tumor research and clinical care. Its multidisciplinary approach, groundbreaking research, innovative treatments, and commitment to education make it a beacon of hope for patients and a driving force in advancing understanding and management of brain tumors.

Pediatric Neurosurgery

The Pediatric Neurosurgery Division at UPMC Children's Hospital of Pittsburgh (CHP) is led by Taylor Abel, MD, and also includes Ian Pollack, MD, Martin Piazza, MD, and Cody Nesvick, MD. The division provides care for children with tumors, spinal and cranial deformities, vascular malformations, spasticity, epilepsy and peripheral nerve disorders. The division has gained international recognition for the treatment of pediatric brain tumors, epilepsy, neurovascular surgery, cerebral palsy and movement disorders, traumatic brain injury, and disorders of the skull base and cranio-cervical junction.

The center's neurosurgeons work closely with specialists in pediatrics, surgery, radiation therapy, pediatric neuro-oncology, physiatry and rehabilitation medicine, orthopedics, plastic surgery, otolaryngology, 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 CHP. These protocols—several of which are unique to CHP or available at only a few centers throughout the country—provide CHP patients access to new treatments and promising studies.

The pediatric neurosurgery program is supported by five full-time advanced practice providers, which—along with an extensive telemedicine presence—has enabled expansion of the division's outreach program to multiple communities beyond the immediate Pittsburgh geographic area. The program's research initiatives are also supported by four full-time research coordinators, allowing the program to maintain a broad array of clinical studies, placing it on the cutting edge of pediatric neurosurgery patient care, while advancing the field in general.

• Pediatric Brain Tumor Program

Dr. Pollack is the institutional principal investigator and chair of the neurosurgery 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 at CHP 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, as well as a series of eight NIH R01, P01, and R21-funded research projects, and a cadre of rising-star investigators, including Sameer Agnihotri, PhD, Gary Kohanbash, PhD, Baoli Hu, PhD, and Antony MichealRaj, 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.

• Pediatric Epilepsy Surgery Program

The Pediatric Epilepsy Surgery Program, led by Dr. Abel, William Welch, MD, and Ruba Al-Ramadhani, MD, of the Division of Child Neurology, is the only center in the region able to provide comprehensive epilepsy surgery evaluation and performs more than 140 epilepsy surgeries each year. A comprehensive pre-surgical evaluation, using state-of-the-art neuroimaging 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. The program is one of the highest volume centers for both pediatric MR-guided laser ablation and pediatric responsive neural stimulation (RNS) in North America. For children with drug-resistant multi-focal or generalized epilepsy, all available treatment procedures are available, including MR-guided laser callosotomy, traditional callosotomy, vagus nerve stimulation, centromedian RNS, and deep brain stimulation. A multidisciplinary epilepsy surgery clinic provides streamlined, comprehensive evaluation of children with drug-resistant epilepsy for surgery.

Dr. Abel's basic research program focuses on understanding the neural basis of complex natural sound perception. This effort is funded by multiple federal grants, including funding from NINDS, NIDCD, and NSF. The epilepsy surgery program's clinical research efforts, also directed by Dr. Abel, focus on comparative effectiveness of different epilepsy surgery strategies, and is funded by both PCORI and industry.

• Pediatric Spasticity and Movement Disorder Program

The Pediatric Spasticity and Movement Disorder Program at UPMC Children's Hospital of Pittsburgh is a nationally recognized center dedicated to advancing care for children with complex movement disorders. Led by Dr. Piazza, the program combines cutting-edge research with a deeply collaborative clinical approach to improve outcomes and quality of life for young patients. Through specialized multidisciplinary clinics held weekly—including the Surgical Movement Disorders and Cerebral Palsy Clinics—patients receive individualized, comprehensive care from a team of experts in neurosurgery, neurology, rehabilitation, orthopedics, and more. Together with families, the team creates tailored treatment plans for children with conditions such as cerebral palsy, spasticity, dystonia, tremor, chorea, and athetosis.

Treatment options range from medication adjustments and equipment recommendations to advanced surgical interventions, including intrathecal and intraventricular baclofen therapy, selective dorsal rhizotomy, deep brain stimulation (DBS), orthopedic procedures, and botulinum toxin injections. The program continues the legacy of innovation established by A. Leland Albright, MD, offering unique therapies like intraventricular baclofen—developed right here in Pittsburgh. For children requiring neuromodulation, the program utilizes state-of-the-art tools like the ROSA robot and O-arm imaging to provide precise, asleep, frameless deep brain stimulation—making this therapy safer and accessible.

At its core, the program is built on partnership—with families and with other subspecialists. In addition to clinical innovation, the team is deeply engaged in research to push the field forward. Dr. Piazza leads a translational research program aimed at understanding how the brain and spinal cord functions in children with cerebral palsy, with the goal of developing new therapies for spasticity. He also directs a clinical research program focused on family-centered decision-making and comparative effectiveness modeling, helping tailor treatment plans to each child's unique needs and goals. Through this integrated approach to care and discovery, the program is shaping a better future for children with movement disorders.

• Pediatric Neurosurgery Spine Program

Pediatric Neurosurgery Spine Program, led by Dr. Piazza, provides comprehensive care for children with a wide range of spinal disorders through a collaborative, multidisciplinary approach. Working in close partnership with orthopedic surgery, anesthesiology and pain medicine, and when appropriate, neurosurgical oncology, the program offers advanced surgical and non-surgical treatments tailored to each patient's unique needs.

The team specializes in the management of complex spinal conditions, including spinal nerve injuries, disc herniations, neuromuscular scoliosis related to cerebral palsy or other neuromuscular disorders, spina bifida, and craniocervical junction abnormalities—whether congenital or tumor-related. With expertise spanning the entire spectrum of pediatric spinal pathology, the program is committed to delivering safe, effective, and family-centered care that optimizes both function and quality of life.

• Pediatric Skull-Base Program

The Pediatric Skull-Base Program, co-led by Dr. Nesvick (Neurosurgery) and Amanda Stapleton, MD, (Department of Otolaryngology-Head & Neck Surgery), is one of only a handful of programs in North America dedicated to the treatment of skull-base pathology in children. What sets the program apart is its uniquely integrated team of specialists—all with dedicated training in skull-base surgery—working seamlessly together to address some of the most challenging conditions faced by children.

This one-of-a-kind program brings together experts in neurosurgery, otorhinolaryngology, oculoplastic surgery, ophthalmology, endocrinology, oncology, neuroradiology and pathology to provide a comprehensive and personalized approach to care. Together, the team manages a wide range of skull-base pathology that includes, but is not limited to, craniopharyngioma, chordoma, schwannoma, meningioma, meningoencephaloceles, pars intermedia (Rathke cleft) cysts, and pituitary adenomas. In a close partnership with the world-renowned Center for Cranial Base Surgery at UPMC, which pioneered the use of the endoscopic endonasal approach (EEA) to skull-base lesions, the program gives patients access to cutting-edge techniques and the highest levels of disease expertise. Beyond EEA, the program also treats selected lesions with trans-orbital, endoscopic transcranial and minimally invasive skull-base approaches.

This multimodal approach ensures that children receive the most effective, safest, and cosmetic treatments available, all with the least possible morbidity. The Pediatric Skull Base Program is more than a surgical service – it is a uniquely collaborative program that emphasizes both technical and intellectual excellence and is committed to providing world-class care for children facing some of the most challenging pathologies of childhood.

• The Neurovascular Center of Excellence at UPMC Children's Hospital of Pittsburgh
The Neurovascular Center of Excellence (NVCE) at UPMC Children's Hospital of Pittsburgh is a premier program dedicated to the diagnosis and treatment of complex neurovascular disorders in children, including arteriovenous malformations, cavernous malformations (cavernomas), moyamoya disease, cerebral aneurysms, stroke, intracerebral hemorrhage and other rare congenital vascular anomalies.

Led by a highly specialized team Alhamza Al-Bayati, MD (interventional neurology), Dr. Nesvick (neurosurgery), Elissa Orlotani, MD (neurology) and Dana Cummings, MD, PhD, (neurology), the NVCE integrates expertise from across the entire spectrum of specialties to provide a unified, technically advanced approach to treating the most complex neurovascular disorders in children.

The NVCE collaborates seamlessly with the Vascular Anomalies Center and hereditary hemorrhagic telangiectasia (HHT) Center of Excellence for patients with multi-system vascular disorders, providing care that is as comprehensive as it is convenient.

When surgical treatment is required, the NVCE emphasizes both precision and safety. Dr. Al-Bayati and Dr. Nesvick collaborate frequently to provide advanced treatments, which include:

- Microsurgical resection of arteriovenous malformations (AVMs) and cavernomas (cavernous malformations).
- Occlusion of intracranial aneurysms.
- Cerebral revascularization (e.g., pial synangiosis) for moyamoya disease.
- Endovascular interventions, including intracranial stenting

In addition to surgical and interventional approaches, the NVCE also works closely with UPMC's Center for Image-Guided Neurosurgery for treatment of select intracranial lesions with Gamma Knife stereotactic radiosurgery, a highly precise type of radiotherapy used to treat select complex cranial conditions with minimal morbidity.

By combining leading-edge technology with multidisciplinary expertise, the NVCE at UPMC Children's stands at the forefront of pediatric neurovascular care, delivering the safest, most effective treatment for children with even the rarest and most complex vascular conditions of the brain and spine.

• Craniofacial Program

The division is an integral collaborator with Pediatric Plastic Surgery 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 to adolescence in order to optimize long-term functional and cosmetic outcome. The center offers a panoply of surgical options, ranging from innovative endoscopic techniques that have been refined at CHP, as well as a broad range of open approaches carefully tailored to the child's anatomy.

• Congenital Neurosurgery Program

In conjunction with a team of specialists at UPMC Magee-Womens Hospital, the division has established a program to treat babies with myelomeningocele, or open 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 of Pittsburgh, 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 division collaborates with maternal-fetal medicine, neonatology, and supportive care experts at UPMC Magee-Womens Hospital as co-PI on multiple grants to study in utero treatment of congenital aqueductal stenosis, a common cause of hydrocephalus.

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 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, CHP 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. These efforts have led to dozens of publications that have helped to advance the field in collaboration with other consortium sites.

• National and International Leadership in Pediatric Neuroscience

Finally, division members maintain an active role in organized neurosurgery and allied fields. In addition to his consortium involvement, Dr. Pollack serves as chair of the American Board of Pediatric Neurosurgery, a director on the Accreditation Council for Pediatric Neurosurgical Fellowships, and a principal investigator with the Children's Brain Tumor Network. Dr. Abel serves on the board of directors for the Pediatric Epilepsy Alliance. Dr. Abel also serves on board of directors of the American Epilepsy Society where he is chair of the American Epilepsy Society membership council. Dr. Abel serves on multiple committees in the American Epilepsy Society and AANS/CNS Section on Pediatric Neurosurgery, including the AES Membership Council, the AES Neurosurgery Task Force, and is the founding chair of the AES Early Career Committee. Dr. Abel also serves on the AANS/CNS Joint Guidelines Committee.

Pituitary Center

Over the past two decades, there has been a dramatic shift in the standard of care for pituitary surgery with the introduction of endoscopic techniques. The UPMC Center for Skull Base Surgery has been a pioneer and leader in the development of these techniques and has performed over 5,000 endoscopic endonasal skull base procedures. As part of this effort, since the introduction of the endoscopic endonasal approach, more than 2,000 pituitary surgeries have been performed at the UPMC Pituitary Center, and the surgical team, consisting of Paul Gardner, MD, and Georgios Zenonos, MD, from neurosurgery, and Carl Snyderman, MD, MBA, and Eric Wang, MD, from otolaryngology, currently performs more than 100 operations for pituitary tumors every year. The Pituitary Center of Excellence is led by a dedicated neuro-endocrinology team of Pouneh K. Fazeli, MD, (director), Hussain Mahmud, MD, and Esra Karslioglu-French, MD who specialize in the medical treatment of patients with pituitary tumors and pituitary-related hormone deficiencies or over-production.

Numerous studies now show better outcomes and lower complication rates in centers with more experienced pituitary surgeons. This experience–outcome effect is likely more pronounced in complex cases such as invasive adenomas, reoperations for recurrent adenomas, giant pituitary adenomas, Cushing's disease, and acromegaly.

As a result, the Pituitary Society has proposed consensus criteria for pituitary centers of excellence (PCOEs), including a baseline requirement of 50 surgical cases per year. In addition, multidisciplinary care via a center of excellence model has been espoused and its advantages well described, even leading to a call for accreditation for PCOEs. Based on the above, combined with UPMC's long-standing expertise and major role in the development of endoscopic pituitary surgery, it is logical that UPMC create a system-wide pathway of care for pituitary tumors. This has led to formation of official pituitary center of excellence criteria within UPMC and recognition of COE status for the skull base center surgeons. The Pituitary Center of Excellence tracks and maintains specific criteria for clinical care, ensuring low complication rates and excellent overall outcomes. In addition, in conjunction with co-surgeon/pediatric neurosurgeons, the Center for Skull Base Surgery is the only group with expertise in pediatric skull base surgery and performs pediatric pituitary surgeries at UPMC Children's Hospital of Pittsburgh.

All physicians on the current pituitary COE team are subspecialty trained. The UPMC Pituitary Center is a multidisciplinary team which includes: neurosurgery, endocrinology, otolaryngology, neuro-ophthalmology, neuroradiology/head and neck radiology, endovascular neurosurgery, radiation oncology (including Gamma Knife radiosurgery), neuroanesthesia, neuro-oncology, and neuropathology. As one of the leading centers for pituitary tumors worldwide, the center's triple mission is to provide comprehensive care and support to patients with pituitary disorders; to provide residency and fellowship training, as well as continuing medical education in the management of pituitary and neuroendocrine disease; and to contribute to basic science and clinical research in pituitary disorders. As a result of this collaboration, UPMC has become a regional, national and international center for referral.

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.

D. Kojo Hamilton, MD, is the director of the Neurosurgical Spine Services Division and chief of spine at UPMC Presbyterian. David O. Okonkwo, MD, PhD, leads the spine trauma and spinal deformity program and Dr. Hamilton provides specialty care in the treatment of cervical misalignment and spinal deformity. Peter C. Gerszten, MD, MPH, leads the percutaneous and spine radiosurgery programs. Thomas J. Buell, MD, joined the division with an expertise in complex open and minimally invasive degenerative spine surgery. Nitin Agarwal, MD, leads the division's minimally invasive spine and robotics surgery program. He also participates in complex second opinion referrals and open complex deformity surgery.

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 spine and robotics surgery program, led by Dr. Agarwal, offers quick recovery and the latest innovative techniques for a variety of spinal conditions including artificial disc replacement, robotic spine surgery, navigation-assisted surgery, endoscopic spine surgery and awake outpatient surgery. With advances in surgical technology, less invasive surgical options are employed while maintaining unparalleled precision and accuracy

The spinal deformity program, led by Dr. Okonkwo, offers full-scale analysis, longitudinal tracking and treatment interventions for patients with scoliosis and thoracolumbar spinal deformity. The team of deformity practitioners continues to push the surgical envelope and combines 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.

The Spine Division supports two distinct fellowship tracks under the leadership of Dr. Hamilton. One track is for those interested in spine and neurotrauma, under the co-direction of Dr. Okonkwo. The other track is for those interested in complex and minimally invasive spine deformity, under the co-direction of Dr. Agarwal. One fellow each per track per year.

Accomplishments and Highlights for Fiscal Year 2024-25

July 2024

- A multidisciplinary group of investigators at the University of Pittsburgh Department of Neurological Surgery and the Barrow Neurological Institute in Phoenix, Ariz., created an interactive molecular atlas of traumatic brain injury in mice, which may help doctors use precision medicine to target treatments for TBI patients in the future. Gary Kohanbash, PhD, was co-senior author on the research published in *Neuron*.

- David Okonkwo, MD, PhD, was appointed as one of five new members to the University of Virginia's governing Board of Visitors.

- Joseph Maroon, MD, offered in-depth comments on President Joe Biden's health status on Newsmax's *Wake Up America* after reviewing medical records.

- A Costas Hadjipanayis, MD, PhD, glioblastoma patient was the first in the United States to receive revolutionary photodynamic therapy treatment to help remove a brain tumor and was featured on WPXI-TV (Pittsburgh).

- Sakibul Huq, MD, and Nitin Agarwal, MD, were awarded grant funding totaling almost $300,000 from the prestigious Beckwith Institute Clinical Transformation Program to fund innovative research initiatives. Dr. Huq received a $175,000 award for his project "Liquid Biopsy in Neurosurgery" while Dr. Agarwal received a $119,000 award for his project "Utilizing AI to Investigate the Efficacy of Romosozumab in Boosting Bone Density and Muscle Mass for Improved Spine Surgery Outcomes."

- Ian Pollack, MD, was awarded a $150,000 grant from the V Foundation for Cancer Research for his project "Metabolic Strategies to Improve Outcome for DIPGs." The award is funded in partnership with the World Wrestling Entertainment (WWE) Connor's Cure initiative, a longstanding supporter of various innovative brain tumor projects in the UPMC Children's Hospital of Pittsburgh Brain Tumor Research Program.

August 2024

- The UPMC Center for Image-Guided Neurosurgery—under the direction of Costas Hadjipanayis, MD, PhD—performed their 19,000th Gamma Knife procedure. First introduced in North America in 1987 at then Presbyterian University Hospital by L. Dade Lunsford, MD, the Gamma Knife pioneered minimally invasive stereotactic radiosurgery, providing a single-day outpatient strategy for a wide variety of vascular, tumor, pain, and abnormal movement indications.

- Hussam Abou-Al-Shaar, MD, was awarded the Columbia Softball Skull Base Award by the Congress of Neurological Surgeons for his abstract "Vestibular Schwannoma Koos Grade I International Study of Active Surveillance Versus Stereotactic Radiosurgery: the VISAS-K1 Study." The Columbia Softball Skull Base Award is given to a high-ranking abstract related to skull base surgery by a resident or medical student.

September 2024

- A study providing a quantifiable assessment of possible dangers associated with professional slap fighting competitions, conducted by fellow Raj Swaroop Lavadi and Nitin Agarwal, MD, was published in *JAMA Surgery* and received widespread media attention. Other authors of this research included Rohit Prem Kumar, MD; Michael Kann; Manan Shah, MD; D. Kojo Hamilton, MD; and Joseph Maroon, MD.

- Vincent Miele, MD, was announced as a winner of UPMC's 2024 Excellence in Patient Experience Award. The award recognizes physicians highly rated by their patients. Of the more than 5,000 UPMC physicians, Dr. Miele was among only 46 recipients of the award for 2024.

- L. Dade Lunsford, MD, was honored with the Congress of Neurological Surgeon's Founder's Laurel Award at the CNS Annual Meeting in Houston, Texas. The award recognizes individuals who have made exceptional contributions to neurosurgery education. *(See page 211)*

October 2024

- David Okonkwo, MD, PhD, was featured on a UPMC *Physician Journal* video discussing a breakthrough, FDA-approved rapid blood test designed to help in the earlier diagnosis of mild traumatic brain injuries.

- Indiana University established the Joseph C. Maroon Professorship in Neuroscience Innovation. The award recognizes Dr. Maroon—a BA'62/MD'65 graduate of the university—for his many contributions to neuroscience, sports medicine, neuro-oncology and the field of neurosurgery in general.

- The UPMC Specialty Care Center in Wexford, Pa., was renamed the UPMC Matt El-Kadi Spine Center in honor of the long-time Department of Neurological Surgery spine specialist, caring for his patients for over 25 years in the Pittsburgh area.

November 2024

- Joseph Maroon, MD, received the first-ever Legends of Excellence Award from The Chuck Noll Foundation for Brain Injury Research at the foundation's inaugural Legends Unite event. The award honored Dr. Maroon for his groundbreaking contributions to concussion and brain injury research.

- D. Kojo Hamilton, MD, was presented with a Larry E. Davis Black Excellence in the Academy Award by the University of Pittsburgh Office of the Provost. The award is one of a series of awards given annually honoring Pitt Black faculty members for their outstanding achievements, contributions and leadership.

- D. Kojo Hamilton, MD, was a guest on the Congress of Neurological Surgeon's *Optimizing Neurosurgical Practice* podcast discussing how to effectively train neurosurgery residents—balancing expectations, feedback and support.

December 2024

- Fellow James Mooney, MD, and his Team AO Spine North America teammates—Mousa Hamad, Hannah Groff and Stephane Owusu-Sarpong—won the 2024 AO Davos Hammerschlagen competition held in Zurich, Switzerland.

- Nitin Agarwal, MD, and Natlie Sherry, PsyD, MBA, ABPP-CN, received grant awards from the UPMC Presbyterian Medical Executive Committee for education and collaboration projects.

February 2025

- David Okonkwo, MD, PhD, was awarded the Arthur C. Rettig Award for Academic Excellence from the National Football League Physicians Society for his work in concussion research.

- Marco Capogrosso, PhD, was featured on WTAE-TV (Pittsburgh) showing how electrical stimulation research is helping patients with spinal muscular atrophy regain movement in their arms. *(See page 254)*

- Pravat Mandal, PhD, and Ava Puccio, RN, PhD, were awarded grants totaling $400,000 from the Chuck Noll Foundation for Brain Injury Research.

- A Jorge González-Martínez, MD, PhD, patient underwent a rare corticectomy procedure involving extremely precise resections to help halt epileptic seizures and was featured in the *Pittsburgh Post-Gazette*.

- A University of Pittsburgh/Marco Capogrosso, PhD, study showing the first use of spinal cord stimulation to help restore motion in patients suffering from deadly Type 3 spinal muscular atrophy was featured in the *Pittsburgh Post-Gazette*.

- Marco Capogrosso, PhD, was interviewed on NPR Radio commenting on his experimental treatment that stimulates the spinal cord, helping restore movement in patients with spinal muscular atrophy.

- Zhimin Huang, PhD, was awarded a $100,000 Faculty Starter Grant in Drug Delivery from the Pharmaceutical Research and Manufacturers of America (PhRMA) Foundation. The grant supports Dr. Huang's efforts to advance noninvasive, site-specific brain therapeutics, helping bring researchers closer to precision treatments that enhance therapy duration and efficacy while minimizing side effects.

March 2025

- Gary Kohanbash was featured on WTAE-TV (Pittsburgh) discussing his publish study that shows how regular T-cells can be customized to fight and destroy tumor cells.

- Ritesh Karsalia, MD; Najib Muhammad, MD; Abhinav Pandey, MD; Rohit Prem Kumar, MD; and Sangami Pugazenthi, MD, matched into the University of Pittsburgh Department of Neurological Surgery residency program.

- The University of Pittsburgh Department of Neurological Surgery announced the establishment of the John J. Moossy Award for Excellence in Neurosurgery, given annually to a University of Pittsburgh medical student interested in the field of neurosurgery, providing the recipient with a summer research internship in a neurosurgery laboratory. *(See page 54)*

- Two University of Pittsburgh Department of Neurological Surgery startups—Lexi Medical and Astria Bioscience—were cited by the *Pittsburgh Business Times* as two of ten most promising tech startups in Pittsburgh to watch in robotics, AI and life sciences.

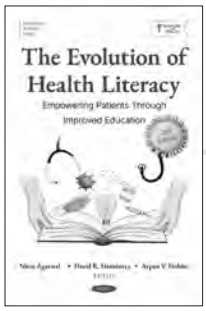
- Thirteen University of Pittsburgh neurosurgeons were named among the top doctors in the field of neurological surgery in a national survey conducted by Castle Connolly. The list includes J. Brad Bellotte, MD; Matt El-Kadi, MD, PhD; Robert Friedlander, MD; Paul Gardner, MD; Peter Gerszten, MD; Jorge González-Martínez, MD, PhD; Costas Hadjipanayis, MD, PhD; D. Kojo Hamilton, MD; L. Dade Lunsford, MD; Vincent Miele, MD; David Okonkwo, MD, PhD; Daniel Wecht, MD; and Pascal Zinn, MD, PhD.

- Robert Friedlander, MD, was featured in a *Pittsburgh Post-Gazette* article discussing brain tumor awareness.

- Thieme Publishers published a new online resource guide—*The Infographic Guide to Neurosurgery*—authored by Nitin Agarwal, MD, and David Fernandes Cabral, MD, that provides a detailed, visual guide on a host of neurosurgical topics. Medical students Samuel Adida and Regan Shanahan contributed to this guide.

- Natalie Sherry, PsyD, MBA, ABPP-CN, appeared on a Parkinson Foundation of Western Pennsylvania webinar describing how Parkinson's disease can affect thinking, memory, mood, and behavior.
- Martin Piazza, MD, was awarded the Basic and Clinical Aspects of Dystonia Award from the Dystonia Medical Research Foundation for his project "Neurosurgery in Pediatric Dystonia: A Multimodal Analysis of Complex Decisions."
- Lilly Tang—a Pitt med student working with Jorge González-Martínez, MD, PhD, and Elvira Pirondini, PhD—was awarded the AANS Neurosurgery Research & Education Foundation Medical Student Summer Research Fellowship Best Abstract Award for her abstract "Advancing Neuromodulation: DBS of the Motor Thalamus for Speech and Swallowing Restoration."

April 2025



- The Giorgio Foundation and the University of Pittsburgh announced the establishment of The Giorgio Foundation Endowed Chair in the Department of Neurosurgery with a total commitment of $2 million. This gift will support groundbreaking research in neurological conditions, with a specific focus on neurofibromatosis type 1. *(See page 256)*
- Nova Science Publishers released the second edition of *The Evolution of Health Literacy: Empowering Patients Through Improved Education*, co-authored by Nitin Agarwal, MD.
- Thieme Publishers released the second edition of *Neurosurgery Fundamentals*, a portable reference source that enables swift assimilation of neurosurgical care essentials for medical students and residents, authored by Nitin Agarwal, MD.
- The Spine Bionics startup team of Nitin Agarwal, MD, Amir Alavai, Benjamin Carnovale and William Rabon took second place in the University of Pittsburgh Big Idea Competition for their work with meta-tribomaterial spinal fusion implants.
- Senior research fellow Rida Mitha, MD, received the best research poster award at the 2025 Annual Meeting of the Neurosurgical Society of Pittsburgh for her research highlighting the need to advance equity and support for physician mothers in neurosurgery.

May 2025

- Cody Nesvick, MD, won the 2025 AANS/CNS Pediatric Section Grant for his project "A Novel Therapeutic Avenue for Atypical Teratoid Rhabdoid Tumor."
- Thirteen University of Pittsburgh neurosurgeons were included on a list of "healthcare neurosurgery and spine research all-stars for 2025" in a study conducted by healthcare analytics company Avant-garde Health. The list includes Kalil Abdullah, MD; Taylor Abel, MD; Nitin Agarwal, MD; Robert Friedlander, MD; Paul Gardner, MD; Peter Gerszten, MD; Jorge González-Martínez, MD, PhD; Bradley Gross, MD; Costas Hadjipanayis, MD, PhD; Michael Lang, MD; Ajay Niranjan, MD David Okonkwo, MD, PhD; and Pascal Zinn, MD, PhD.

- Joseph C. Maroon, MD, was honored as an Ellis Island Medal of Honor recipient at a special black-tie gala in Ellis Island's Great Hall in New York. The honor, officially recognized by both Houses of Congress as one of our nation's most prestigious awards, celebrates "Americans who are selflessly working for the betterment of our country and its citizens." *(See page 7)*
- Oliver Tang, MD, was selected as one of 12 nationwide incoming fellows for the 2025-26 Council of State Neurosurgical Societies (CSNS) Socioeconomic Fellowships.

- David Okonkwo, MD, PhD, was a guest on Practical Neurology's *Neuro Frontiers* podcast discussing important updates to guidelines for the assessment of traumatic brain injury, including game-changing breakthrough for biomarker neurological disorder testing.

- Rehab Neural Engineering Labs researcher Jordyn Ting received a $100,000 translational research award from the Hunter Family Foundation to support her research on whether deep brain stimulation in the motor thalamus can improve speech and swallowing in patients with a traumatic brain injury.

- David Okonkwo, MD, PhD was a guest on the WJCT-TV (Jacksonville, Fla.) *News Health Program* discussing concussions, the long-term consequences of head injuries, and how contact sports and technology are evolving to address the concussion crisis.

- UPMC Center for Cranial Base Surgery—under the direction of Paul Gardner, MD, and Georgios Zenonos, MD, in the Department of Neurological Surgery; Carl Snyderman, MD, MBA, Eric Wang, MD, and Garret W. Choby, MD, in the Department of Otolaryngology; and Tonya Stefko, MD, from the Department of Ophthalmology—performed its 5,000th endoscopic endonasal approach (EEA) skull base surgery procedure.

- The inaugural University of Pittsburgh Longitudinal Attending-Resident-Student Mentorship Initiative (LAMI) event was held. Led by Nitin Agarwal, MD, and medical student Regan Shanahan, the program aims to provide tiered mentorship to students across various levels of training.

June 2025

- Joseph Maroon, MD, was featured in a TribLive.com article that looked at the career path that led him to his prestigious Ellis Medal of Honor Award.

- Brain therapeutics researcher Zhimin Huang, PhD, was featured on the PhRMA Foundation website for his work developing a new technology that uses focused ultrasound to activate drugs in specific parts of the brain.

- Ava Puccio, RN, PhD received the Mary Ann Liebert Award for Science from the National Neurotrauma Society. The award recognizes a female researcher who has made notable career scientific contributions in the field of neurotrauma and who has made recent impactful contributions to education, mentoring or advocacy.

- The Joseph C. Maroon UPMC MRI-Guided Focused Ultrasound (FUS) Unit was dedicated at UPMC Presbyterian marking a paradigm shift in precision brain surgery, opening a whole new era of minimally invasive treatment for such things as Parkinson's disease, dystonia, essential tremor and more. *(See next page.)*

Maroon Focused Ultrasound Unit Dedicated at UPMC

The Joseph C. Maroon UPMC MRI-Guided Focused Ultrasound (FUS) Unit was dedicated June 27, 2025 at the UPMC Center for Image-Guided Neurosurgery, marking a paradigm shift in precision brain surgery.

Focused ultrasound is a non-invasive technology that uses precisely targeted sound waves to treat deep areas of the brain without the need for surgery or radiation. Depending on the frequency used, FUS can either generate heat to treat conditions such as essential tremor and tremor-dominant Parkinson's disease or create mechanical effects that temporarily open the blood-brain barrier. This latter approach is currently under investigation to improve the delivery of medication for conditions such as brain tumors, epilepsy and Alzheimer's disease.

FUS treatments are guided by real-time MRI imaging, allowing for submillimeter precision and ongoing monitoring during the procedure. Because it is incisionless, focused ultrasound offers patients a faster recovery, fewer complications, and minimal side effects compared to traditional surgical approaches. Many patients with essential tremor or Parkinson's disease experience significant tremor reduction immediately after treatment.

At the University of Pittsburgh, focused ultrasound is part of a comprehensive, patient-centered program led by a highly specialized multidisciplinary team. Each patient is carefully evaluated by experts from multiple fields—including neurosurgery, movement disorders, epilepsy and radiosurgery—to determine the safest and most effective treatment path based on their unique clinical needs.

The program is co-directed by Costas Hadjipanayis, MD, PhD, director of the UPMC Center for Image-Guided Neurosurgery and Jorge A. González-Martínez, MD, PhD, director of the UPMC Epilepsy and Functional Neurosurgery Program.

Dr. González-Martínez is internationally recognized for his pioneering work in functional neurosurgery and epilepsy, including advanced techniques such as stereo-electroencephalography (SEEG), SEEG-guided laser ablation, and robotic-assisted surgeries. He is actively expanding the use of focused ultrasound for patients with neurological conditions including epilepsy, addiction and psychiatric disorders through upcoming clinical trials.

Dr. Hadjipanayis is a leader in minimally invasive therapies for malignant brain tumors. His groundbreaking work includes the first use of 5-ALA (Gleolan) in the U.S. for fluorescence-guided glioma surgery, and the first

intraoperative photodynamic therapy (PDT) for glioblastoma. He is currently leading and developing investigational studies that combine focused ultrasound with novel therapeutic agents to enhance treatment for difficult-to-reach tumors such as glioblastoma, brain metastases, and DIPG/DMG tumors.

The focused ultrasound program at the CIGNS is integrated into UPMC's renowned Movement Disorders and Epilepsy Program, which is among the few in the country to offer the full spectrum of treatment modalities—including medication management, deep brain stimulation, laser therapy, radiosurgery, botulinum toxin therapy and focused ultrasound. This breadth of options allows our team to provide personalized counseling and expert care, built on decades of experience treating a wide range of complex neurological conditions.

The multidisciplinary team with the UPMC focused ultrasound program includes Ajay Niranjan, MD, with the Department of Neurological Surgery; Houman Homayoun, MD, Valerie Suski, DO, and Sarah Berman, MD, PhD, movement disorder specialists with the Department of Neurology; and Thunder Aung, MD, and Alexandra Urban, MD, epilepsy specialists with the Department of Neurology.

Every patient referred for focused ultrasound undergoes a comprehensive, multidisciplinary evaluation, including an assessment of their medical history, condition, and overall health.

The FUS suite is named after Joseph Maroon, MD, a long-time proponent, innovator and visionary of minimally invasive brain and spine surgery. ■

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, an undergraduate student must obtain faculty permission and complete online 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
Department 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.

• 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. Students who have completed their core clinical training and will be in the fourth year of medical education at their LCME- or AOA-accredited home institution in North America may apply for an elective through the Visiting Student Learning Opportunities (VSLO) program. Elective rotations (subinternships) are four weeks in length.

• Clerkships
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.

• Pitt Med Neurosurgery Interest Group
The Neurosurgery Interest Group (NSIG) 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 to Pitt medical students. The goal is to provide a background of the current advances in neurosurgery to prospective students interested in a neurosurgical career.

• Longitudinal Attending-Resident-Student Mentorship Initiative (LAMI)
The Longitudinal Attending-Resident-Student Mentorship Initiative (LAMI) at the University of Pittsburgh School of Medicine is a structured program within the Department of Neurological Surgery to provide consistent, individualized guidance to medical students interested in neurosurgery.

LAMI students are placed into a tiered mentorship group that includes upperclassmen, residents and a designated attending. Students engage in a variety of activities designed to prepare them for a successful career in neurosurgery. These include regular attendance at clinical shadowing experiences in the OR and clinic, participation in subspecialty research groups, and mentorship meetings with both residents and faculty. Structured monthly and quarterly meetings provide checkpoints for research progress, career guidance, and navigating milestones such as UPSOM research requirements, away rotations, and ERAS.

The program equips creates a pipeline for engaged, motivated future neurosurgeons to develop the tools and network necessary for a successful application and career. Students are eligible to apply the winter of their MS1 year.

• Flex Week
The University of Pittsburgh School of Medicine's Three Rivers Curriculum affords students the opportunity to dedicate a "Flex Week" to research, shadowing, and professional development.

The goals of Flex Week include:

- Enhance research and literature review skills through HSLS classes.
- Complete preliminary data collection for assigned sub-project.
- Foster learning and collaboration in neurosurgery with classmates.

Flex Week offers students protected time to work through the beginning stages of a clinical research project under the direction of peer and resident mentorship. Students move forward after the Flex Week to finish data collection, execute data analysis and eventually, prepare an abstract/manuscript. "Flex Week" students learn more about the field of neurosurgery, build vertical connections with others interested in the field, and refine clinical research skills.

Students are assigned a clinical research data collection project and are introduced to the electronic medical record system (Powerchart, EPIC) and RedCap. In partnership with the University of Pittsburgh Health Sciences Library System, students attend "Painless PubMed," "Basic EndNote," and "Where Should I Publish?" A Methodical Approach for Selecting Journals workshops to build foundational skills in clinical research.

• Brain and Blade: The World of Neurosurgery
The University of Pittsburgh Department of Neurological Surgery hosts a pre-clinical annual elective course for interested second-year medical students that seeks to provide the most comprehensive exposure to neurosurgery available at any medical school. The course, titled "Brain and Blade: The World of Neurosurgery," consists of approximately 10 modules dedicated to exploring each subspecialty of neurosurgery. It runs from October through December of the academic calendar.

Past modules have included vascular, oncology, functional, spine, radiosurgery, endoscopy, plus a wide array of other topics. Each module consists of a one-hour lecture on the topic followed by an hour-long procedure workshop on cadavers during which students have the opportunity to attempt complex neurosurgical procedures such as spinal instrumentation and carotid endarterectomies.

The driving impetus of Brain and Blade is to fill the relatively limited exposure to neurosurgery that many students have prior to clinical years. A general understanding of neurosurgical topics is beneficial to all students and this course provides students with a career interest in surgery to engage with potential resident and attending mentors.

A substantial amount of literature has demonstrated that positive experiences with surgeons early in medical school increases the likelihood of specializing in surgery. The department has published its own experience Impact of a "Hands-on Pre-Clinical Neurosurgery Elective Course on Second-Year Medical Student Interest and Attitudes" in the *Journal of Medical Education and Curricular Development* on the topic, finding that exposure through the Brain and Blade elective significantly improved the perception and interest in neurosurgery in addition to resulting in a high level of content retention.

Since its inception in 2015-16, the course has remained highly popular among students with surgical aspirations and was recognized with the 2020 Award for Outstanding Elective by the University of Pittsburgh School of Medicine student body. It continues to over-enroll annually.

Standard course modules include:

- Introduction to Neurosurgery (Lumbar Punctures)
- Stereotactic Radiosurgery (Gamma Knife Planning)
- Emergent Procedures (Hemicraniectomy and EVDs)
- Pediatric (Supracerebellar Infratentorial Approach)
- Tumor (Interhemispheric Approach)
- Skull Base(Orbitozygomatic Approach)
- Spine (Cervicothoracic approach)
- Spine (ACDF and Posterior Lumbar Fusion)
- Vascular (Carotid Endarterectomy)
- Functional (Hemispherectomies)

• Weekly Teaching Sessions

The University of Pittsburgh Department of Neurological Surgery prides itself on its commitment to educational excellence. Faculty from our department, alongside experts from various specialties, deliver comprehensive lectures covering a broad range of topics, with a strong focus on preparing residents for the neurosurgery board examinations. These sessions not only benefit neurosurgery residents from PGY-1 through PGY-5 by being completely free of clinical duties during teaching hours, but they also provide a tremendous opportunity for rotating medical students to engage with and learn from leading professionals in the field. This dedicated, protected teaching time is a cornerstone of our program, ensuring that every trainee has access to the highest quality education and mentorship essential for success in their neurosurgical careers.

• Monthly Microsurgical and Surgical Anatomy Lab Training Sessions

As part of our commitment to hands-on, advanced surgical education, the department offers monthly Microsurgical and Surgical Anatomy Lab training sessions. These sessions are guided by a comprehensive curriculum developed by our faculty and are designed to provide residents with in-depth exposure to complex cranial and spinal approaches. Under expert supervision, trainees perform anatomical dissections that include open and endoscopic cranial techniques,

bypass models, anterior neck dissections for vascular access, and both anterior and posterior/lateral spinal approaches. Fluoroscopy and spinal hardware instrumentation are integrated into these sessions to simulate real operative conditions and optimize the learning experience. By practicing these advanced procedures in the lab, residents develop a deep understanding of surgical anatomy and foundational techniques, ultimately enhancing their readiness to translate these skills into safe and effective care for patients in the operating room.

• Weekly Research Lectures

The Department of Neurosurgery at the University of Pittsburgh Department of Neurological Surgery hosts weekly research lectures beginning in early fall, creating a dynamic forum for academic exchange and innovation. These sessions feature invited experts from a wide range of fields who present groundbreaking research that serves as inspiration for faculty, residents, and medical students alike. In addition to fostering curiosity and academic growth, the lectures promote interdisciplinary collaboration across the department and beyond. Residents also have the opportunity to present their own ongoing research projects, receiving valuable feedback and strengthening their presentation skills. This structured academic environment reinforces our culture of inquiry and advances our collective commitment to pushing the frontiers of neurosurgical science.

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 (29 residents until June 30, 2025). 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 stresses professionalism as well as interpersonal and communication skills and relies heavily on both inpatient and outpatient use of informatics.

The University of Pittsburgh Department of Neurological Surgery—which can trace its roots to 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.

In a 2023 survey of 30,000 U.S. physicians conducted by Doximity, the online networking service for medical professionals, the University of Pittsburgh neurological surgery residency program was ranked #7 in the country for best clinical training

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 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 showed that our department

ranked as the most productive residency program in the nation in terms of graduates remaining and contributing to academic neurosurgery.

In 2018, the department completed a 50-year retrospective assessment of training at our program, published in the *Journal of Neurosurgery*. 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 residents 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.

More than 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.

• Neurosurgery Bootcamp

Neurosurgery Bootcamp at the University of Pittsburgh is an intensive two-week training program designed to prepare incoming PGY-1 neurosurgery residents for the transition into residency. Developed by David T. Fernandes Cabral, MD, director of resident education, in collaboration with residency program coordinator Melissa Lukehart, the bootcamp takes place during the last two weeks of June, just prior to the start of formal training on July 1. This comprehensive orientation covers core elements of neurosurgical practice and departmental culture, offering a structured introduction to life as a neurosurgical resident. The curriculum includes foundational lectures in tumor, spine, vascular, functional, epilepsy, anatomy, neuro-ophthalmology, stroke, and critical care. Additionally, the program features practical skill-building sessions in basic neurosurgical procedures such as external ventricular drains (EVDs), lumbar punctures, and lumbar drains, as well as bedside neurological examinations. Interns also complete ATLS, BLS, and ACLS certifications, develop communication skills, and gain firsthand exposure through daily shadowing across the neurosurgery services. This immersive experience is designed to ease the transition into residency, strengthen clinical confidence, and set the stage for success during the critical first months of training.

• PGY-1

Residency training at the department begins with the first-year experience. PGY-1 residents who enter the field as novices in neurosurgery will rotate on the neurosurgical, critical care medicine, and neuropathology services. The first year of training is critically evaluated to optimize the introductory experience in neurosurgery. It is designed to optimize performance for the next year, when full integration into patient care teams is accomplished. The United States Medical Licensing Examination Step 3 is expected to be completed during the PGY-1 year. Residents may also have the opportunity to participate in a practice run of the written board examination (American Board of Neurological Surgery) during the PGY-1 to PGY-3 years.

• 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 making. The department emphasizes the importance of the flow of information and communication 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 neurooncology service (UPMC Shadyside), 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 insertions and placement of cerebral blood flow technologies such as Licox tissue oxygenation 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 physician outpatient office. Numerous mid-level 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 brain and spinal surgery including vascular neurosurgery (an initial intro to endovascular and open vascular techniques), image-guided surgery, functional neurosurgery, and pediatric service (UPMC Children's Hospital of Pittsburgh).

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.

• 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. During this time, residents take the ABNS written board examination for self-assessment/or credit. 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 months 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 block: the Clinical Investigator Path and the Surgeon Scientist Investigator Path:

Clinical Investigator Path:

The clinical investigator path includes a 21-month period of time during the PGY-5 and PGY-6 or PGY-7 years (i.e., residents will complete their chief residency year in PGY-6 or PGY-7 depending on enfolded fellowship plans) for subspecialty training. Residents will

identify a primary mentor by 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 21 months to further develop a preclinical and academic research career working in a functional and dedicated laboratory. Some residents choose to enter one of two NIH T32 postdoctoral research fellowship programs available through the University of Pittsburgh's Department of Anesthesia and Department of Surgery as well as the university's Physician Scientist Incubator Program. This program is designed to train the highest quality biomedical physician investigators, focusing on those with MD degrees with PhD doctoral training, seeking careers involving pre-clinical research.

Residents will identify a primary mentor by their PGY-4 year. Residents in this path are able to submit for national grants using existing mechanisms from the AANS, CNS, NIH, and 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 subspecialty clinical or research training in their last year of clinical neurosurgery before final graduation in June. Selected enfolded 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

The University of Pittsburgh neurosurgery residency program is distinguished by its breadth, depth, and dedication to comprehensive surgical education. Residents receive world-class training across a wide range of subspecialties, including microneurosurgery, pediatric neurosurgery, endoscopic and image-guided techniques, radiosurgery, and both open and endovascular approaches, with particular strength in complex cerebrovascular and bypass procedures. Daily teaching rounds are supplemented by a protected weekly educational curriculum for residents from PGY-1 through PGY-5. These didactic sessions, delivered by faculty from neurosurgery and other disciplines, emphasize preparation for board certification and mastery of core neurosurgical principles. Rotating medical students are invited to participate, enhancing their exposure to the academic culture of the program.

In addition, the department offers monthly Microsurgical and Surgical Anatomy Laboratory sessions, where residents engage in cadaveric dissections under faculty supervision. These labs are structured around key cranial and spinal techniques, including endoscopic skull base approaches, extracranial-intracranial bypass models, anterior cervical and vascular exposures, and posterior/lateral spine instrumentation using fluoroscopic guidance. These hands-on experiences reinforce anatomical knowledge and technical skill in a controlled environment. The academic year also features a weekly Research Lecture Series, beginning in early fall, which invites national and international leaders to present pioneering research. Residents are active contributors, presenting their own work and participating in scholarly dialogue that fosters interdisciplinary collaboration. Collectively, these initiatives reflect the department's unwavering commitment to cultivating surgical excellence, academic inquiry, and professional development in every stage of training.

The training program also includes the following faculty/resident conference:

- Multidisciplinary Brain Tumor Board (weekly)
- Chairman's Conference (twice monthly)
- Faculty Teaching Conference (weekly)
- 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)
- Spine 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 those cases presented. 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 10 or more 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.

Despite the extensive experience in all aspects of brain, spine, and peripheral nerve surgery, some residents elect to complete post-residency fellowships with other prestigious mentors. In particular, residents who wish 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
- Brain Tumor Research
- Clinical and Basic Science Head Injury Program
- Clinical Outcomes of Radiosurgery
- Computer-Image Integration into Surgical Planning
- Intracranial Blood Flow and Saccular Aneurysm Formation
- Research in Spinal Tumors and Spine Biomechanics
- Spasticity
- Stem Cells
- Studies on Cranial Nerve Disorders
- Teleradiography
- Viral Vectors in Tumor Management

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. The department supports the largest number of neurosurgeons with federally-sponsored funding. 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. D. Kojo Hamilton, MD, is the department's residency director. Nitin Agarwal, MD, is the associate residency director and David T. Fernandes Cabral, MD, is the director of resident education.

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). For 2024-25, the faculty award was given to David T. Fernandes Cabral, MD, (top), while the resident honor was awarded to Hussam Abou-Al-Shaar, MD, (bottom).

N3-PREP

The Neurology, Neurosurgery, and Neuropathology Pittsburgh Research Education Program (N3-PREP) is intended to help advance academic research careers of residents and fellows in the neuroscience fields. Developed in coordination with the University of Pittsburgh Department of Neurological Surgery, the Department of Neurology and the Division of Neuropathology—and funded by a five-year NIH NINDS UE5 Research Education Program—the overarching and long-term goal of the program is to train the next generation of physician-neuroscientists in basic science, translational science, data science, and clinical (patient-oriented) research through a closely mentored approach, in an environment ripe with physical and faculty resources across the translational spectrum of neuro-focused research.

Key components of N3-PREP include a well-defined pathway for each trainee to be paired with a primary mentor and a mentoring committee, a core curriculum, internal study sections for grant reviews, progress tracking for both the trainee and mentor, and continued support for the trainee's progress toward an NIH K mentored-career development award or equivalent. A longitudinal track beginning in the PGY-1 year will increase the interest of the matriculating residents across participating departments, transform the culture, and ultimately increase a diverse pool of residents well-prepared to receive the most from the benefits of direct UE5 funding.

The core curriculum of N3-PREP includes formal training in experimental design and scientific rigor, statistical methodology, grant writing, presentation skills, DEI principles, and the responsible conduct of research. Led by multi-principal investigators Constantinos G. Hadjipanayis, MD, PhD, executive vice-chair of the Department of Neurological Surgery; Page B. Pennell, MD, Henry B. Higman Chair of the Department of Neurology; and Julia K. Kofler, MD, director of the Division of Neuropathology—along with an advisory committee—N3-PREP is well-supported by commitments from 87 research mentors across 16 University of Pittsburgh/UPMC departments.

Physician-neuroscientists are essential for converting the discoveries from the laboratory to diagnostic and therapeutic strategies for persons burdened by neurologic diseases that include neuro-oncology. Integration of research training during clinical training years (residency and fellowship) is pivotal to fostering the next generation of physician-neuroscientists, essential to bringing the neuro-based discoveries to the bedside.

Biomedical research is a high priority at the University of Pittsburgh with faculty across more than 20 departments and institutes performing a wide variety of cutting-edge research. Ultimately, researchers believe that N3-PREP will increase the number of well-prepared neuro-focused physician-scientists from the University of Pittsburgh who will progress to the forefront of guiding innovative neuroscience research

Fellowships

The University of Pittsburgh Department of Neurological Surgery offers several fellowships including AO Spine and CAST (Committee on Advanced Subspecialty Training) approved fellowships. These fellowships include the following.

• Complex and Minimally Invasive Spine Deformity Fellowship

Complex and minimally invasive spine fellows are trained for all spinal diseases, degenerative, deformity, oncology and trauma spinal pathologies, with a special emphasis placed on open and minimally invasive techniques to treat adult spinal deformity and complex reconstructive spine surgery. Experience in all disorders of the craniocervical, cervical, thoracic, lumbar and sacral spine is available. The option for additional training in peripheral nerve, sports medicine and spinal stereotactic radiosurgery is available as well.

• Endoscopic and Open Skull Base Fellowship

The skull base fellowship is primarily focused on endoscopic and open skull base work surgery. About half of these cases are endoscopic endonasal surgeries and are performed in conjunction with their otolaryngology colleagues. The remaining cases are various open skull base cases, including lateral skull base approaches with neurotology, vascular and brain tumor procedures, minimally invasive transorbital approaches and some general cranial surgery.

• Endovascular Neurosurgery Fellowship

The endovascular neurosurgery fellowship at UPMC provides exceptional training in the management of complex cerebrovascular disease, with robust endovascular volumes totaling over 2,000 cases per year including over 300 stroke thrombectomies and over 150 aneurysm

treatments. Fellows engage in innumerable multicenter ischemic and hemorrhagic disease trials gaining direct exposure and experience.

• Intraoperative Neuromonitoring Fellowship
The intraoperative neuromonitoring fellowship provides exceptional training in interpreting evoked potentials, electroencephalography, electromyography, as well as electrocorticography and cortical mapping during awake craniotomies. Fellows will have diverse opportunities for clinical and translational research and will be well prepared for careers in intraoperative neuromonitoring

• Neurocritical Care Fellowship
Neurocritical care fellows are part of the intensive care unit's patient care team that also includes Critical Care Medicine faculty, anesthesia and surgical residents and medical students. This collaborative team then develops a single treatment plan based on current evidence-based guidelines and local consensus-based protocols. As the fellows progress through the program, they are expected to take on more of a leadership role in the ICU, leading rounds and making decisions regarding patient care. This culminates in the junior attending rotation, during which faculty allow the fellow significant autonomy and provide feedback on leadership and decision-making skills.

• Neurosurgical Oncology Fellowship
The neurosurgical oncology fellowship is primarily focused on the surgical management of primary and metastatic brain tumors incorporating skull base tumors and spinal oncology. Fellows will have the opportunity to treat brain tumor patients with important technologies such as Gamma Knife stereotactic radiosurgery (SRS) and focused ultrasound. They will also be exposed to novel surgical approaches/treatments that include fluorescence-guided surgery (FGS), laser interstitial thermal therapy (LITT), tumor-related epilepsy surgery, photodynamic therapy, and robotic-assisted exoscope neurosurgery. Awake craniotomy and intraoperative brain mapping techniques (direct and subcortical stimulation) will be an important component of the fellowship. This fellowship is currently only offered to neurosurgical residents in training at UPMC during their PGY-7 year.

• Neurotrauma Fellowship
The UPMC neurotrauma fellowship provides advanced training in surgical and medical management of traumatic brain and spinal cord injuries. The goal is to train the next generation of neurotraumatologists by providing a comprehensive and supervised educational experience. Fellows are incorporated into all aspects of service leadership and engage with colleagues in Trauma Surgery, Critical Care, Neurology, Neuroradiology and other disciplines to master multidisciplinary management of the neurotrauma population. Progressive independence in patient evaluation and management and service leadership is encouraged during the course of the fellowship.

• Pediatric Fellowship
The ACPNF-accredited pediatric neurosurgery fellowship at UPMC Children's Hospital of Pittsburgh focuses on an overall training philosophy that covers the full gamut of the field with cutting edge approaches to brain tumors, epilepsy, movement disorders, vascular lesions, spinal cord malformations, and cranial base surgery, among other areas. We follow a graded responsibility model that provides increasing independence in the management of an extensive array of pediatric neurosurgery cases in one of the most picturesque pediatric hospitals in the country, supported by a panoply of state-of-the-art instrumentation.

• Spine/Trauma Fellowship
Fellows in the spine and neurotrauma track receive advanced training across all aspects of spinal disorders, with a special emphasis on management of acute neurosurgical emergencies. Fellows are integrated into the UPMC neurotrauma service and have the opportunity to pursue additional training in sports neurosurgery, including concussion evaluation and management and care of sports-related spine and peripheral nerve injuries. Spine/trauma fellows can shadow program faculty with professional and collegiate sports teams in Pittsburgh.

• Sports Fellowship
The Joseph Maroon Sports Fellowship provides an excellent opportunity for interested residents to spend a dedicated period of their training with neurosurgeons working with Pittsburgh area professional and collegiate sports teams. Residents 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.

• Stereotactic Radiosurgery & Functional Fellowship
Stereotactic radiosurgery and functional fellows participate in all patient care activities at the UPMC Center for Image-Guided Neurosurgery including evaluation and management leading to decision making, participation in procedures designed to increase learning in the field, and pre- and post-operative care. Fellows participate in educational activities that improve clinical skill acquisition, prepare outcomes research, and publish in the clinical or basic science research arena. This fellowship has two tracks: Track A reflects a nine-month focus on the spectrum of indications, use and outcomes of Gamma Knife stereotactic radiosurgery. It includes three months experience in functional and epilepsy surgery under the direction of Jorge González-Martínez, MD, PhD. Track B reflects a nine-month focus on modern functional neurosurgery for movement disorders and the surgical management of epilepsy. The emerging role of HIFU and LIFU will be explored. The remaining time will include experience with the use of Gamma knife stereotactic radiosurgery.

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 Costas G. Hadjipanayis, MD, PhD; Ajay Niranjan, MD; and L. Dade Lunsford, MD. 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. For the past two years, the course has been offered in a hybrid method as registrants become online “Pitt students” for one week during the course. All registrants are also invited to participate in-person for several days to observe cases and practice dose planning skills beyond the hands-on methods available on line.

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). 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.

Peter J. Jannetta Lectureship

The Peter J. Jannetta Lecture—focusing on innovations in the field of neurosurgery—is held annually in honor of the former, long-time chair 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.

Zoher Ghogawala, MD, FACS—professor and chair of the Department of Neurosurgery at the Lahey Hospital Medical Center and UMass Chan Medical School in Worcester Mass.—was the Jannetta Lecturer for 2024-25, presenting a talk on "Optimizing Neurosurgery: How Do We Evaluate Cost?" on May 7, 2025.

Zohar Ghogawala, MD, addresses faculty and residents at 2025 Peter J. Jannetta Lectureship.

Stuart Rowe Society Lectureship and Research Day

The Stuart Rowe Society Lectureship and Resident Research Day showcases research activities in the field of neurological surgery and provides 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 a special honored guest promi-

nent in the field of neurosurgery. The honored guest will follow this discussion with a special lecture. The honored guest will also select a “Best Presentation” award presented at a special reception held in their honor later in the evening.

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 Vajkoczy, MD—professor and chair of neurosurgery at Charité - Universitätsmedizin in Berlin, Germany—was the Rowe Lecturer for 2024-25, presenting a lecture on “Our Current Research Advances in Neurovascular Surgery” on November 20, 2024.

Arka Mallela, MD, received the best resident presentation award at this year’s Rowe Day for his talk, “Deconstructing the Process of Expressive Language Production.” Stephanie Casillo, MD, took home runner-up honors for her presentation, “Targeting Metabolic Dependencies in Diffuse Midline Glioma.”

2025 Stuart Rowe honored guest lecturer Peter Vajkoczy, MD, (left) and department chair Robert Friedlander, MD, (right) present best presentation award to Arka Mallela, MD.

Dorothy Klenke Nash Lectureship

The Dorothy Klenke Nash Lecture is a celebration of the first female neurosurgeon to practice in the United States, working at the University of Pittsburgh and local area hospitals from the 1940s through the 1960s.

A graduate of the Columbia College (N.Y.) of Physicians and Surgeons and the Neurologic Institute of New York, Dr. Nash moved to Pittsburgh in 1936 and later became a senior surgeon at St. Margaret’s Hospital in 1942. Shortly thereafter, she joined Stuart Niles Rowe, MD, at then Presbyterian University Hospital and the University of Pittsburgh School of Medicine.

A big advocate of women in medicine, Dr. Nash actively encouraged women to pursue careers in the field, providing vocational lectures aimed toward female students at the University of Pittsburgh. She was also extensively involved in volunteer activities in a number of areas including cerebral palsy and mental illness.

Gelareh Zadeh, MD, PhD—chair of the Mayo Clinic Department of Neurosurgery in Rochester, Minn.—was the Nash Lecturer for 2024-25 presenting a lecture on "Predicting Tumor Behaviour and Response to Treatment to Optimize Surgical Approach," on March 5, 2025.

Gelareh Zadeh, MD, PhD, presents 2025 Dorothy Klenke Nash Lecture at the Pittsburgh Golf Club.

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.

John J. Moossy Award in Neurosurgery Established

On March 28, 2025, the University of Pittsburgh Department of Neurological Surgery announced the establishment of the John J. Moossy Award for Excellence in Neurosurgery to be given annually to a University of Pittsburgh medical student interested in the field of neurosurgery, providing the recipient with a summer research internship in a neurosurgery laboratory.

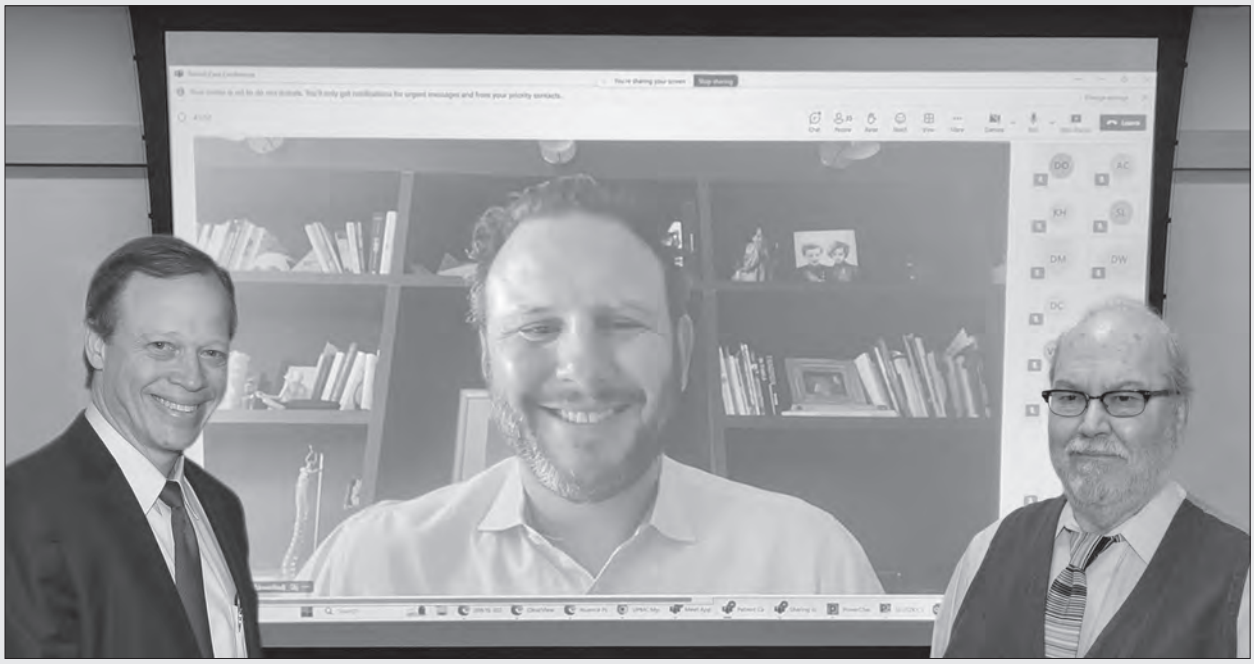
The award honors John J. Moossy, MD, long-time director of the department's Center for Pain Management program and a valued mentor and instrumental contributor to the education of countless residents over the years.

Dr. Moossy joined the faculty of the Department of Neurological Surgery at the University of Pittsburgh in 1986 and is now chief of neurosurgery at the Veterans Affairs Pittsburgh Healthcare System.

Highly regarded by colleagues, residents and patients, Dr. Moossy's clinical practice specializes in the surgical treatment of intractable pain problems through neuro-augmentative and neuro-ablative procedures.

Principal funding for this endowment was obtained from Matthew J. Tormenti, MD, 2013 graduate of the department's residency program as an acknowledgement of Dr. Moossy's significant impact on his career.

Inaugural recipients of the award were Shovan Bhatia, Jhair Colon and Lily Tang. ■



Principal donor Matthew Tormenti (center) joins department chair Robert Friedlander (left) and John Moossy (right) remotely at department weekly conference for announcement of the establishment of the John J. Moossy Excellence in Neurosurgery Award.

Faculty Biographies

Kalil G. Abdullah, MD

Associate Professor
Director, Translational Neuro-Oncology Laboratory

Kalil G. Abdullah, MD, surgically treats brain tumors and specializes in minimally invasive surgical options for benign and malignant tumors of the central nervous system.

Dr. Abdullah is one of the few neurosurgeons in the country who is a principal investigator on multiple grants from the National Institutes of Health. He has been an investigator for numerous glioma studies and is actively involved in bringing promising brain tumor drugs from the laboratory to early-stage clinical trials. He has published more than 100 research articles including scientific advances in journals such as *Neuro-Oncology, Cancer Cell, Nature Medicine* and *Nature*.

Dr. Abdullah earned his medical degree at the Cleveland Clinic Lerner College of Medicine where he was a National Institutes of Health Howard Hughes Medical Institute Scholar. He completed a residency in neurological surgery at the University of Pennsylvania and then received advanced training in neurosurgical oncology through a fellowship at the Wellington Hospital in New Zealand. He completed an additional postdoctoral research fellowship in stem cell biology at the University of Pennsylvania and holds a master's degree from the London School of Economics.

Specialized Areas of Interest
Brain tumors, hydrocephalus.

Board Certifications
Diplomate, American Board of Neurological Surgeons

Hospital Privileges
UPMC Presbyterian
UPMC Shadyside

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

Professional Activities
Tissue and Biospecimen Steering Committee, Glioma Therapeutics Network, NCI
Children's Brain Tumor Network Scientific Committee
Oligodendroglioma Proteomics Analysis Working Group, CPTAC/NCI
Reviewer, Center for Scientific Review, NIH

Education & Training
MD, Cleveland Clinic, 2012
Postdoc Fellow, University of Pennsylvania, 2017
Clinical Fellow, Wellington Regional Hospital, New Zealand, 2018
MSc, Health Economics, Policy, and Management, London School of Economics, 2019
Neurosurgery Residency, University of Pennsylvania, 2012-19

Honors & Awards
Keynote Lecturer, Cleveland Clinic Lerner College of Medicine Research Day, 2024
Hillman Fellow for Innovative Developmental Cancer Research, 2024

Kalil G. Abdullah, MD

Eugene P. Frenkel Scholar in Clinical Medicine, UT Southwestern, 2021
Early Clinical Investigator Award, Cancer Prevention and Research Institute of Texas, 2021
Emerging Investigator Award, Academy of Neurological Surgeons, 2020
Rising Star Award, Texas Super Doctors, 2019, 2020
Howard Hughes Medical Institute Scholar, National Institutes of Health, 2008

Publications: 2024-25

• Refereed Articles:

Gecici NN, Habib A, Mallela AN, Rich JN, Drappatz J, Mantica M, Abdullah KG, Zinn PO. Ventricular Entry During Glioblastoma Resection is Associated With Reduced Survival and Increased Risk of Distant Recurrence. *Neurosurgery* [Epub ahead of print], 2025.

Richardson TE, Walker JM, Hambardzumyan D, Brem S, Hatanpaa KJ, Viapiano MS, Pai B, Umphlett M, Becher OJ, Snuderl M, McBrayer SK, Abdullah KG, Tsankova NM. Genetic and epigenetic instability as an underlying driver of progression and aggressive behavior in IDH-mutant astrocytoma. *Acta Neuropathol* 148(1):5, 2024.

Hicks WH, Gattie LC, Shami ME, Traylor JI, Davar D, Najjar YG, Richardson TE, McBrayer SK, Abdullah KG. Matched three-dimensional organoids and two-dimensional cell lines of melanoma brain metastases mirror response to targeted molecular therapy. *Sci Rep* 14(1):24843, 2024.

Liu R, Ren X, Park YE, Feng H, Sheng X, Song X, AminiTabrizi R, Shah H, Li L, Zhang Y, Abdullah KG, Dubois-Coyne S, Lin H, Cole PA, DeBerardinis RJ, McBrayer SK, Huang H, Zhao Y. Nuclear GTPSCS functions as a lactyl-CoA synthetase to promote histone lactylation and gliomagenesis. *Cell Metab* S1550-4131(24)00451-0, 2024.

Lin MD, Tsai AC, Abdullah KG, McBrayer SK, Shi DD. Treatment of IDH-mutant glioma in the INDIGO era. *NPJ Precis Oncol* 8(1):149, 2024.

Abdullah KG. Classifying Glioma via Liquid Biopsy: Progress toward an Unmet Clinical Need. *Clin Cancer Res* 30(14):2860-2861, 2024.

Research Activities

The Abdullah Lab has continued to focus on the metabolic basis of glioma, with an increased emphasis on the role metabolites function as neurotransmitters to drive tumor growth through neuronal activation. A key finding this year has been the identification of simple dietary modifications which can prolong survival in mice with glioblastoma. A clinical trial evaluating these findings is forthcoming. In 2024/2025, the Abdullah Lab was the recipient of R01s R01CA289260-01A1 and 1R01NS134724-01, two awards focused on the role of metabolism in glioma.

Taylor J. Abel, MD

Associate Professor
Chief, Pediatric Neurosurgery
Chief, Pediatric Epilepsy Surgery
Surgical Director, Pediatric Epilepsy Surgery Program

Taylor Abel, MD, is chief of pediatric neurosurgery and surgical director of the Pediatric Epilepsy Surgery Program at UPMC Children's Hospital of Pittsburgh. He is an American Board of Neurological Surgery and American Board of Pediatric Neurological Surgery certified pediatric neurosurgeon specializing in epilepsy surgery.

Taylor J. Abel, MD

Dr. Abel is from Seattle, Washington 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 subsequently completed subspecialty fellowship training in both pediatric neurosurgery (Hospital for Sick Children, Toronto) and epilepsy surgery (Grenoble, France).

Dr. Abel's clinical practice focuses on caring for children drug-resistant epilepsy and general pediatric neurosurgery. He founded and co-directs the UPMC Children's Hospital of Pittsburgh Multi-Disciplinary Pediatric Epilepsy Surgery Clinic, which focuses on providing comprehensive care to children with drug-resistant epilepsy. He performs traditional open epilepsy surgery, stereotactic and minimally invasive epilepsy surgery, and all forms of neuromodulation.

Dr. Abel is chair of the American Epilepsy Society membership council and serves on the board of directors for both the American Epilepsy Society (ex-officio) and Pediatric Epilepsy Surgery Alliance.

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

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

Hospital Privileges
UPMC Children's Hospital of Pittsburgh
UPMC Harrisburg
UPMC Magee-Womens Hospital
UPMC Presbyterian

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

Professional Activities
Chair, Membership Council, American Epilepsy Society
Board of Directors (ex officio), American Epilepsy Society
Board of Directors, Pediatric Epilepsy Surgery Alliance
Co-Chair, Research Subcommittee, AANS/CNS Joint Section on Pediatric Neurosurgery

Education & Training
BS, Neurobiology, University of Washington, 2005
MD, University of Washington School of Medicine, 2010

Taylor J. Abel, MD

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
Certificate, Health Leadership and Business Fundamentals, University of Pittsburgh, 2022

Honors & Awards
ICRE Excellence in Teaching Award, University of Pittsburgh, 2024
The Philip Troen, MD, Excellence in Medical Student Research, University of Pittsburgh, 2024
The Donald S. Fraley Award for Outstanding Medical Student Mentorship, 2023
Pediatric Epilepsy Surgery Alliance Relentless Service Award, 2022
40 under 40, *Pittsburgh Magazine*, 2021
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

News Media Appearances: 2024-25
"New Study Reveals Hidden Brain Functions That Decode Speech Melody," *The University Network*, March 4, 2025.
"Your Brain Decodes Hidden Messages In Speech Melody," *Science Blog*, March 3, 2025.

Publications: 2024-25
• Refereed Articles:
Rupp KM, Hect JL, Harford EE, Holt LL, Ghuman AS, Abel TJ. A hierarchy of processing complexity and timescales for natural sounds in the human auditory cortex. *Proc Natl Acad Sci U S A* 122(18):e2412243122, 2025.

Harford EE, Mandava A, Dede O, Sinha A, Piazza M, Abel T. Long-term musculoskeletal outcomes in pediatric hemispherotomy. *Epilepsy Res* 214:107560, 2025.

McNamara CR, Menchaca CI, Abel TJ, Horvat CM, Berger RP, Fink EL, Kochanek PM, Simon DW. Effectiveness of Fosphenytoin and Levetiracetam to Prevent Posttraumatic Seizures in Young Children with Accidental or Abusive Traumatic Brain Injury. *Neurocrit Care* 42(2):502-511, 2025.

Raphael I, Xiong Z, Sneiderman CT, Raphael RA, Mash M, Schwegman L, Jackson SA, O'Brien C, Anderson KJ, Sever RE, Hendrikse LD, Vincze SR, Diaz A, Felker J, Nazarian J, Nechemia-Arbely Y, Hu B, Kammula US, Agnihotri S, Rich JN, Broniscer A, Drappatz J, Abel TJ, Uttam S, Hwang EI, Pearce TM, Taylor MD, Nisnboym M, Forsthuber TG, Pollack IF, Chikina M, Rajasundaram D, Kohanbash G. The T cell receptor landscape of childhood brain tumors. *Sci Transl Med* 17(790):eadp0675, 2025.

Gnanateja GN, Rupp K, Llanos F, Hect J, German JS, Teichert T, Abel TJ, Chandrasekaran B. Cortical processing of discrete prosodic patterns in continuous speech. *Nat Commun* 3;16(1):1947, 2025.

Piazza MG, Thambireddy S, Mandava A, Abel TJ, Kellogg RG. Intraventricular baclofen for the treatment of pediatric spasticity in cerebral palsy: technique and outcomes. *J Neurosurg Pediatr* 35(3):298-303, 2025.

Taylor J. Abel, MD

Speakes ME, Reznik-Schaefer K, Al-Ramadhani R, Fernandez LD, Hect JL, Abel TJ, Welch WP. Treatment of pediatric drug-resistant generalized epilepsy with responsive neurostimulation of the centromedian nucleus of the thalamus: A case series of seven patients. *Epilepsy Res* 210:107516, 2025.

Harford EE, Smith ED, Holt LL, Abel TJ. Listening with one hemisphere: A review of auditory processing among individuals after hemispheric surgery. *Neuropsychologia* 205:109019, 2024.

Gaba F, Hect JL, Abel TJ. Applications of magnetic resonance-guided laser interstitial thermal therapy in disconnective epilepsy surgery. *Front Neurol* 15:1484263, 2024.

Samanta D, Haneef Z, Albert GW, Naik S, Reeders PC, Jain P, Abel TJ, Al-Ramadhani R, Ibrahim GM, Warren AEL. Neuromodulation strategies in developmental and epileptic encephalopathies. *Epilepsy Behav* 160:110067, 2024.

Samanta D, Aungaroon G, Albert GW, Karakas C, Joshi CN, Singh RK, Oluigbo C, Perry MS, Naik S, Reeders PC, Jain P, Abel TJ, Pati S, Shaikhouni A, Haneef Z. Advancing thalamic neuromodulation in epilepsy: Bridging adult data to pediatric care. *Epilepsy Res* 205:107407, 2024.

Research Activities
Dr. Abel's research group is investigating the cortical representation of auditory information in human auditory cortex using direct brain recordings in the context of epilepsy surgery. Dr. Abel's other major research focus is using decision analysis to compare the effectiveness of pediatric neurosurgery strategies…specifically, epilepsy surgery.

Nitin Agarwal, MD

Associate Professor
Director, Minimally Invasive Spine and Robotics Surgery
Associate Program Director, Neurological Surgery Residency
Co-Director, Complex and Minimally Invasive Spine Deformity Fellowship

Nitin Agarwal, MD, is an associate professor in the University of Pittsburgh Department of Neurological Surgery with a secondary appointment in the University of Pittsburgh Department of Bioengineering and an affiliate faculty member at the McGowan Institute of Regenerative Medicine. As part of his educational mission, he serves as the associate program director of the UPMC/University of Pittsburgh neurological surgery residency program and co-director of the department's Complex and Minimally Invasive Spine Deformity Fellowship. On the clinical front, he is director of the department's Minimally Invasive Spine and Robotics Surgery program.

Dr. Agarwal received his medical degree from Rutgers New Jersey Medical School. Afterward, he completed his neurological surgery residency at the University of Pittsburgh. During this time, he also completed an enfolded fellowship in sports medicine and in minimally invasive and complex spine surgery. He then completed an AO Spine and Committee on Advanced Subspecialty Training (CAST) approved minimally invasive and complex spine surgery fellowship at the University of California, San Francisco, with dual training from orthopedic and neurosurgical mentors. Before joining the University of Pittsburgh, Dr. Agarwal served as the director of neurotrauma at the Washington University School of Medicine in St. Louis with a clinical focus on spinal deformity surgery. He is currently pursuing an executive MBA at The Wharton School of the University of Pennsylvania.

Dr. Agarwal also serves as a director for the Spine Computational Outcomes Learning Institute (SCOLI), a hub for cutting-edge clinical and translational science that enhances neurosurgical

Nitin Agarwal, MD

patient care. SCOLI has funded investigations in four main domains: neurotrauma outcomes, spine outcomes, socioeconomic research, and patient education.

To date, Dr. Agarwal has published over 300 peer-reviewed articles and has spoken at several regional and national conferences with over 350 oral and poster presentations. His health literacy research has been published in several high-impact factor journals, including *JAMA Internal Medicine* and *JAMA Surgery*, and he has also been featured by prominent healthcare-oriented news outlets such as Reuters Health. In addition, he is an editor for the following books: *Neurosurgery Fundamentals, Surviving Neurosurgery: Vignettes of Resilience, The Evolution of Health Literacy: Empowering Patients through Improved Education,* and *Pre-Medicine: The Complete Guide for Aspiring Doctors.*

Dr. Agarwal also actively participates in organized neurosurgery advocating for medical student and patient education. Locally, under the SCOLI umbrella, he runs a weekly education and research conference for trainees as well as a research internship for undergraduate students who are interested in pursuing medical school. He also runs a quarterly patient support group focused on spine and scoliosis. Moreover, he has pledged his commitment to advancing neurosurgery as a member of the Neurosurgery Research and Education Foundation Cushing Circle of Giving.

Outside of neurological surgery, Dr. Agarwal has been deeply dedicated to martial arts, specifically Taekwondo, Krav Maga, and Jiu-Jitsu. For over a decade, he served as a certified instructor, national judge, and school owner. Dr. Agarwal credits martial arts with providing mental and physical discipline as well as adherence to a strict honor code.

Specialized Areas of Interest
Minimally invasive spine surgery; artificial disc replacement; robotic spine surgery; navigation-assisted surgery; endoscopic spine surgery; awake outpatient surgery; brain and spine trauma; sports medicine; cervical deformity; scoliosis surgery.

Board Certifications
American Board of Neurological Surgeons

Hospital Privileges
Pittsburgh Veterans Affairs Medical Center
UPMC Presbyterian

Professional Organization Membership
American Association of Neurological Surgeons
American Association of South Asian Neurosurgeons
American Medical Association
American Spinal Injury Association
AO Spine
Association of Veterans Affairs Surgeons
Cervical Spine Research Society
Congress of Neurological Surgeons
Council of State Neurosurgical Societies
Lumbar Spine Research Society
North American Spine Society
Pennsylvania Neurosurgical Society
Scoliosis Research Society
Society of Neurological Surgeons
Society for Minimally Invasive Spine Surgery

Nitin Agarwal, MD

Professional Activities

Associate Member, AO Spine Knowledge Forum Spinal Cord Injury (SCI)
Social Media Representative, AO Spine Knowledge Forum Spinal Cord Injury (SCI)
Member-at-Large, AANS Neurosurgery, PAC Board of Directors
Chair, Congress of Neurological Surgeons Caucus, CSNS
Social Media Chair, CSNS
Website Chair, CSNS Communication and Education Committee
AANS Early Career Member, CSNS
Advisory Member, UPMC Spine Value Analysis Committee
UPMC Graduate Medical Education Committee
UPSOM Curriculum Committee Advisory Board
Faculty-At-Large Member, UPSOM Educational Policy Council
Associate Program Chair, Neurosurgical Society of Pittsburgh
Positional Member, Society of Neurological Surgeons
Medical Student Committee, Society of Neurological Surgeons

Education & Training

BS, Biology, The College of New Jersey, 2010
MD, Rutgers, The State University of New Jersey, 2014
Enfolded Fellowship, Sports Medicine, UPMC, 2019-20
Enfolded Fellowship, Minimally Invasive and Complex Spine Surgery, UPMC, 2018-20
Neurological Surgery Residency, UPMC, 2014-21
Fellowship, Minimally Invasive and Complex Spine Surgery, AO Spine/CAST Fellowship, University of California, San Francisco, 2021-22
Master of Business Administration (Candidate), The Wharton School, University of Pennsylvania, Philadelphia, 2024-2026

Honors & Awards

Research All-Star for Neurosurgery and Spine, Avant-garde Health, 2025
Implementation Award, Penn Wharton Innovation Fund, 2025
Emerging Technologies Fellowship, Scoliosis Research Society, 2023
Faculty Teaching Award, University of Pittsburgh Department of Neurological Surgery, 2023
Young Surgeon Travel Grant, UPMC Department of Neurological Surgery, 2023
SpineLine 5th Annual 20 under 40 Class, North American Spine Society, 2022
Young Surgeon Grant and Educational Track, Society for Minimally Invasive Spine Surgery Annual Forum, 2022
Young Clinician Investigator Award, NREF and the Academy of Neurological Surgeons, 2022
Thomas A. Zdeblick Best Paper Award, Lumbar Spine Research Society, 2022
Harold Rosegay Award, San Francisco Neurological Society, 2022
Educator of the Year Award, Congress of Neurological Surgeons, 2021
CSRS Resident and Fellow Scholarship, Cervical Spine Research Society Annual Meeting, 2021
Young Surgeon Grant and Educational Track, Society for Minimally Invasive Spine Surgery Annual Forum, 2021
Resident Teaching Award, University of Pittsburgh Department of Neurological Surgery, 2021
Branch Research Award, AANS/CNS Joint Section on Disorders of the Spine and Peripheral Nerves, 2021
SRS North American Meeting Scholarship for Residents and Fellows, Scoliosis Research Society, 2021
Young Surgeon Grant, International Society for the Advancement of Spine Surgery Annual Conference, 2021
AO Spine North America Fellowship Award, University of California, San Francisco, Department of Neurological Surgery, 2021

Nitin Agarwal, MD

Distinguished Junior Mentor Award, University of Pittsburgh School of Medicine, 2020
Neurosurgery Research and Education Foundation Travel Grant, European Association of Neurosurgical Societies Spine Training Course, 2020
Young Surgeon Grant, Society for Minimally Invasive Spine Surgery Annual Forum, 2019
Young Investigator Award, 12th Annual Society of Lateral Access Surgery Meeting, 2019
First Place History E-poster Award, 87th American Association of Neurological Surgeons Annual Scientific Meeting, 2019
Young Surgeon Travel Grant, 16th Annual Meeting: State of Surgery Think Tank, 2019
Socioeconomics, Health Policy, & Law NEUROSURGERY® Publications Top Paper of the Year, Annual Congress of Neurological Surgeons Meeting, 2018
Journalistic and Academic Neurosurgical Excellence (J.A.N.E.) Award, 34th Spine Summit, 2018
First Place Socioeconomic E-poster Award, 85th American Association of Neurological Surgeons Annual Scientific Meeting, 2017
Charlie Kuntz IV Scholar Award, 32nd Spine Summit, 2016
Peter W. Carmel, MD, Award in Neurological Surgery, Outstanding Academic Achievement, 2014
Kenneth G. Swan, MD, Memorial Award, NJMS Student Affairs, 2014
Class of 1979 Scholarship, NJMS Alumni Association Grant, 2011
Armstrong Engineering Scholarship Award, Scholastic Merit Based Grant, 2007
Oval Society Award, Community Service Distinction, 2007

News Media Appearances: 2024-25

"Slap Fighting is 'Barbaric'… and Built for Social Media," *The Telegraph*, May 18, 2025
"Campeonato de Tapa na Cara de dono do UFC resulta em danos cerebrais nos lutadores, aponta estudo," *Estadão* (Brazil), October 19, 2024.
"Exclusive: Neurosurgeons React to Power Slap & Respond to Dana White," si.com, October 18, 2024.
"Video Analysis of Concussion Among Slap Fighting Athletes," NYU Doctor Radio, Sirius-XM Channel 110, October 10, 2024.
"Medical Experts Raise Red Flags Over Dana White's Power Slap," si.com, October 6, 2024.
"'It's barbaric': Pitt study quantifies concussions in slap fighting," *Pittsburgh Post-Gazette*, September 27, 2024.
"Competitive slap fighting exposed: First study finds 78% show signs of brain injuries," StudyFinds.org, September 26, 2024.
"Study Says Almost 80% of Slap Fighting Contenders at Risk of Brain Damage," *Men's Health*, September 25, 2024.
"Slap Fighting Study Raises Concerns Over Brain Injuries - Muscle & Fitness," *Muscle & Fitness*, September 25, 2024.
"Neurosurgeons sound alarm over concerning levels of brain trauma in slap fighting matches," *ZME Science*, September 24, 2024.
"Slap fighting causes high risk of brain injury, doctors call for safeguards over alarming concussion rates," msn.com, September 23, 2024.
"Medics fear that slap fighting will lead to brain damage," *Female First*, September 20, 2024.
"'They're soft': Local 'slap fighter' brushes off concerns raised by Pitt neurological researchers," WTAE-TV, September 20, 2024.
"Inside bizarre world of slap fighting: How 'ultimate test of toughness' has gained millions of followers and celebrity fans - as competitors are warned they risk brain damage," dailymail.com, (London, England), September 19, 2024.
"First academic study on slap fighting highlights risks to participants' neurological health," *ScienceDaily*, September18, 2024.
"Pittsburgh researchers publish study to record signs of concussion in slap fighters," KDKA-TV, September 18, 2024.

Nitin Agarwal, MD

"Face it, slap fighters told, your brains are taking a beating too," *The Times* (London, England), September 18, 2024.
"Concussion warning over face-slap fighting," BBC, September 18, 2024.
"Slap fighting may be fun to watch but it's not great for the participants' brains," consumeraffairs.com, September 18, 2024.

Publications: 2024-25

• Books:

Neurosurgery Fundamentals, 2nd Edition. Agarwal N (ed), Thieme International, 2025.

The Evolution of Health Literacy: Empowering Patients Through Improved Education, 2nd Edition. Agarwal N, Hansberry DR, Prabhu AV (eds), Nova Science Publishers, 2025.

The Infographic Guide to Neurosurgery. Agarwal N, Cabral DF (eds), Thieme Medical Publishers, 2025.

• Refereed Articles:

Dholaria N, Daulat SR, Parmar R, Gupta Y, Singh D, Hussein A, Barbagli G, Agarwal V, Agarwal N, Elsayed G, Baaj AA. Spine Disease Clinical Trial Representation: An Analysis of Racial, Ethnic, and Gender Diversity. *Neurosurgery* [Online ahead of print], 2025.

Mitha R, Kumar RP, Agarwal N, Gerszten PC, Hamilton DK, Friedlander RM, Sefcik R. Opportunities to Overcome Barriers to Lactation-Recommendations for Best Practices. *J Surg Educ* 82(4):103445, 2025.

Rabon W, Rode M, Taylor T, Muluk P, Krishnamoorthy A, Easow H, Stout G, Chang YF, Hamilton DK, Thirumala PD, Agarwal N. Establishing Indicative Neurofilament Gradients Based on Severity of Spinal Cord Injury. *World Neurosurg* 195:123515, 2025.

Lavadi RS, Carnovale B, Tirmizi Z, Gajjar AA, Kumar RP, Shah MJ, Hamilton DK, Agarwal N. Examining the Readability of AtlasGPT, The Premiere Resource for Neurosurgical Education. *World Neurosurg* 194:123469, 2025.

Gajjar AA, Covell MM, Prem Kumar R, Tang OY, Ranganathan S, Muzyka L, Mualem W, Rehman I, Patel SV, Lavadi RS, Mitha R, Lieber BA, Hamilton DK, Agarwal N. Evidence Against a Traumatic Brain Injury "July Effect": An Analysis of 3,160,452 Patients from the National Inpatient Sample. *Neurosurgery* 96(2):447-453, 2025.

Kann MR, Lavadi RS, Crane A, Aizooky T, Hardi A, Polavarapu H, Kumar RP, Mitha R, Shah M, Hamilton DK, Agarwal N. Fluid biomarkers for cervical spondylotic myelopathy. *Neurosurg Rev* 48(1):232, 2025.

Carnovale BJ, Lavadi RS, Choudhary A, Gajjar AA, Kumar RP, Hudson JS, Shah MJ, Hamilton DK, Agarwal N. Accounts of Spine and Paraspinal Disease While Playing Golf. *World Neurosurg* 194:123343, 2025.

Arbuckle BB, Abo Kasem R, Shaik A, Downes A, Hwang S, Passias PG, Agarwal N, Jea A, Janjua M. Microbial Analyses of Subdural Empyema: A Case Report and Literature Review. *Cureus* 17(1):e76800, 2025.

Lavadi RS, Kumar RP, Kann MR, Shah MJ, Hamilton DK, Maroon JC, Agarwal N. Video Analysis of Concussion Among Slap Fighting Athletes. *JAMA Surg* 159(12):1435-1436, 2024.

Nitin Agarwal, MD

Ali A, Kumar RP, Polavarapu H, Lavadi RS, Mahavadi A, Legarreta AD, Hudson JS, Shah M, Paul D, Mooney J, Dietz N, Fields DP, Hamilton DK, Agarwal N. Bridging the Gap: Can Large Language Models Match Human Expertise in Writing Neurosurgical Operative Notes? *World Neurosurg* 192:e34-e41, 2024.

Roy S, Mitha R, Lavadi RS, Kumar RP, Jaikumar V, Pease M, Alan N, Ozpinar A, Kuris E, Daniels AH, Buell TJ, Heary RF, Agarwal N, Hamilton DK. Emergent Spinal Pathologies in Late-Term Pregnancy. *J Craniovertebr Junction Spine* 15(4):391-397, 2024.

Monek AC, Mitha R, Andrews E, Sarkaria IS, Agarwal N, Hamilton DK. Multidisciplinary Surgical Approach Utilizing Augmented Reality Pre-Planning for Resection of Giant Thoracic Schwannoma with Robotic Assisted Thoracoscopic Mobilization. *Oper Neurosurg* (Hagerstown) 27(4):500-503, 2024.

Mitha R, Mahan MA, Patel RP, Colan JA, Leyendecker J, Zaki MM, Harake ES, Kathawate V, Kashlan O, Konakondla S, Huang M, Elsayed GA, Hafez DM, Pennicooke B, Agarwal N, Hofstetter CP, Ogunlade J. Lumbar Endoscopic Unilateral Laminectomy for Bilateral Decompression in Degenerative Spondylolisthesis. *World Neurosurg* 191:e644-e651, 2024.

Lavadi RS, Anand SK, Culver LG, Deng H, Ozpinar A, Puccio LM, Agarwal N, Alan N. Surgical Management of Hip-Spine Syndrome: A Systematic Review of the Literature. *World Neurosurg* 189:10-16, 2024.

Lavadi RS, Johnson BR, Chalif JI, Shanahan R, Das A, Hamilton DK, Agarwal N, Fields DP 2nd. Comparing reactive versus empiric cerebrospinal fluid drainage strategies for spinal perfusion pressure optimization in patients with acute traumatic spinal cord injuries. *J Clin Neurosci* 127:110757, 2024.

Gajjar AA, Kumar RP, Paliwoda ED, Kuo CC, Adida S, Legarreta AD, Deng H, Anand SK, Hamilton DK, Buell TJ, Agarwal N, Gerszten PC, Hudson JS. Usefulness and Accuracy of Artificial Intelligence Chatbot Responses to Patient Questions for Neurosurgical Procedures. *Neurosurgery* 95(1): 171-178, 2024.

Kumar RP, Adida S, Lavadi RS, Mitha R, Legarreta AD, Hudson JS, Shah M, Diebo B, Fields DP, Buell TJ, Hamilton DK, Daniels AH, Agarwal N. A Guide to Selecting Upper-Thoracic versus Lower-Thoracic Uppermost-Instrumented Vertebra in Adult Spinal Deformity Correction. *Eur Spine J* 33(7):2742-2750, 2024.

Dietz N, Alkin V, Agarwal N, Bjurström MF, Ugiliweneza B, Wang D, Sharma M, Drazin D, Boakye M. Polypharmacy in spinal cord injury: Matched cohort analysis comparing drug classes, medical complications, and healthcare utilization metrics with 24-month follow-up. *J Spinal Cord Med* 22:1-10, 2024.

Research Activities

Dr. Agarwal's Spine Computational Outcomes Learning Institute (SCOLI) has explored several advanced technologies and methodologies in 2024-25. Among its notable projects is the development of intelligent metamaterial implants in collaboration with Amir Alavi, PhD. These are designed to overcome common surgical complications such as failed fusion.

Additionally, SCOLI employs advanced neuroimaging to detect occult neurotrauma that standard imaging techniques might miss, in collaboration with Sheng-Kwei Song, PhD. This paves the way for early intervention and better patient outcomes.

Nitin Agarwal, MD

The laboratory also investigates molecular signaling mechanisms within the musculoskeletal system, focusing on tailored therapeutics for elderly patients with degenerative conditions, enhancing procedural success and long-term recovery.

More recently, SCOLI has begun developing and validating blood-based biomarkers for cervical spondylotic myelopathy (CSM), with the goal of enabling timely diagnosis and improving surgical outcomes through earlier intervention.

Sameer Agnihotri, PhD

Associate Professor
Director, Brain Tumor Biology and Therapy Lab

Sameer Agnihotri, PhD, is a tenured associate professor at the University of Pittsburgh Department of Neurological Surgery and serves as the director of the Brain Tumor Biology and Therapy Laboratory, based at UPMC Children's Hospital of Pittsburgh. Dr. Agnihotri earned his PhD in medical biophysics from the University of Toronto in 2012, where he focused on identifying novel drivers of glioblastoma. His research primarily investigates pediatric and adult high-grade gliomas (HGG), including diffuse intrinsic pontine gliomas (DIPG), with a significant focus on NF1-associated tumor biology and its implications for brain tumor progression.

Through integrated genomic and metabolic analyses, Dr. Agnihotri's laboratory aims to develop accurate preclinical models of high-grade gliomas. These models are essential for testing novel therapies and facilitating early-phase clinical trials, ultimately striving toward personalized brain tumor treatments.

A significant focus of Dr. Agnihotri's work is on the tumor suppressor genes NF1, NF2, and chromosome 9p in brain tumor development. NF1, which encodes neurofibromin, plays a critical role in negatively regulating the RAS-MAPK and PI3K-AKT signaling pathways, both of which are crucial for cell proliferation and survival. Mutations or loss of function in NF1 can drive uncontrolled cell growth, contributing to the progression of high-grade gliomas. His current research on NF1 is centered on developing novel genome engineering tools to enhance gene therapy strategies. Additionally, his team has uncovered previously unrecognized metabolic roles for NF1, which present opportunities for drug repurposing or even dietary interventions as therapeutic strategies.

Dr. Agnihotri's contributions to brain tumor biology have earned him international recognition. In 2022, he was awarded the prestigious Sontag Distinguished Scientist Award for his pioneering work on pediatric brain tumors. His research is supported by grants from the Department of Defense and the V Foundation for Cancer Research, highlighting the impact and promise of his investigations.

Dr. Agnihotri has authored over 100 peer-reviewed publications, and his findings have been published in top-tier medical journals, including *Cell, Nature Genetics, Nature Cancer, Cancer Cell, Cancer Discovery, Cell Metabolism, Cancer Research, JCI Insight, Molecular Oncology,* and *Developmental Cell*. He has served as a grant reviewer for the Department of Defense and the National Institutes of Health study sections and is a member of the editorial board for *Cancer Research* and *Neuro-Oncology*.

Specialized Areas of Interest
Pediatric and adult high-grade gliomas

Sameer Agnihotri, PhD

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

Professional Activities
Scientific Committee, Children's Brain Tumor Tissue Consortium
Membership Committee, Society of Neuro-oncology

Education & Training
BSc, 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

Honors & Awards
Sontag Distinguished Scientist Award, Sontag Foundation, 2022
Junior Scholar Award in Clinical/Translational Cancer Research, UPMC Hillman Cancer Center, 2022
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: 2024-25
• Refereed Articles:
Xiong Z, Sneiderman CT, Kuminkoski CR, Reinheimer J, Schwegman L, Sever RE, Habib A, Hu B, Agnihotri S, Rajasundaram D, Zinn PO, Forsthuber TG, Pollack IF, Li X, Raphael I, Kohanbash G. Transcript-targeted antigen mapping reveals the potential of POSTN splicing junction epitopes in glioblastoma immunotherapy. *Genes Immun* 26(3):190-199, 2025.

Lu C, Kang T, Zhang J, Yang K, Liu Y, Song K, Lin Q, Dixit D, Gimple RC, Zhang Q, Shi Z, Fan X, Wu Q, Li D, Shan D, Gao J, Gu D, You H, Li Y, Yang J, Zhao L, Qiu Z, Yang H, Zhao N, Gao W, Tao W, Lu Y, Chen Y, Ji J, Zhu Z, Kang C, Man J, Agnihotri S, Wang Q, Lin F, Qian X, Mack SC, Hu Z, Li C, Taylor MD, Liu N, Zhang N, Lu M, You Y, Rich JN, Zhang W, Wang X. Combined targeting of glioblastoma stem cells of different cellular states disrupts malignant progression. *Nat Commun* 16(1):2974, 2025.

Raphael I, Xiong Z, Sneiderman CT, Raphael RA, Mash M, Schwegman L, Jackson SA, O'Brien C, Anderson KJ, Sever RE, Hendrikse LD, Vincze SR, Diaz A, Felker J, Nazarian J, Nechemia-Arbely Y, Hu B, Kammula US, Agnihotri S, Rich JN, Broniscer A, Drappatz J, Abel TJ, Uttam S, Hwang EI, Pearce TM, Taylor MD, Nisnboym M, Forsthuber TG, Pollack IF, Chikina M, Rajasundaram D, Kohanbash G. The T cell receptor landscape of childhood brain tumors. *Sci Transl Med* 17(790):eadp0675, 2025.

Sameer Agnihotri, PhD

Nisnboym M, Sneiderman CT, Jaswal AP, Xiong Z, Vincze SR, Sever RE, Zou H, Frederico SC, Agnihotri S, Hu B, Drappatz J, Pollack IF, Kohanbash G, Raphael I. Assessment of anti-CD69 antibody therapy alone or in combination with anti-PD-1 in murine GBM. *Expert Rev Clin Immunol* 21(2):239-247, 2025.

Gao J, Gu D, Yang K, Zhang J, Lin Q, Yuan W, Zhu X, Dixit D, Gimple RC, You H, Zhang Q, Shi Z, Fan X, Wu Q, Lu C, Cheng Z, Li D, Zhao L, Xue B, Zhu Z, Zhu Z, Yang H, Zhao N, Gao W, Lu Y, Shao J, Cheng C, Hao D, Yang S, Chen Y, Wang X, Kang C, Ji J, Man J, Agnihotri S, Wang Q, Lin F, Qian X, Mack SC, Hu Z, Li C, Taylor MD, Li Y, Zhang N, Rich JN, You Y, Wang X. Infiltrating plasma cells maintain glioblastoma stem cells through IgG-Tumor binding. *Cancer Cell* 43(1):122-143.e8, 2025.

Uswatte G, Taub E, Ball K, Mitchell BS, Blake JA, McKay S, Biney F, Iosipchuk O, Hempfling P, Harris E, Dickerson A, Lokken K, Knight AJ, Mark VW, Agnihotri S, Cutter G. Long COVID brain fog treatment: An early-phase randomized controlled trial of constraint-induced. *Rehabil Psychol* [Online ahead of print], 2025.

Guo Y, Li Z, Parsels LA, Wang Z, Parsels JD, Dalvi A, The S, Hu N, Valvo VM, Doherty R, Peterson E, Wang X, Venkataraman S, Agnihotri S, Venneti S, Wahl DR, Green MD, Lawrence TS, Koschmann C, Morgan MA, Zhang Q. H3K27M diffuse midline glioma is homologous recombination defective and sensitized to radiotherapy and NK cell-mediated antitumor immunity by PARP inhibition. *Neuro Oncol* [Online ahead of print], 2025.

Xiong Z, Walsh KM, Sneiderman CT, Nisnboym M, Hadjipanayis CG, Agnihotri S, Eagar TN, Wang H, Pollack IF, Forsthuber TG, Li X, Raphael I, Kohanbash G. Immuno-epidemiologic mapping of HLA diversity across glioma patient cohorts. *Neuro Oncol* [Online ahead of print], 2025.

Lv D, Dixit D, Cruz AF, Kim LJY, Duan L, Xu X, Wu Q, Zhong C, Lu C, Gersey ZC, Gimple RC, Xie Q, Yang K, Liu X, Fang X, Wu X, Kidwell RL, Wang X, Bao S, He HH, Locasale JW, Agnihotri S, Rich JN. Metabolic regulation of the glioblastoma stem cell epitranscriptome by malate dehydrogenase 2. *Cell Metab* 36(11):2419-2436.e8, 2024.

Mbah NE, Myers AL, Sajjakulnukit P, Chung C, Thompson JK, Hong HS, Giza H, Dang D, Nwosu ZC, Shan M, Sweha SR, Maydan DD, Chen B, Zhang L, Magnuson B, Zhu Z, Radyk M, Lavoie B, Yadav VN, Koo I, Patterson AD, Wahl DR, Franchi L, Agnihotri S, Koschmann CJ, Venneti S, Lyssiotis CA. Therapeutic targeting of differentiation-state dependent metabolic vulnerabilities in diffuse midline glioma. *Nat Commun* 15(1):8983, 2024.

Li F, Yang K, Gao X, Zhang M, Gu D, Wu X, Lu C, Wu Q, Dixit D, Gimple RC, You Y, Mack SC, Shi Y, Kang T, Agnihotri SA, Taylor MD, Rich JN, Zhang N, Wang X. A peptide encoded by upstream open reading frame of MYC binds to tropomyosin receptor kinase B and promotes glioblastoma growth in mice. *Sci Transl Med* 16(767):eadk9524, 2024.

Andrade AF, Annett A, Karimi E, Topouza DG, Rezanejad M, Liu Y, McNicholas M, Gonzalez Santiago EG, Llivichuzhca-Loja D, Gehlhaar A, Jessa S, De Cola A, Chandarana B, Russo C, Faury D, Danieau G, Puligandla E, Wei Y, Zeinieh M, Wu Q, Hebert S, Juretic N, Nakada EM, Krug B, Larouche V, Weil AG, Dudley RWR, Karamchandani J, Agnihotri S, Quail DF, Ellezam B, Konnikova L, Walsh LA, Pathania M, Kleinman CL, Jabado N. Immune landscape of oncohistone-mutant gliomas reveals diverse myeloid populations and tumor-promoting function. *Nat Commun* 15(1):7769, 2024.

Sameer Agnihotri, PhD

Liu I, Alencastro Veiga Cruzeiro G, Bjerke L, Rogers RF, Grabovska Y, Beck A, Mackay A, Barron T, Hack OA, Quezada MA, Molinari V, Shaw ML, Perez-Somarriba M, Temelso S, Raynaud F, Ruddle R, Panditharatna E, Englinger B, Mire HM, Jiang L, Nascimento A, LaBelle J, Haase R, Rozowsky J, Neyazi S, Baumgartner AC, Castellani S, Hoffman SE, Cameron A, Morrow M, Nguyen QD, Pericoli G, Madlener S, Mayr L, Dorfer C, Geyeregger R, Rota C, Ricken G, Ligon KL, Alexandrescu S, Cartaxo RT, Lau B, Uphadhyaya S, Koschmann C, Braun E, Danan-Gotthold M, Hu L, Siletti K, Sundström E, Hodge R, Lein E, Agnihotri S, Eisenstat DD, Stapleton S, King A, Bleil C, Mastronuzzi A, Cole KA, Waanders AJ, Montero Carcaboso A, Schüller U, Hargrave D, Vinci M, Carceller F, Haberler C, Slavc I, Linnarsson S, Gojo J, Monje M, Jones C, Filbin MG. GABAergic neuronal lineage development determines clinically actionable targets in diffuse hemispheric glioma, H3G34-mutant. *Cancer Cell* 27:S1535-6108(24)00305-2, 2024.

Johnston MJ, Lee JJY, Hu B, Nikolic A, Hasheminasabgorji E, Baguette A, Paik S, Chen H, Kumar S, Chen CCL, Jessa S, Balin P, Fong V, Zwaig M, Michealraj KA, Chen X, Zhang Y, Varadharajan S, Billon P, Juretic N, Daniels C, Rao AN, Giannini C, Thompson EM, Garami M, Hauser P, Pocza T, Ra YS, Cho BK, Kim SK, Wang KC, Lee JY, Grajkowska W, Perek-Polnik M, Agnihotri S, Mack S, Ellezam B, Weil A, Rich J, Bourque G, Chan JA, Yong VW, Lupien M, Ragoussis J, Kleinman C, Majewski J, Blanchette M, Jabado N, Taylor MD, Gallo M. TULIPs decorate the three-dimensional genome of PFA ependymoma. *Cell* 187(18):4926-4945.e22, 2024, 2024.

Wu X, Yuan H, Wu Q, Gao Y, Duan T, Yang K, Huang T, Wang S, Yuan F, Lee D, Taori S, Plute T, Heissel S, Alwaseem H, Isay-Del Viscio M, Molina H, Agnihotri S, Hsu DJ, Zhang N, Rich JN. Threonine fuels glioblastoma through YRDC-mediated codon-biased translational reprogramming. *Nat Cancer* 5(7):1024-1044, 2024.

Edward Andrews, MD

Assistant Professor

Edward G. Andrews, MD, joined the University of Pittsburgh Department of Neurological Surgery in July of 2023 after completing his seven-year residency and a two-year enfolded neuro-oncology fellowship, at the University of Pittsburgh.

Dr. Andrews attended the University of Pennsylvania, graduating summa cum laude in 2009 with a degree in neuroscience and near eastern studies, focusing specifically on ancient Egyptian languages. He subsequently earned his medical degree from Sidney Kimmel Medical College at Thomas Jefferson University in 2016, graduating magna cum laude.

During residency, he developed an interest in applications of spatial computing in surgery. This has led to his founding the Surreality Lab, for which he is the executive co-director along with his partner, Jacob Biehl, PhD, an associate professor in the School of Computing and Information at the University of Pittsburgh. The lab was founded in 2020 with the driving mission to democratize surgical care through the development and application of spatial computing innovations and clinical workflows. To achieve the lab's core mission of care, its technical approach is holistic, bringing together spatial computing, robotics, and artificial intelligence. He believes that the integration of these technologies in the operating room will bring quaternary care capabilities to rural and underserved institutions empowering the average surgeon with the resources to be an exceptional surgeon.

Specialized Areas of Interest

Neuro-oncologic neurosurgery; minimally invasive and robotic spine surgery; technology innovation in neurosurgery.

Edward Andrews, MD

Professional Organization Membership
Alpha Omega Alpha
American Association of Neurological Surgeons
American Board of Neurological Surgery
Congress of Neurological Surgeons

Professional Activities
Executive Director, Surreality Lab, University of Pittsburgh

Education & Training
BA, University of Pennsylvania, 2005-09
MD, Sidney Kimmel Medical College, 2012-16
Residency, Neurological Surgery, University of Pittsburgh, 2023
Fellowship, Neuro-oncologic Surgery, University of Pittsburgh, 2020-22

Honors & Awards
Joseph Maroon Aequanimitas Award, University of Pittsburgh, 2023
Resident Teaching Award, Department of Neurological Surgery, University of Pittsburgh, 2023
Best Journal Paper, ISMAR, 2023
Physician Champion of Nursing Award, University of Pittsburgh, 2018
Magna Cum Laude, Sidney Kimmel Medical College, 2016
William F. Keller Prize, Sidney Kimmel Medical College, 2016
Gold Humanism Honor Society Inductee, Sidney Kimmel Medical College, 2016
McClellan Surgical Honor Society, Sidney Kimmel Medical College, 2016
Alpha Omega Alpha (Junior Inductee), Sidney Kimmel Medical College, 2015
Summa Cum Laude, University of Pennsylvania, 2009

News Media Appearances: 2024-25
"Pittsburgh Start-Up noVRel Transforms Neurosurgery Through Augmented Reality," *The Tartan*, Carnegie Mellon University, April 14, 2025.

Publications: 2024-25
• Refereed Articles:
Monek AC, Mitha R, Andrews E, Sarkaria IS, Agarwal N, Hamilton DK. Multidisciplinary Surgical Approach Using Augmented Reality Preplanning for Resection of Giant Thoracic Schwannoma With Robotic-Assisted Thoracoscopic Mobilization. *Oper Neurosurg* (Hagerstown) 27(4):500-503, 2024.

Littlefield N, Amirian S, Biehl J, Andrews EG, Kann M, Myers N, Reid L, Yates AJ Jr, McGrory BJ, Parmanto B, Seyler TM, Plate JF, Rashidi HH, Tafti AP. Generative AI in orthopedics: an explainable deep few-shot image augmentation pipeline for plain knee radiographs and Kellgren-Lawrence grading. *J Am Med Inform Assoc* 31(11):2668-2678, 2024.

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 for adult and pediatric neurosurgical, orthopedic, ENT, vascular, and interventional neuroradiology procedures, as well as motor and language mapping during awake craniotomies. Dr. Anetakis also has an integral role in microelectrode recording and subcortical mapping for the Movement Disorder Surgery Program at UPMC.

Katherine M. Anetakis, MD

Dr. Anetakis competed her pediatric neurology residency and clinical neurophysiology fellowship at UPMC Children's Hospital of Pittsburgh. Her fellowship concentrations included pediatric epilepsy as well as intraoperative neuromonitoring. In 2021, she was named fellowship director of the non-ACGME track IONM fellowship at UPMC.

Specialized Areas of Interest
Intraoperative neurophysiological monitoring; perioperative stroke; post-operative outcomes.

Board Certifications
American Board of Psychiatry and Neurology
American Board of Psychiatry and Neurology: Subspecialty in Clinical Neurophysiology

Hospital Privileges
Indiana Regional Medical Center
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

Professional Activities
Course Lecturer, Principles and Practice of Intraoperative Monitoring, UPMC
Course Lecturer, Cardiovascular Neuromonitoring, UPMC

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

Ahmed J. Awad, MD

Clinical Assistant Professor
Director, Functional and Stereotactic Neurosurgery, UPMC Hamot

Ahmed Awad, MD, joined the UPMC Department of Neurological Surgery in 2025 from Stanford University. As clinical assistant professor and director of functional neurosurgery at UPMC Hamot, Dr. Awad brings exceptional expertise in treating movement disorders, medically refractory epilepsy, and chronic pain syndromes using advanced minimally invasive techniques, including frame-based, frameless, awake, and asleep stereotactic approaches.

Born in Kansas and raised in Germany and Palestine, Dr. Awad's global perspective was shaped early in life. He earned his medical degree from An-Najah National University in Palestine, where he cultivated a passion for neurosurgery and neuroscience research. During medical school, he participated in numerous humanitarian neurosurgery missions, delivering critical care in underserved regions and reinforcing his commitment to patient-centered excellence.

Dr. Awad completed his neurosurgery residency at the Medical College of Wisconsin, training under Peter Pahapill, MD, PhD, and Dan Heffez, MD, pioneers in functional, stereotactic neurosurgery, and pain. During residency, he honed his skills in functional neurosurgery and research. Dr. Awad further refined his expertise through the world-renowned functional neurosurgery fellowship at Stanford University under the mentorship of Jaimie Henderson, MD, and Vivek Buch, MD, mastering cutting-edge neuromodulation techniques.

At UPMC Hamot, Dr. Awad leads the functional neurosurgery program, specializing in deep brain stimulation (DBS) for movement disorders such as Parkinson's disease, essential tremor, and dystonia; surgical treatment for medically refractory epilepsy; and neuromodulation for chronic pain syndromes, including trigeminal neuralgia, occipital neuralgia, Chiari malformation, and other central pain conditions. He has specialized training in spinal cord stimulation, baclofen and pain pumps, responsive neurostimulation (RNS), and stereo-EEG-guided epilepsy surgery. He also performs minimally invasive focused ultrasound ablation for tremors and other movement disorders. His multidisciplinary approach involves collaboration with neurologists, pain specialists, neuropsychologists, and rehabilitation experts to deliver personalized, state-of-the-art care.

In addition to his expertise in functional neurosurgery, Dr. Awad's practice extends to cranial surgeries for both benign and malignant brain tumors, radiosurgery for brain tumors and vascular malformations, and cerebrospinal fluid (CSF) shunt procedures for hydrocephalus. His expertise also includes the surgical management of spinal disorders, such as degenerative spine disease, spinal trauma, spinal tumors, and metastatic spinal cancers.

Dr. Awad's current research interests include clinical outcomes following neuromodulation and focused ultrasound therapy, as well as expanding the role of neuromodulation techniques in neuropsychiatric, pain and neurodegenerative disorders. Throughout his training, Dr. Awad received several nationally competitive research grants, including from the Neurosurgery Research and Education Foundation (NREF), and has published extensively in the areas of DBS, epilepsy surgery, and neuromodulation. He has been invited to present his research and give lectures at prestigious national and international neurosurgery and neuromodulation conferences, contributing to UPMC's leadership in clinical trials and innovative treatments.

Dr. Awad is actively involved in academic neurosurgery and servers on the board of American Society for Stereotactic and Functional Neurosurgery and Congress of Neurological Surgeons committees. With his global perspective, humanitarian experience, and dedication to advancing neurosurgery, Dr. Awad is a vital asset to the University of Pittsburgh Department of Neuro-

Ahmed J. Awad, MD

logical Surgery, enhancing the lives of patients in western Pennsylvania and beyond through compassionate, cutting-edge treatment.

Specialized Areas of Interest
Functional and stereotactic neurosurgery; neuromodulation for pain; epilepsy surgery; spinal cord stimulation; Chiari malformation; baclofen and pain pumps; brain tumors; and spine surgery.

Hospital Privileges
UPMC Hamot
UPMC Presbyterian

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

Professional Activities
Liaison, American Society for Stereotactic and Functional Neurosurgery
Research Committee, American Society for Stereotactic and Functional Neurosurgery

Education & Training
MD, An-Najah National University, Palestine, 2012
Residency, Medical College of Wisconsin, 2024
Fellowship, Stanford University, 2025

Honors & Awards
Research Award, MCWAH Research & Quality Improvement Awards, Medical College of Wisconsin, 2022
Brain Aneurysm Medical Research Award, The BEE Foundation, 2016.
Best Scientific Abstract, American Academy of Neurological and Orthopedic Surgeons, Conference, 2016
Second Prize, ZEISS/Cureus Intraoperative Fluorescence Research Publishing Competition, 2014

Publications: 2024-25
• Refereed Articles:
Awad AJ, Murray MM, Morris JL, Pahapill PA. The Retrograde Approach of Surgical Paddle-Lead Placement for Spinal Cord Stimulation. *Neuromodulation* 28(2):323-330 2025.

Robert L. Bailey, MD

Clinical Assistant Professor
Vice Chief of Neurosurgery, UPMC Passavant

Robert L. Bailey, MD—an ABNS board-certified neurosurgeon—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. In addition, he has expertise in robotic spine surgery to assist in ensuring

Robert L. Bailey, MD

a less invasive surgical approach whenever deemed appropriate. 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. He provides spine care in the Wexford area of Pittsburgh and also participates in community-based clinics in outlying communities including Butler and Sewickley in southwestern Pennsylvania.

Dr. Bailey is an active member of the medical community at UPMC Passavant. He serves on the medical executive committee for the hospital. He was recently appointed as vice chief of neurosurgery for UPMC Passavant.

Specialized Areas of Interest
Back and spine care; minimally invasive spine surgery; robotic spine surgery.

Board Certifications
American Board of Neurological Surgery

Hospital Privileges
UPMC Passavant
UPMC Presbyterian
UPMC Shadyside

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

Professional Activities
Credentialing Committee, UPMC Passavant
Surgical Outcome Committee, UPMC
Medical Executive Committee, UPMC Passavant

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 refining language testing during awake craniotomy procedures to the utilization of signal processing analysis during cerebrovascular procedures. Dr. Balzer received his undergraduate education at the University of Pittsburgh, where he also pursued a graduate education and a PhD in behavioral neuroscience.

Jeffrey Balzer, PhD

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 144 refereed articles and 19 book chapters.

Specialized Areas of Interest
Intraoperative neurophysiological monitoring, subarachnoid hemorrhage, cerebral blood flow and SCS for restoration of function after stroke.

Board Certifications
American Board of Neurophysiological Monitoring

Hospital Privileges
Indiana Regional Medical Center
UPMC Altoona
UPMC Carlisle
UPMC Children's Hospital of Pittsburgh
UPMC Hanover
UPMC Harrisburg
UPMC Horizon
UPMC Jameson
UPMC Lititz
UPMC McKeesport
UPMC Memorial
UPMC Mercy
UPMC Passavant
UPMC Presbyterian
UPMC St. Margaret's
UPMC Shadyside
UPMC Susquehanna
UPMC Western Maryland
UPMC West Shore

Professional Organization Membership
American Clinical Neurophysiology Society
American Society for Neurophysiological Monitoring (Fellow)
American Society for Electroneurodiagnostic Technologists
Pittsburgh Neuroscience Society

Professional Activities
Co-Course Director, Principles and Practice of Intraoperative Monitoring, UPMC
Secretary/Treasurer, American Board of Neurophysiologic Monitoring
Board of Directors, American Society of Neurophysiological Monitoring
Co-Editor, (Koht A, Sloan TB), *Toleikis's Monitoring the Nervous System for Anesthesiologists and Other Health Care Professionals*, 3rd Edition, Springer
Associate Editor, *The Neurodiagnostic Journal*

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

Honors & Awards

Richard Brown Life Time Achievement Award in Intraoperative Neuromonitoring, American Society of Neurophysiologic Monitoring, 2024

Outstanding Publication Award, American Society of Neurophysiological Monitoring, 2024

Publications: 2024-25

• Refereed Articles:

Prat-Ortega G, Ensel S, Donadio SS, Borda L, Boos A, Yadav AP, Verma N, Ho J, Carranza E, Frazier-Kim S, Fields DP, Fisher LE, Weber DJ, Balzer JR, Duong JT, Weinstein S, Eliasson M, Montes, Chen KS, Clemens P, Gerszten P, Mentis GZ, Pirondini E, Friedlander RM, Capogrosso M. First-in-human Study of Epidural Spinal Cord Stimulation in Individuals with Spinal Muscular Atrophy. *Nat Med* 31(4):1246-1256 2025.

Gecici NM, Habib A, Niranjan A, Balzer JR, Sherry N, Zinn PO. Optimizing Brain Mapping: integrating Real-Time Neuropsychological Assessment in Awake Craniotomy. *Neurosurg Focus Video* 12(1):V6 2025.

Khajavi K, Youssef J, Eastlack RK, Balzer JR, Niznik G, Smith W. Safety and Feasibility of Transabdominal Muscle Action Potential Monitoring (TMAP) in Lateral Lumbar Surgery. *World Neurosurg* 197:123878, 2025.

Al-Qudah AM, Tallapaneni PS, Crammond DJ, Balzer J, Anetakis KM, Shandal V, Biaesch J, Ghannam M, Nadkarni N, Gross BA, Lang M, Subramanium K, Sadhasivam S, Thirumala PD. Intraoperative neuromonitoring as an independent predictor for postoperative delirium in ICU following aneurysm clipping. *eNeurologicalSci* 38:100549, 2025.

Al-Qudah AM, Alkalbani L, Tallapaneni PS, Vinuthna DV, Suresh V, Anetakis KM, Crammond D, Balzer J, Shandal V, Visweswaran S, Subramaniam K, Sadhasivam S, Thirumala P. Predicting Postoperative Delirium Using Intraoperative Neuromonitoring in Patients Undergoing Craniotomy for Aneurysm Clipping Surgery. *Eur Neurol* 88(1):1-10, 2025.

Jain U, Balzer J. Benefits of Intraoperative Neuromonitoring for Detection of Cerebral Ischemia. *J Cardiothorac Vasc Anesth* 39(3):849-851 2025.

Al-Qudah AM, Sivaguru S, Anetakis KM, Crammond DJ, Balzer JR, Thirumala PD, Subramaniam K, Sadhasivam S, Shandal V. Role of Intraoperative Electroencephalography in Predicting Postoperative Delirium in Patients Undergoing Cardiovascular Surgeries. *Clin Neurophysiol* 164:40-46 2024.

Al-Qudah AM, Sivaguru S, Anetakis KM, Crammond DJ, Balzer JR, Subramaniam Sadhasivam S, Shandal V, Thirumala PT. Role of Intraoperative Neurophysiological Monitoring in Predicting Postoperative Delirium in Patient Undergoing Carotid Endarterectomy Surgeries. *Eur Neurol* 87(5-6):242-249, 2024.

James Cushing Bayley, MD

Assistant Professor

James Cushing Bayley, MD joined the University of Pittsburgh Department of Neurological Surgery in 2023 as an assistant professor specializing in spinal oncology and peripheral nerve disorders. A native of Boston, he attended Harvard College, earning a degree in applied mathematics, and received his medical degree from the University of Cincinnati College of Medicine.

James Cushing Bayley, MD

Dr. Bayley completed his residency in neurological surgery at Baylor College of Medicine in 2023. During residency, he completed subspecialty training in neurosurgical oncology at MD Anderson Cancer Center with a focus on spinal oncology. Based on his experiences at MD Anderson, Dr. Bayley is building a multidisciplinary center at UPMC, including practitioners from orthopaedic oncology, surgical oncology, radiation oncology, medical oncology, and pain management, dedicated to providing comprehensive care for patients with spinal tumors. Additionally, he received specialized training on peripheral nerve tumors and surgical techniques for nerve reconstruction in cases of injury by trauma or tumors. As with spine tumors, Dr. Bayley will provide comprehensive, multidisciplinary care for peripheral nerve disorders at UPMC with his colleagues from neurology, neurophysiology and rehab medicine.

During residency, Dr. Bayley performed NIH-funded research in meningiomas, the most common primary tumor of the brain and spine. Utilizing next-generation sequencing techniques, he identified molecular groups to advance our knowledge of the behavior and biology of these tumors. His research interest include using computational techniques to advance our understanding of spinal tumors (particularly chordoma), clinical outcomes in the treatment of spine and peripheral nerve tumors, as well as utilization of novel techniques in the treatment of challenging spinal tumors, including laser ablation.

Outside of neurosurgery, Dr. Bayley is an accomplished oarsman, earning second-team All-Ivy honors during college and subsequently winning a U.S. Rowing Club National Championship in the single scull. His wife, Erin Bayley, MD, is a breast surgical oncologist at UPMC and together they have three young children.

Specialized Areas of Interest
Spine tumors, both primary and metastatic; minimally invasive spine surgery; peripheral nerve tumors; peripheral nerve injuries; nerve reconstruction.

Hospital Privileges
Excela Health
UPMC Mercy
UPMC Passavant
UPMC Presbyterian
UPMC Shadyside

Professional Organization Membership
Alpha Omega Alpha
American Association of Neurological Surgeons
Congress of Neurological Surgeons
Pennsylvania Neurosurgical Society
Society for Neuro-Oncology

Education & Training
AB, Applied Mathematics, Harvard College, 2009
MD, University of Cincinnati College of Medicine, 2016
Residency, Baylor College of Medicine and MD Anderson Cancer Center, 2023

Honors & Awards
Kinjiro Iwata Award for Academic Achievement, Baylor College of Medicine, 2022
Best Scientific Paper, Texas Association of Neurological Surgeons, 2021
Alpha Omega Alpha, University of Cincinnati College of Medicine, 2016
Richard Harris Gottesman Award, Harvard College, 2016

James Cushing Bayley, MD

Publications: 2024-25

• Refereed Articles:

Adida S, Taori S, Tirmizi Z, Bayley JC, Zinn PO, Flickinger JC, Burton SA, Choi S, Sefcik RK, Gerszten PC. Stereotactic body radiation therapy for spinal metastases from gastrointestinal primary cancers. *J Neurooncol* 173(3):683-694, 2025.

Taori S, Adida S, Bayley JC, Zinn PO, Burton SA, Flickinger JC, Sefcik RK, Gerszten PC. Long-term outcomes following upfront stereotactic body radiotherapy alone for spinal metastases. *J Neurooncol* [Online ahead of print], 2025.

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
Castle Connolly Top Doctors in America, 2023-25
Orthopedic Teaching Award, UPMC Hamot, 2011-12

Lindsay Bhandari, MD

Clinical Assistant Professor

Lindsay Bhandari, MD, is a neurologist certified by the American Board of Psychiatry and Neurology. She joined the University of Pittsburgh Center of Clinical Neurophysiology in January 2024. She completed her pediatric neurology residency and epilepsy fellowship at Johns Hopkins Hospital, followed by an intraoperative neurophysiologic monitoring fellowship at UPMC Presbyterian in Pittsburgh. Prior to residency, she received her medical degree from the Virginia Commonwealth University School of Medicine.

Dr. Bhandari's clinical interests include intraoperative neurophysiological monitoring in adult and pediatric neurosurgical, orthopedic, ENT, vascular, and interventional neuroradiology procedures, as well as motor and language mapping during awake craniotomies.

Specialized Areas of Interest
Intraoperative neurophysiological monitoring, electroencephalography, transcranial motor evoked potentials, subcortical mapping with microelectrode recording.

Board Certifications
American Board of Psychiatry and Neurology, Child Neurology
American Board of Psychiatry and Neurology, Epilepsy

Hospital Privileges
Excela Health Hospital System
Indiana Regional Medical Center
Trinity Health System
UPMC Altoona
UPMC Bedford
UPMC Children's Hospital of Pittsburgh
UPMC Cole
UPMC East
UPMC Hamot
UPMC Horizon
UPMC McKeesport
UPMC Mercy
UPMC Muncy
UPMC Northwest
UPMC Passavant
UPMC Pinnacle
UPMC Presbyterian
UPMC St. Margaret
UPMC Shadyside
UPMC Shenango
UPMC Somerset
UPMC Susquehanna
UPMC Western Maryland

Professional Organization Membership
American Academy of Neurology
American Clinical Neurophysiology Society

Lindsay Bhandari, MD

Education & Training
BS, Neuroscience, The College of William and Mary, 2013
MD, Virginia Commonwealth University School of Medicine, 2017
Residency, Pediatric Neurology, Johns Hopkins Hospital, 2022
Fellowship, Epilepsy (ACGME), Johns Hopkins Hospital, 2023
Fellowship, Intraoperative Neuromonitoring (non-ACGME), University of Pittsburgh, 2024

Bryan Bolinger, DO

Clinical Assistant Professor

Bryan Bolinger, DO, received a bachelor's degree in neuroscience from the University of Pittsburgh in 2001. During his undergraduate years, he also participated in clinical and bench research at the Brain Trauma Research Center and the Safar Center for Resuscitation Research. Dr. Bolinger obtained his medical degree from the Philadelphia College of Osteopathic Medicine in 2007 and completed his neurosurgical residency through the Philadelphia College of Osteopathic Medicine Consortium of Hospitals in 2013.

Dr. Bolinger returned to the University of Pittsburgh Medical Center in 2013 to complete fellowship training in complex spine surgery under the direction of Adam Kanter, MD; David Okonkwo, MD, PhD, and Peter Gerszten, MD. Board certified in neurosurgery, and after years of practice in Pennsylvania, Dr. Bolinger joined the University of Pittsburgh Department of Neurological Surgery in April of 2020 as a clinical assistant professor.

Specialized Areas of Interest
Minimally invasive spine surgery; endoscopic spine surgery; robotic spine surgery; lateral access spine surgery; artificial disc technology; spinal cord injury; spine trauma; traumatic brain injury.

Board Certifications
American Osteopathic Board of Surgery – Neurosurgical Discipline

Hospital Privileges
UPMC Carlisle
UPMC Community Osteopathic
UPMC Hanover
UPMC Harrisburg
UPMC Lititz
UPMC Memorial
UPMC West Shore
UPMC Williamsport

Professional Organization Membership
American Association of Neurological Surgeons
American College of Osteopathic Surgeons
American Osteopathic Association
North American Spine Society

Education & Training
BS, Neuroscience, University of Pittsburgh, 2001
DO, Philadelphia College of Osteopathic Medicine, 2007
Neurosurgical Residency, Philadelphia College of Osteopathic Medicine, 2013
Fellowship, Complex Spine Surgery, University of Pittsburgh Medical Center, 2014

Bryan Bolinger, DO

Honors & Awards
AANS/CNS Cahill Fellowship Award, 2013

John A. Braca III, MD

Clinical Assistant Professor
Chief of Neurosurgery, UPMC Central & North Central Pa. Regions

John A. Braca III, MD, joined the University of Pittsburgh Department of Neurological Surgery as the chief of neurosurgery for central and north central Pennsylvania in October of 2023. He oversees clinical operations in the eight Neurological Institute locations that serve Annville, Carlisle, Harrisburg, Hershey, Lancaster, Mechanicsburg, Spring Grove and Williamsport.

Dr. Braca received his medical degree from New York Medical College in Valhalla, New York and completed his undergraduate training with a degree in biological sciences and chemistry at Fordham University in New York. He completed his residency training in neurological surgery at Loyola University Medical Center in Maywood, Illinois, and his post residency, CAST-accredited fellowship training in endovascular and cerebrovascular surgery with Goodman Campbell Brain and Spine at Indiana University in Indianapolis. In addition, Dr. Braca completed an enfolded complex spine surgery, intra-residency fellowship with the Loyola University Medical Center.

Dr. Braca is board-certified by the American Board of Neurological Surgery and is a fellow of the American Association of Neurological Surgeons. He specializes in treating patients with intracranial aneurysms, cerebral and spinal arteriovenous malformations (AVMs), carotid endarterectomy, carotid artery stenting, ischemic stroke intervention, endoscopic minimally invasive skull base surgery, pituitary tumors, brain tumors, spine tumors, degenerative spine disease, cervical myelopathy, motion preservation spine surgery and trigeminal neuralgia/facial pain syndromes.

Prior to joining UPMC, Dr. Braca served as an endovascular neurosurgeon with Tower Health in Reading, Pennsylvania, where he also held an academic position of assistant professor with the department of neurosurgery at the Drexel College of Medicine in Philadelphia.

Specialized Areas of Interest
Intracranial aneurysms, cerebral and spinal arteriovenous malformations, dural arteriovenous fistulas, cerebral cavernous malformations, brain tumors, spine tumors, carotid stenosis, intracranial stenosis, ischemic stroke, mechanical thrombectomy.

Board Certifications
American Board of Neurological Surgeons

Hospital Privileges
UPMC Carlisle
UPMC Community General
UPMC Hanover
UPMC Harrisburg
UPMC Lititz
UPMC Memorial
UPMC West Shore
UPMC Williamsport

John A. Braca III, MD

Professional Organization Membership
American Association of Neurological Surgeons
Congress of Neurological Surgeons
Subcortical Surgery Group
Pennsylvania Neurosurgical Society

Education & Training
BS, Biological Sciences and Chemistry, Fordham University, 1999
Masters of Medical Science, Drexel College of Medicine, 2003
MD (Upper Quintile), New York Medical College, 2007
Intra-Residency Complex Spine Focused Training, Loyola University Medical Center, 2013
Neurosurgery Residency, Loyola University Medical Center, 2014
Endovascular Neurosurgery Fellowship, Goodman Campbell Brain and Spine, Indiana University, 2015
Cerebrovascular Fellowship, Goodman Campbell Brain and Spine, Indiana University, 2016

Honors & Awards
Cor et Manus Award, New York Medical College, 2007
William Cullen Bryant Award, New York Medical College, 2007
Neurosurgery Department Award, New York Medical College, 2007
Alumni Endowed Scholarship, New York Medical College, 2007
Loyola University Medical Center Magis Award, 2008-14

Thomas J. Buell, MD

Assistant Professor

Thomas J. Buell, MD, joined the University of Pittsburgh Department of Neurological Surgery in January of 2022. A native of Texas, he attended the University of Texas at Austin where he earned a Bachelor of Science degree in electrical engineering, graduating with high honors and earning the W. C. Dusty and Doris Duesterhoeft Endowed Presidential Scholarship. His early engineering research focused on designing algorithms to advance parallel and distributed processing. After graduation, he worked as an electrical engineer before attending Baylor College of Medicine, earning his medical degree in 2013.

He completed his neurological surgery residency at the University of Virginia in 2020. There he completed an enfolded CAST-accredited complex spine fellowship under Justin Smith, MD, an enfolded CAST-accredited endovascular fellowship, and an international fellowship at Auckland City Hospital in Auckland, New Zealand. He then attended Duke University for a combined orthopedic and neurosurgical AO Spine adult and pediatric complex spine and oncology fellowship training program under Isaac Karikari, MD, and Christopher Shaffrey, MD.

Dr. Buell specializes in complex spinal reconstructive surgery for treatment of all spinal deformities of the cervical, thoracic, and lumbar regions. He is a high-volume surgeon, performing over 300 operations per year. His clinical philosophy is conservative believing, in many cases, non-operative treatment options improve patient symptoms. He provides individualized, patient-engaged, compassionate care and focuses on maximizing outcomes with the least invasive approach.

Dr. Buell has been actively engaged in clinical research, both prospectively and retrospectively, to evaluate which treatments provide greatest clinical benefit while minimizing complications. His research interests focus on clinical outcomes after spinal surgery. He is a prolific academician, having published over 110 papers in peer-reviewed journals such as *Neurology, Neurosurgery, Journal of Neurosurgery, JNS Spine, Spine Deformity,* and *Stroke*. He is also an assistant editor

Thomas J. Buell, MD

for *Operative Neurosurgery* and *Spine Deformity*. He has authored and edited over 20 textbook chapters.

Dr. Buell is a member of the International Spine Study Group, a multi-center non-profit research foundation that studies clinical and economic outcomes resulting in best practice guidelines for adult patients with spinal deformities. This is a consortium of spinal deformity specialists and researchers at over 20 top academic centers in the United States and Canada with collaborators in Europe and Japan. Since the inception in 2009, the International Spine Study Group has presented over 2000 scientific abstracts and has published over 300 peer reviewed manuscripts.

Specialized Areas of Interest
Spinal deformity (cervical, thoracic, lumbar); traditional, open, complex deformity surgery; minimally invasive deformity surgery.

Board Certifications
American Board of Neurological Surgery

Hospital Privileges
UPMC Children's Hospital of Pittsburgh
UPMC Mercy
UPMC Passavant
UPMC Presbyterian
UPMC Shadyside

Professional Organization Membership
American Association of Neurological Surgeons
AO Spine
Congress of Neurological Surgeons
International Spine Study Group Foundation
North American Spine Society
Scoliosis Research Society
Society for Minimally Invasive Spine Surgery

Professional Activities
Assistant Editor, *Operative Neurosurgery*
Editorial Board, *Spine Deformity*

Education & Training
BS, Electrical Engineering, University of Texas at Austin, 2005
MD, Baylor College of Medicine, 2013
Neurosurgery Residency, University of Virginia, 2020
Neuroendovascular Surgery Fellowship, University of Virginia Health System, 2017
Enfolded Fellowship, Adult & Pediatric Spine Deformity Surgery, University of Virginia, 2020
Clinical Associate, Fellow, Duke University, 2022

Honors & Awards
State of Spine Grant Recipient, State of Spine Surgery Think Tank, 2024
Early-Career Spine Surgeon Grant, Masters in Spine Surgery Seminar, 2024
Resident & Fellow Research Award, North American Spine Society, 2020
Whitecloud Award for Best Clinical Abstract, International Meeting on Advanced Spine Techniques (IMAST). 2020
Best Presentation Abstract Award, AANS/CNS Joint Spine Section, Spine Summit, 2018

Thomas J. Buell, MD

John A. Jane, Sr. Neuroanatomy Award, University of Virginia, 2017
Crutchfield, Cage, and Thomson Award, 2nd Place Clinical Research, Neurosurgical Society of the Virginias, 2017
Crutchfield, Cage, and Thomson Award, 1st Place Basic Science, Neurosurgical Society of the Virginias, 2014
Mission Connect Neurotrauma Research Award, Institute for Rehabilitation and Research Foundation, 2011
Medical Student Research Scholarship, Baylor College of Medicine, 2004
Distinguished College Scholar, University of Texas at Austin, 2004
W. C. Dusty and Doris Duesterhoeft Endowed Presidential Scholarship, University of Texas at Austin, 2003-2005

Publications: 2024-25

• Refereed Articles:

Passias PG, Mir JM, Schoenfeld AJ, Yung A, Smith JS, Lafage V, Lafage R, Diebo B, Daniels AH, Line BG, Eastlack RK, Mundis GM, Kebaish KM, Mullin JP, Fessler RG, Mummaneni PV, Chou D, Hamilton DK, Lee SH, Soroceanu A, Scheer JK, Protopsaltis T, Kim HJ, Buell TJ, Hostin RA Jr, Gupta MC, Klineberg EO, Riew KD, Burton DC, Schwab FJ, Bess S, Shaffrey CI, Ames CP; International Spine Study Group. Quantifying the Importance of Upper Cervical Extension Reserve in Adult Cervical Deformity Surgery and Its Impact on Baseline Presentation and Outcomes. *Neurosurgery* [Online ahead of print], 2025.

Mir JM, Smith JS, Yung A, Onafowokan OO, Lafage R, Gum J, Line BG, Diebo B, Daniels AH, Hamilton DK, Agarwal N, Buell TJ, Scheer JK, Eastlack RK, Mullin JP, Mundis GM, Hosogane N, Yagi M, Anand N, Mummaneni PV, Chou D, Klineberg EO, Kebaish KM, Gupta MC, Kim HJ, Lenke LG, Ames CP, Schwab FJ, Lafage V, Hostin RA, Bess S, Burton DC, Shaffrey CI, Passias PG. Impact of thoracolumbar inflection point on outcomes and complications in adult spinal deformity. *Neurosurg Focus* 58(6):E8, 2025.

Adida S, Hudson JS, Legarreta AD, Taori S, Shanahan RM, Jawad-Makki MH, Colan JA, Mitha R, Agarwal N, Okonkwo DO, Hamilton DK, Buell TJ. Revision surgery for proximal junctional failure: A single-center analysis. *Clin Neurol Neurosurg* 253:108880, 2025.

Diebo BG, Balmaceno-Criss M, Lafage R, Singh M, Daher M, Hamilton DK, Smith JS, Eastlack RK, Fessler R, Gum JL, Gupta MC, Hostin R, Kebaish KM, Kim HJ, Klineberg EO, Lewis S, Line BG, Nunley PD, Mundis GM, Passias PG, Protopsaltis TS, Buell T, Scheer JK, Mullin J, Soroceanu A, Ames CP, Lenke LG, Bess S, Shaffrey CI, Schwab FJ, Burton DC, Lafage V, Daniels AH; ISSG. Iatrogenic posterior translation of the construct at the uppermost instrumented vertebrae is associated with proximal junctional kyphosis. *Eur Spine J* 34(4):1470-1479, 2025.

Gohel P, Lavadi RS, Jawad-Makki MH, Kumar RP, Waheed AA, Elkaim LM, Jaikumar V, Alan N, Buell TJ, Pennicooke B, Hamilton DK, Agarwal N. Comprehensive guidelines for prehabilitation in spine surgery. *J Craniovertebr Junction Spine* 16(1):5-15, 2025.

Cloney MB, Buell TJ, Paul DA, Nail TJ, Polavarapu H, Jawad-Makki MA, Adida S, Okonkwo DO. Simultaneous Traumatic Fractures of the Atlas and Axis: Presentation, Management, and Outcomes from a Series of 103 Consecutive Patients. *World Neurosurg* 195:123580, 2025.

Kumar RP, Adida S, Lavadi RS, Mitha R, Legarreta AD, Hudson JS, Shah M, Diebo B, Fields DP, Buell TJ, Hamilton DK, Daniels AH, Agarwal N. A guide to selecting upper thoracic versus lower thoracic uppermost instrumented vertebra in adult spinal deformity correction. *Eur Spine J* 33(7):2742-2750, 2024.

Thomas J. Buell, MD

Cetik RM, Gum JL, Lafage R, Smith JS, Bess S, Mullin JP, Kelly MP, Diebo BG, Buell TJ, Scheer JK, Line BG, Lafage V, Klineberg EO, Kim HJ, Passias PG, Kebaish KM, Eastlack RK, Daniels AH, Soroceanu A, Mundis GM, Hostin RA, Protopsaltis TS, Hamilton DK, Hart RA, Gupta MC, Lewis SJ, Schwab FJ, Lenke LG, Shaffrey CI, Ames CP, Burton DC; International Spine Study Group. Intraoperative fluid management in adult spinal deformity surgery: variation analysis and association with outcomes. *Spine Deform* 13(1):241-250, 2025.

Smith JS, Ben-Israel D, Kelly MP, Lafage V, Lafage R, Klineberg EO, Kim HJ, Line B, Protopsaltis TS, Passias P, Eastlack RK, Mundis GM, Riew KD, Kebaish K, Park P, Gupta MC, Gum JL, Daniels AH, Diebo BG, Hostin R, Scheer JK, Soroceanu A, Hamilton DK, Buell TJ, Lewis SJ, Lenke LG, Mullin JP, Schwab FJ, Burton D, Shaffrey CI, Ames CP, Bess S. The gap between surgeon goal and achieved sagittal alignment in adult cervical spine deformity surgery. *J Neurosurg Spine* 42(3):309-319, 2025.

Roy S, Mitha R, Lavadi RS, Kumar RP, Jaikumar V, Pease M, Alan N, Ozpinar A, Kuris E, Daniels AH, Buell TJ, Heary RF, Agarwal N, Hamilton DK. Emergent spinal pathologies in late-term pregnancy. *J Craniovertebr Junction Spine* 15(4):391-397, 2024.

Onafowokan OO, Lafage R, Tretiakov P, Smith JS, Line BG, Diebo BG, Daniels AH, Gum JL, Protopsaltis TS, Hamilton DK, Buell T, Soroceanu A, Scheer J, Eastlack RK, Mullin JP, Mundis G, Hosogane N, Yagi M, Anand N, Okonkwo DO, Wang MY, Klineberg EO, Kebaish KM, Lewis S, Hostin R, Gupta MC, Lenke LG, Kim HJ, Ames CP, Shaffrey CI, Bess S, Schwab FJ, Lafage V, Burton D, Passias PG; International Spine Study Group. Comparative Analysis of Outcomes in Adult Spinal Deformity Patients with Proximal Junctional Kyphosis or Failure Initially Fused to Upper Versus Lower Thoracic Spine. *J Clin Med* 13(24):7722, 2024.

Passias PG, Tretiakov P, Onafowokan OO, Das A, Lafage R, Smith JS, Line BG, Nayak P, Diebo B, Daniels AH, Gum JL, Hamilton DK, Buell TJ, Soroceanu A, Scheer JK, Eastlack RK, Mullin JP, Schoenfeld AJ, Mundis GM, Hosogane N, Yagi M, Mummaneni PV, Chou D, Fu KM, Than KD, Anand N, Okonkwo DO, Wang MY, Klineberg E, Kebaish KM, Lewis S, Hostin R, Gupta M, Lenke L, Kim HJ, Ames CP, Shaffrey CI, Bess S, Schwab F, Lafage V, Burton D. When is staging complex adult spinal deformity advantageous? Identifying subsets of patients who benefit from staged interventions. *J Neurosurg Spine* 42(2):185-192, 2024.

Singh M, Balmaceno-Criss M, Daher M, Lafage R, Hamilton DK, Smith JS, Eastlack RK, Fessler RG, Gum JL, Gupta MC, Hostin R, Kebaish KM, Klineberg EO, Lewis SJ, Line BG, Nunley PD, Mundis GM, Passias PG, Protopsaltis TS, Buell T, Ames CP, Mullin JP, Soroceanu A, Scheer JK, Lenke LG, Bess S, Shaffrey CI, Schwab FJ, Lafage V, Burton DC, Diebo BG, Daniels AH; International Spine Study Group. Restoring L4-S1 Lordosis Shape in Severe Sagittal Deformity: Impact of Correction Techniques on Alignment and Complication Profile. *World Neurosurg* 189:e219-e229, 2024.

Passias PG, Onafowokan OO, Joujon-Roche R, Smith J, Tretiakov P, Buell T, Diebo BG, Daniels AH, Gum JL, Hamiltion DK, Soroceanu A, Scheer J, Eastlack RK, Fessler RG, Klineberg EO, Kim HJ, Burton DC, Schwab FJ, Bess S, Lafage V, Shaffrey CI, Ames C; International Spine Study Group. Expectations of clinical improvement following corrective surgery for adult cervical deformity based on functional disability at presentation. *Spine Deform* 12(5):1431-1439, 2024.

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 Federale de Lausanne, Switzerland where he worked on the development of brain spinal interfaces for the restoration of voluntary motor control in animals and humans with spinal cord injury. Before joining the University of Pittsburgh, he directed a research group at the primate center of the University of Fribourg, Switzerland and was a manager of the primate platform. He is now director of the Spinal Cord Stimulation Laboratory and part of the Rehab and Neural Engineering Labs of the University of Pittsburgh. Dr. Capogrosso received the Young Investigator Award of the Society for Neuroscience in November 2023

Specialized Areas of Interest
Neural control of movement; neural engineering; biophysics of electrical stimulation; arm paralysis; stroke, neurodegeneration, spinal cord injury; brain computer interfaces.

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

Honors & Awards
Young Investigator Award, Society for Neuroscience, 2023
Senior Vice Chancellor's Research Seminar Award, University of Pittsburgh 2023
Outstanding Reviewer Award, The Journal of Neural Engineering 2020
European Research Council Starting Grant Award, 2019
Career Award, Technological Advances in Spinal Cord Injury, Lupicaia Foundation 2018
MIT 10 Best Breakthrough Technologies, Wireless Brain-Spine Interface, 2017
Swiss National Science Foundation Ambizione Fellowship, 2016
Best Post-Doc Paper, NCCR Robotics, 2014, 2016
Finalist, Tomorrow's PI Prize, Swiss Life Science Annual Meeting, 2015

News Media Appearances: 2024-25
"UPMC-Pitt trial offers hope for patients with rare neurodegenerative diseases," WTAE-TV, (Pittsburgh), February 19, 2025.
"Pitt study the first to use spinal cord stimulation to treat deadly disease, SMA," *Pittsburgh Post-Gazette*, February 15, 2025.
"Reawakening Dormant Nerve Cells: Groundbreaking Neurotechnology Restores Motor Function in SMA," *SciTechDaily,* February 8, 2025.
"Spinal cord stimulation restores movement for people with 'muscle wasting' disorder," Fox News, February 7, 2025.

Marco Capogrosso, PhD

"Experimental spinal stimulation treatment may help with paralyzing genetic disorder," NPR/ WAMU 88.5 (Washington, D.C.) February 6, 2025.
"A spine-zapping implant helped 3 people with a muscle-wasting disease walk better," ABC News, February 5, 2025.
"Spinal Zap Implant Helps Muscle Disease Patients Regain Strength," *HealthDay News*, February 5, 2025.
"How a tiny spinal implant could help those with muscle-wasting disease," *The Independent* (London, England), February 5, 2025.
"Spinal Cord Stimulation Improves Leg Strength and Walking in Adults with SMA," *Genetic Engineering and Biotechnology News*, February 5, 2025.
"A spine-zapping implant helped 3 people with a muscle-wasting disease walk better," *Minnesota Star-Tribune*, February 5, 2025.
"A spine-zapping implant helped 3 people with a muscle-wasting disease walk better," WRAL.com (Raleigh, N.C.), February 5, 2025.
"Neurostimulation improves movement in adults with spinal muscle atrophy," news-medical.net, February 5, 2025.
"A spine-zapping implant helped 3 people with a muscle-wasting disease walk better," Associated Press, February 5, 2025.
"Purposeful. Powerful," *PittMed*, Fall 2024.

Publications: 2024-25

• Refereed Articles:

Prat-Ortega G, Ensel S, Donadio S, Borda L, Boos A, Yadav P, Verma N, Ho J, Carranza E, Frazier-Kim S, Fields DP, Fisher LE, Weber DJ, Balzer J, Duong T, Weinstein SD, Eliasson MJL, Montes J, Chen KS, Clemens PR, Gerszten P, Mentis GZ, Pirondini E, Friedlander RM, Capogrosso M. First-in-human study of epidural spinal cord stimulation in individuals with spinal muscular atrophy. *Nat Med* 31(4):1246-1256, 2025.

Mahrous AA, Liang L, Balaguer JM, Ho JC, Grigsby EM, Karapetyan V, Damiani A, Fields DP, Gonzalez-Martinez JA, Gerszten PC, Bennett DJ, Heckman CJ, Pirondini E, Capogrosso M. Pharmacological blocking of spinal GABAA receptors in monkeys reduces sensory transmission to the spinal cord, thalamus, and cortex. *Cell Rep* 44(1):115100, 2025.

Ho JC, Grigsby EM, Damiani A, Liang L, Balaguer JM, Kallakuri S, Tang LW, Barrios-Martinez J, Karapetyan V, Fields D, Gerszten PC, Hitchens TK, Constantine T, Adams GM, Crammond DJ, Capogrosso M, Gonzalez-Martinez JA, Pirondini E. Potentiation of cortico-spinal output via targeted electrical stimulation of the motor thalamus. *Nat Commun* 15(1):8461, 2024.

Farooqui J, Nanivadekar AC, Capogrosso M, Lempka SF, Fisher LE. The effects of neuron morphology and spatial distribution on the selectivity of dorsal root ganglion stimulation. *J Neural Eng* 21(5):056030, 2024.

Research Activities

Dr. Capogrosso and his team completed their first-in-human clinical trial testing the efficacy of spinal cord stimulation (SCS) to restore arm and hand function in people with chronic stroke (NCT04512690). This trial is performed in collaboration with Peter Gerszten, MD, and Robert Friedlander, MD, from the University of Pittsburgh Department of Neurological Surgery; Elvira Pirondini, PhD, and Lee Fisher, PhD, from the University of Pittsburgh Department of Physical Medicine and Rehabilitation; George Wittenberg, MD, PhD, from the University of Pittsburgh Department of Neurology; Douglas Weber, PhD, from Carnegie Mellon University; and John Krakauer, MD, from Johns Hopkins University. The team's hypothesis is that SCS can support residual motor function in people with upper limb paralysis in consequence of stroke and

Marco Capogrosso, PhD

significantly improve motor control. They observed unexpectedly large effect sizes that substantially improved strength, motor control and daily-life abilities of people with stroke. Dr. Capogrosso's team believes that their data shows that their technology has the potential to become the first effective therapy for permanent post-stroke upper limb hemiparesis. They also reported the results of their first-in-human clinical trial to explore the feasibility of using SCS to treat motor deficits and slow disease progress in people with Spinal Muscular Atrophy (NCT05430113), a human motoneuron disease. The paper published in *Nature Medicine* in 2025 received world-wide media attention for being the first study demonstrating improvement of motoneuron function in a human motoneuron disease using neurotechnology. Dr. Capogrosso's team completed the pilot study and is now working towards the next phase of the clinical trial using a fully implantable system for long-term observation. This study is supported by the venture branch of Roche: Genentech and the SMA Foundation.

Diane L. Carlisle, PhD

Associate 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 differentiating 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 for the NIH-funded stem cell course, Frontiers in Stem Cells and Regeneration, which is held annually at the Marine Biological Laboratories in Woods Hole, Massachusetts.

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.

Professional Activities

Faculty, Frontiers in Stem Cells and Regeneration, University of Chicago Marine Biological Lab
Study Section, 2025 NIH/NIA Technology Evaluation Panel (TEP)
UPMC Certified Peer Coach

Education & Training

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

Diane L. Carlisle, PhD

Research Activities
In the past year, Dr. Carlisle has used patient-specific induced pluripotent stem cells (iPSCs) to investigate mitochondrial function of neural progenitors and neurons 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. She also initiated a new study investigating the use of focused ultrasound to target potential therapeutics to the brain for treatment of neurodegenerative diseases.

Shaun W. Carlson, PhD

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 brain 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 functional recovery following brain injury.

Professional Organization Membership
National Neurotrauma Society
Society for Neuroscience

Professional Activities
Reviewer, National Institutes of Health: Brain Injury and Neurovascular Pathologies
Reviewer, Veterans Affairs: Rehabilitation Research and Development
Reviewer, National Institutes of Health: Small Business Innovation Research and Small Business Technology Transfer programs, ZRG1 NV-S (14) Special Emphasis Panel
Membership Committee, National Neurotrauma Society
Training, Education and Mentoring (TEAM), National Neurotrauma Society

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

Honors & Awards
Allen Humphrey Excellence in Mentoring Award, University of Pittsburgh, 2024
Mellon Scholar, Richard King Mellon Foundation Institute for Pediatric Research, 2023-present
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

Shaun W. Carlson, PhD

Publications: 2024-25

• Refereed Articles:

Rani, A, Raikwar SP, Yoo W, Ahmad S, Vagni VA, Janesko-Feldman KL, Carlson SW, Eberle A, Miller M, Helm J, Catapano J, Zusman BE, Desai S, Kohanbash G, Rajasundaram D, Waters M, Ducruet A, Jadhav A,Kumar A, Phuah CL, Kochanek PM, Jha RM. Sexually Dimorphic Injury and Recovery Responses Reveal Multifaceted Benefits of Glibenclamide after Traumatic Brain Injury. *J Neurotrauma* [Online ahead of print], 2025.

Svirsky SE, Henchir J, Parry M, Holets E, Zhang T, Gittes GK, Carlson SW, Dixon CE. Viral-mediated increased hippocampal neurogranin modulate synapses at one month in a rat model of controlled cortical impact. *Sci Rep* 14(1):28998 2024.

Research Activities

Dr. Carlson's team investigates the mechanisms underlying synaptic and neurobehavioral dysfunction following traumatic brain injury, utilizing multiple experimental injury models, to recapitulate the heterogeneity of TBI across the spectrum of injury severity in support of his National Institutes of Health, Department of Defense and foundation grants. Dr. Carlson's research efforts include the utilization of translational non-invasive imaging, fluid and genetic biomarkers to examine outcomes after traumatic brain injury.

Yue-Fang Chang, PhD

Research Associate Professor

Yue-Fang Chang, PhD, 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: 2024-25

• Refereed Articles:

Sekikawa A, Li M, Joshi N, Herbert B, Tilves C, Cui C, Gao S, Chang Y, Nakano Y, Sciurba FC. Much Lower Prevalence and Mortality of Chronic Obstructive Pulmonary Disease in Japan Than in the United States Despite Higher Smoking Rates: A Meta-Analysis/Systematic Review. *J Epidemiol* 35(2):90-99, 2025.

Linkov F, Chang YF, Ramanan H, Morgan RS, McTigue KM, Dimmock AEF, Bascom R, Kass DJ. Epidemiology of idiopathic pulmonary fibrosis in central and Western Pennsylvania. *Respir Res* 26(1):97, 2025.

Yue-Fang Chang, PhD

Barrios-Martinez JV, Almast A, Lin I, Youssef A, Aung T, Fernandes-Cabral D, Yeh FC, Chang YF, Mettenburg J, Modo M, Henry L, Gonzalez-Martinez JA. Structural connectivity changes in focal epilepsy: Beyond the epileptogenic zone. *Epilepsia* 66(1):226-239, 2025.

Thirumala PD, Snitz BE, Jacobsen E, Chang CH, Chang YF, Ganguli M. Long-term Cognitive Trajectories in Older Adults After Surgery: A Population-based Cohort Study. *Alzheimer Dis Assoc Disord* 39(1):39-43, 2025.

Rabon W, Rode M, Taylor T, Muluk P, Krishnamoorthy A, Easow H, Stout G, Chang YF, Hamilton DK, Thirumala PD, Agarwal N. Establishing Indicative Neurofilament Gradients Based on Severity of Spinal Cord Injury. *World Neurosurg* 195:123515, 2025.

Henry LC, McDowell MM, Stephenson TL, Crittenden JB, Byrd AL, Fernández-de Thomas RJ, Chang YF, Nowicki KW, Mantena R, Strick PL, Friedlander RM.J Predecompression and postdecompression cognitive and affective changes in Chiari malformation type I. *Neurosurg* 143(1):4-12, 2025.

Paget-Blanc A, Thurston RC, Smagula SF, Chang Y, Maki PM. Rest-activity rhythm characteristics associated with lower cognitive performance and Alzheimer's disease biomarkers in midlife women. *Alzheimers Dement* (Amst) 17(2):e70105, 2025.

Tang A, Abdallah HM, Chang YF, Zenonos GA, Gardner PA, Choby GW, Wang EW, Snyderman CH. Changes in pituitary adenoma patient presentation and outcomes during the COVID pandemic at a Pituitary Center of Excellence. *Pituitary* 27(6):986-991, 2024.

Jakubowski K, Riedmann CA, Chang Y, Koenen KC, Maki PM, Thurston RC. Trauma history and persistent poor objective and subjective sleep quality among midlife women. *Menopause* 32(3):207-216, 2025.

Yablonska S, Strohlein CE, Baranov SV, Yeh SM, Patel A, Singh T, Jauhari A, Kim J, Khattar NK, Li F, Wang X, Chang YF, Lee CYD, Yang XW, Carlisle DL, Friedlander RM. Regulation of Mutant Huntingtin Mitochondrial Toxicity by Phosphomimetic Mutations within Its N-Terminal Region. *J Neurosci* 45(8):e1254242024, 2025.

Mandal PK, Arora Y, Samkaria A, Maroon JC, Fodale V, Mehta Y, Chang YF. Oxidative Stress Monitoring Platform: A Longitudinal In vitro Multinuclear (1H/19F) MR Spectroscopic Study. *Cell Biochem Biophys* 83(2):2281-2288, 2025.

Bethamcharla R, Yugrakh MS, Chang YF, Sekula RF Jr. Long-Term Effectiveness of Early Versus Late Microvascular Decompression for Trigeminal Neuralgia Secondary to Arterial Compression. *Eur J Neurol* 32(6):e70184, 2025.

Li M, Fujiyoshi A, Willcox BJ, Li J, Kadota A, Kadowaki S, Seto T, Kadowaki T, Chang Y, Evans R, Miura K, Edmundowicz D, Okamura T, Masaki KH, Ueshima H, Sekikawa A. Progression of aortic calcification among Japanese in Japan and white and Japanese Americans: a prospective cohort study. *Eur Heart J Cardiovasc Imaging* 26(2):273-279, 2025.

Sekikawa A, Higashiyama A, Lopresti BJ, Ihara M, Cui C, Li J, Watanabe M, Li M, Goon S, Aizenstein HJ, Chang Y, Kakuta C, Yu Z, Mathis CA, Kokubo Y, Royse S, Fukuda T, Snitz B, Lopez OL, Miyamoto Y. An inverse association of cerebral amyloid-β deposition and serum docosahexaenoic acid levels in cognitively normal older adults in Japan. *J Alzheimers Dis* 106(1):378-386, 2025.

Yue-Fang Chang, PhD

Saeed A, Chang Y, Swanson J, Vu M, Mapstone M, Villemagne VL, Snitz BE, Royse SK, Wang H, Lopresti B, Aizenstein HJ, Wu M, Kip K, Reis SE, Lopez O, Cohen A. Association of mid-life cardiovascular risk with biomarkers of Alzheimer's disease, neurodegeneration, and white matter hyperintensities: Heart SCORE brain study. *J Alzheimers Dis Rep* 9:25424823241299297, 2025.

Thurston RC, Chang Y, Wu M, Harrison EM, Aizenstein HJ, Derby CA, Barinas-Mitchell E, Maki PM. Reproductive hormones in relation to white matter hyperintensity volumes among midlife women. *Alzheimers Dement* 20(9):6161-6169, 2024.

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. He 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 and mapping 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, thalamus 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 vice-chair of the American Board of Neurophysiologic Monitoring (ABNM).

Specialized Areas of Interest
The application of neurophysiological mapping in the surgical treatment of movement disorders and epilepsy, 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
UPMC Children's Hospital of Pittsburgh
UPMC Presbyterian
UPMC Shadyside

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

Professional Activities
Vice-Chair, American Board of Neurophysiologic Monitoring
Chair, Review Committee, American Board of Neurophysiologic Monitoring
Education Committee, American Society of Neurophysiologic Monitoring
Carnegie Mellon University IRB, DSMB

Donald J. Crammond, PhD

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

Publications: 2024-25

• Refereed Articles:

Al-Qudah AM, Tallapaneni PS, Crammond DJ, Balzer J, Anetakis KM, Shandal V, Biaesch J, Ghannam M, Nadkarni N, Gross BA, Lang M, Subramanium K, Sadhasivam S, Thirumala PD. Intraoperative neuromonitoring as an independent predictor for postoperative delirium in ICU following aneurysm clipping. *eNeurologicalSci* 38:100549, 2025.

Al-Qudah AM, Alkalbani L, Tallapaneni PS, Vinuthna DV, Suresh V, Anetakis KM, Crammond DJ, Balzer J, Shandal V, Visweswaran S, Subramanium K, Sadhasivam S, Thirumala PD. Predicting postoperative delirium using intraoperative neuromonitoring in patients undergoing craniotomy for aneurysm clipping surgery. *Eur Neurol* 88(1):1-10, 2025.

Ho JC, Aung T, Damiani A, Tang L, Mallela AN, Crammond DJ, González-Martínez JA. Refining centromedian nucleus stimulation for generalized epilepsy with targeting and mechanistic insights from intraoperative electrophysiology. *Nat. Commun* 16(1):5272, 2025.

Ho JC, Grigsby EM, Damiani, A, Liang L, Balaguer J-M, Kallakuri S, Tang, L, Barrios-Martinez J, Karapetyan V, Fields D, Gerszten PC, Hitchens KT, Constantine T, Adams G, Crammond DJ, Capogrossi M and Gonzalez-Martinez, Pirondini E. Potentiation of cortico-spinal output via targeted electrical stimulation of the motor thalamus. *Nat Comm* 15(1):8461, 2024.

Al-Qudah AM, Sivaguru S, Anetakis KM, Crammond D, Balzer JR, Subramaniam K, Sadhasivam S, Shandal V, Thirumala PD. Role of Intraoperative Neurophysiological Monitoring in Predicting Postoperative Delirium in Patients Undergoing Carotid Endarterectomy Surgeries. *Eur Neurol* 87(5-6):242-249, 2024.

Lipski WJ, Bush A, Chrabaszcz A, Crammond DJ, Fiez JA, Turner RS, Richardson RM. Subthalamic nucleus neurons encode syllable sequence and phonetic characteristics during speech. *J Neurophysiol* 132(5):1382-1394, 2024.

Research Activities

Dr. Crammond's major clinical research interest is the study of basal ganglia, thalamus and cerebral cortical physiology and their functional interactions related to the control of movement in movement disorders including Parkinson's disease, dystonia and essential tremor, the use of subcortical mapping using micro-electrode recording (MER) to optimize placement of implanted DBS electrodes for DBS therapy of movement disorders and studying thalamic electrophysiology using MER mapping for the optimal placement of RNS electrodes in the treatment of generalized epilepsy. This is accomplished by recording neurophysiological data using MER to record from single neurons and local field potential (LFP) recordings in the basal ganglia or thalamus simultaneously with electrocorticography (ECoG) and LFP from cerebral cortex and by stimulating various structures, to examine the physiological relationship between basal ganglia and thalamus and functional areas of cerebral cortex that are known circuits involved in these respective conditions.

Donald J. Crammond, PhD

Dr. Crammond's research examines how these cortical areas and subcortical nuclei are involved in different aspects of movement planning and movement execution during the performance of controlled behavioral tasks. Currently, three research studies are ongoing. The first is examining the role of the motor thalamus in the facilitation of primary motor cortex to test if motor thalamus stimulation can facilitate corticospinal activation of arm and face muscles in patients with a loss of motor function after suffering a subcortical stroke. Dr. Crammond hopes to use DBS therapy to treat patients with spinal lesions or subcortical strokes and this is being actively tested in patients undergoing DBS implantation into motor thalamus to treat essential tremor. The plan is to soon study the use of motor thalamus DBS in stroke patients as a potential new therapy to enhance movement in these stroke patients who have impaired arm/hand and speech function and to facilitate their recovery after stroke with rehabilitation therapies. The second completed study examined the use of DBS to treat addiction. Specifically, two patients have had DBS implanted into the limbic area of the globus pallidum who are being followed over the long term to examine if limbic pallidal DBS can treat or modify their alcohol addiction. The third study is examining several thalamic nuclei to determine if stimulation of subregions of these nuclei modulates cortical EEG activity and Dr. Crammond has found that stimulation-induced EEG slowing is a potential biomarker to guide optimal placement of implanted RNS electrodes used to treat seizures occurring in these same cerebral cortical regions.

As we understand more about basal ganglia and thalamic physiology and cortical-basal ganglia-thalamic interactions, we hope this will improve the targeting for optimal DBS placement within the basal ganglia and thalamic nuclei to improve the efficacy of DBS and RNS therapy in movement disorder and epilepsy patients respectively and to continue to explore new indications for DBS therapy.

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.

C. Edward Dixon, PhD

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 is a member of the advisory committee for PRE Clinical Interagency reSearch resourcE-TBI (PRECISE-TBI). As part of the PRECISE-TBI, he directs the Preclinical Model Catalogue Core and is a member of the working group for preclinical common data elements Dr. Dixon served as president of the National Neurotrauma Society for the 2002-03 term and continued as councilor of the society for terms 2004-07 and 2009-12. 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 257 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
International Behavioral Neuroscience Society
National Neurotrauma Society (Charter Member)
Pittsburgh Chapter of Society for Neuroscience
Society for Neuroscience

Professional Activities
TBI Model Core Director, PRE Clinical Interagency reSearch resourcE-TBI
Scientific Board Member, Texas Institute for Rehabilitation Research
Grant Reviewer, Congressionally Directed Medical Research Programs (CDMRP)
Grant Reviewer, NIH Special Emphasis Panel/Scientific Review Group
Grant Reviewer, Department of Defense, CDMRP TBI Panel
Grant Reviewer and Chair, NIH, Special Emphasis Panel
Co-Chair, Kentucky Spinal Cord & Head Injury Study Section
Grant Reviewer, NJCBIR (New Jersey Commission on Brain Injury Research)
Grant Reviewer, Mission Connect-TIRR Foundation
Grant Reviewer, U.S. Army Medical Research & Development Command

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

Publications: 2024-25
• Refereed Articles:
Svirsky SE, Henchir J, Parry M, Holets E, Zhang T, Gittes GK, Carlson SW, Dixon CE. Viral-mediated increased hippocampal neurogranin modulate synapses at one month in a rat model of controlled cortical impact. *Sci Rep* 14(1):28998, 2024.

Ahmed E. Doomi, MD

Clinical Assistant Professor

Ahmed Doomi, MD, joined the University of Pittsburgh's Department of Neurological Surgery as a clinical assistant professor in August 2024. He brings specialized expertise in spine surgery, stereotactic and functional neurosurgery, and general neurosurgery. Following advanced fellowship training in complex and minimally invasive spine procedures, Dr. Doomi is skilled in performing a wide range of surgical techniques—including minimally invasive, ultra-minimally invasive endoscopic, and open spine surgeries. His comprehensive approach enables him to tailor treatment plans to each patient, ensuring personalized care for a variety of spinal conditions.

Dr. Doomi's fellowship training in functional neurosurgery and neuromodulation enables him to deliver optimal outcomes for patients with movement disorders, intractable epilepsy, and chronic pain. He is affiliated with UPMC Altoona.

Dr. Doomi earned his medical degree from the University of Khartoum in Sudan. He went on to complete a neurosurgery residency at Hamad Medical Corporation (HMC) in Qatar, an institution affiliated with Weill Cornell Medical College in Qatar (WCMC-Q), one of the most prestigious academic healthcare institutions in the Middle East. He is board-certified in neurosurgery by the Arab Board of Neurosurgery, the European Board of Neurosurgery, and the Royal College of Surgeons in the United Kingdom.

Following his residency, Dr. Doomi practiced neurosurgery before relocating to the United States, where he completed a postdoctoral fellowship in skull base and microneurosurgery at Weill Cornell Medical College in New York, N.Y. He also pursued a postdoctoral research fellowship in spine biomechanics at Barrow Neurological Institute in Phoenix, Arizona.

Dr. Doomi further advanced his training through two CAST-accredited clinical fellowships: one in stereotactic and functional neurosurgery at the University of Miami, and another in minimally invasive and complex spine surgery at Houston Methodist Hospital.

Dr. Doomi's research portfolio includes numerous publications and abstracts in the field of neurosurgery. He has been actively involved in both clinical and basic science research projects. Outside of his professional work, Dr. Doomi enjoys traveling, music, and teaching.

Specialized Areas of Interest
Minimally invasive spine surgery, spine endoscopy, and stereotactic and functional neurosurgery.

Board Certifications
Arab Board of Neurosurgery
European Board of Neurosurgery
The Royal College of Surgeons in the United Kingdom

Hospital Privileges
UPMC Altoona

Professional Organization Membership
American Association of Neurological Surgeons
American College of Surgeons
Congress of Neurological Surgeons
European Association of Neurological Surgeons
Royal College of Surgeons of Edinburgh

Ahmed E. Doomi, MD

Pan Arab Neurosurgical Society
Sudanese American Physician Association
Sudanese Association of Neurosurgeons

Education & Training
MBBS, University of Khartoum, Sudan, 2006
Residency, Neurological Surgery, Hamad Medical Corporation (HMC) in Qatar, 2014
Postdoctoral Fellowship, Skull Base and Micro Neurosurgery, Weill Cornell Medical College, 2018
Postdoctoral Research Fellowship, Spine Biomechanics, Barrow Neurological Institute, 2022
Fellowship, Stereotactic and Functional Neurosurgery, University of Miami, 2023
Fellowship, Minimally Invasive and Complex Spine Surgery, Houston Methodist Hospital, 2024

Honors & Awards
Todd's Award, Best Oral Abstract, Joint AANS/CNS Spine Section, 2024
Graduated with distinction in Pathology and Surgery, University of Khartoum, 2006

Publications: 2024-25
• Refereed Articles:
Khan MM, Ali A, Elbadway M, Shah N, Doomi A, Alrabayah T, Belkhair S. Balancing the Scalpel and the Heart: A Neurosurgeon's Guide to Empathy. *World Neurosurg* 195:123703, 2025.

Abdelradi FE, Ahmed M, Hussein A, Doomi A. Paraganglioma of The Skull as A Rare Presentation with Literature Review. *Surg Res* 6(6):1-9, 2024.

Mustafa Ahmed MM, Imam M, Abdelradi FE, Zidan A, Bashier BM, Issawi K, Aldeaf SA, Drgam A, Hamed M, Taha S, Hussein A, Doomi A. Outcome in war related penetrating brain injury. *J Neurol Neurosci* (5):111-115, 2024.

Shawn R. Eagle, PhD

Research Assistant Professor

Shawn R. Eagle, PhD, joined the faculty of the Department of Neurological Surgery at the University of Pittsburgh in January of 2022. Dr. Eagle has collaborated on Department of Defense (DoD) funded research through the University of Pittsburgh since 2013. He began focusing on TBI in 2015 when he began his doctoral studies at the University of Pittsburgh's Neuromuscular Research Laboratory. Dr. Eagle extended his studies as a postdoctoral fellow in the UPMC Sports Medicine Concussion Clinic from 2019 to 2021. His research interests are currently focused on mitigating risk for long-term sequelae following traumatic brain injury, with a specific focus on mental health issues. Dr. Eagle's research has been supported by the Congressionally Directed Medical Research Program (CDMRP), the Chuck Noll Foundation for Brain Injury Research, and the American College of Sports Medicine.

Dr. Eagle has published over 150 papers in refereed journals and presented his research at local, national and international scientific conferences. Dr. Eagle serves the broader TBI research community as an assistant editor for *Neurosurgery* and *Journal of Athletic Training*, as a member of the National Neurotrauma Society (NNS) publication committee, serving on the National Institute of Neurological Disorders and Stroke (NINDS) common data element working groups, and as a member of the Parkinson Foundation of Western Pennsylvania medical advisory board.

Specialized Areas of Interest
Understanding how systemic health at time of injury impacts TBI recovery and long-term health; Improving implementation of new technologies for the assessment and management of TBI into clinical practice.

Shawn R. Eagle, PhD

Board Certifications
Certified Athletic Trainer

Professional Organization Membership
International Initiative for Traumatic Brain Injury Research (InTBIR)
National Athletic Trainers' Association
National Neurotrauma Society
Sports Neuropsychology Society

Professional Activities
Traumatic Brain Injury Subject Matter Expert, TBI Center of Excellence, Department of Defense.

Education & Training
BA, Athletic Training, Denison University, 2011
MAT, Athletic Training, Texas Tech University, 2013
PhD, Rehabilitation Science, University of Pittsburgh, 2019
Postdoctoral Fellowship, Department of Orthopaedic Surgery, University of Pittsburgh, 2021

Honors & Awards
Young Investigator Award Finalist, Military Health Sciences Research Symposium, 2020
Neuromuscular Plasticity Scholar Award, University of Florida, 2018
Doctoral Student Award, International Congress on Soldiers' Physical Performance, 2017
Mid-Atlantic Regional Doctoral Student Investigator Award, American College of Sports Medicine, 2016

News Media Appearances: 2024-25
"Higher BMI linked to slower concussion recovery in athletes, cadets," *Medical News*, June 25, 2025.
"New Innovations in Concussion Research: Predictive Biomarkers and Mental Health Factors," *Talking Heads: Fresh Topics in Sports Neuropsycholgy* Podcast, Sports Neuropsychology Society, January 9, 2025.

Publications: 2024-25
• Refereed Articles:
Eagle SR, Puccio A, Svirsky S, Mountz J, Laymon C, Borasso A, Henry L, Okonkwo DO. Identifying a biological signature of trauma-related neurodegeneration following repeated traumatic brain injuries compared to healthy controls. *Neurotrauma Rep* 6(1):560-568 2025.

Eagle SR, Svirsky SE, Puccio AM, Borrasso A, Edelman K, Beers S, Agoston D, Soose R, Collins M, Kontos A, Schneider W, Okonkwo DO. Predictive Blood Biomarkers of Targeted Intervention for Chronic Mental Health Symptoms following Traumatic Brain Injury. *J Neurotrauma* 42(5-6):e454-e460, 2025.

Eagle SR, Barber J, Temkin N, McCrea MA, Giacino JT, Okonkwo DO, Madhok D, Yue JK, Zerbato JM, Manley GT, Nelson LD; TRACK-TBI Investigators. Follow up rates and patient interest in clinical care after mild traumatic brain injury presenting to a level 1 trauma center: a TRACK-TBI prospective cohort study. *Front Neurol* 16:1558204, 2025.

Eagle SR, Gardner RC, Jain S, Sun X, Puccio A, Brent D, Nelson LD, McCrea MA, Giacino JT, Okonkwo DO, Yue JK, Manley GT, Stein MB; TRACK-TBI Investigators. Association of blood-based glial fibrillary acidic protein level with depression and suicidal ideation following traumatic brain injury with Glasgow Coma Scale score 13 to 15: a TRACK-TBI study. *Brain Commun* 7(2):fcaf123, 2025.

Shawn R. Eagle, PhD

Eagle SR, Choukas-Bradley S. Research Letter: Sexual Minority Disparities in Self-Reported Sport- or Recreation-Related Concussion Rates in a Nationally Representative US Sample. *J Head Trauma Rehabil* 40(4):E329-E333, 2025.

Eagle SR, Preszler J, Brunner MN, Manderino L, Zynda AJ, French J, Collins MW, Kontos AP. Identifying the 'Miserable Minority' Among Pediatric Patients Following Concussion. *J Pediatr Surg* 60(2):162006, 2025.

Eagle SR, Zynda AJ, Sandulli L, Hickey RW, Kegel NE, Nelson L, McCrea M, Collins MW, Okonkwo DO, Thomas DG, Kontos AP. The Role of Body Mass Index on Physical Activity, Symptoms, and Related Outcomes Following Pediatric Concussion. *J Pediatr* 277:114386, 2025.

Eagle SR, Kontos AP, Flanagan SD, Connaboy C. Association of Risk-Taking Behaviors, Vestibular Provocation and Action Boundary Perception Following Sport-Related Concussion in Adolescents. *Brain Sci* 15(3):229, 2025.

Eagle SR, Temkin N, Barber JK, McCrea M, Giacino JT, Okonkwo D, Manley GT, Nelson L; TRACK-TBI Investigators. Association of Subacute Mild Traumatic Brain Injury Symptoms With Long-Term Persistent Symptoms, Functional Limitations, and Quality of Life. *Neurology* 104(8):e213427, 2025.

Serlin Y, Imtiaz H, MacLean MA, Pease MW, Okonkwo DO, Puccio AM, Eagle S, Castellano JF, Inati SK, Friedman A. Paroxysmal cortical slowing predicts posttraumatic epilepsy after severe traumatic brain injury. *Neurocrit Care* [Online ahead of print], 2025.

Eagle SR, Huber D, McCrea M, Okonkwo DO, Harezlak J, McAllister T, Pasquina P, Broglio S, Meier TB, and the CARE Consortium Investigators. Effect of obese body mass index on clinical outcomes and inflammatory blood biomarkers following sport-related concussion in collegiate athletes and military cadets: findings from the NCAA-DoD CARE Consortium. *Sports Med* [Online ahead of print], 2025.

Eagle SR, Lamb B, Huber D, McCrea MA, Tarima S, deRoon-Cassini TA, Okonkwo DO, Nelson LD. Distinct symptom recoveries based upon highest level of care in patients with sport-related concussion or traumatic brain injury and Glasgow Coma Scale 13-15. *Clin Neurol Neurosurg* [Online ahead of print], 2025.

Temkin N, Barber J, Machamer J, Sugar G, Morrissey MR, Boase K, Zahniser E, Bodien YG, Giacino JT, McCrea MA, Nelson LD, Stein MB, Taylor S, Robertson C, Okonkwo D, Manley G, Dikmen S; TRACK-TBI Investigators (incl. Eagle SR). Contribution of Extracranial Injuries to GOSE Scores after Traumatic Brain Injury TBI: A TRACK-Traumatic Brain Injury Study. *J Neurotrauma* [Online ahead of print], 2025.

Krieger D, Shepard P, Kontos AP, Collins MW, Puccio A, Eagle S, Schneider W, Okonkwo DO. Sensory driven neurophysiological mechanisms of concussion: a parsimonious and falsifiable theory. *Front Neurol* 16:1547786 2025.

Okonkwo DO, Mares A, Wasserman EB, Shrestha R, Terry DP, Solomon G, Sills A, Eagle SR. No Association Between Fencing Response After Concussion and Recovery Time, Concussion Severity, or Clinical Outcomes in Professional American Football Players. *Neurosurgery* [Online ahead of print], 2025.

Shawn R. Eagle, PhD

Eagle SR, Sherry N, Kershaw EE, Basantani MK, Puccio A, McIntyre P, Henry RJ, Okonkwo DO. Impact of obese body mass index on inflammasome blood biomarkers and neurocognitive performance following traumatic brain injury with Glasgow coma scale 13 to 15. *J Neurol Sci* 464:123159, 2024.

Yue JK, Etemad LL, Elguindy MM, van Essen TA, Belton PJ, Nelson LD, McCrea MA, Vreeburg RJG, Gotthardt CJ, Tracey JX, Coskun BC, Krishnan N, Halabi C, Eagle SR, Korley FK, Robertson CS, Duhaime AC, Satris GG, Tarapore PE, Huang MC, Madhok DY, Giacino JT, Mukherjee P, Yuh EL, Valadka AB, Puccio AM, Okonkwo DO, Sun X, Jain S, Manley GT, DiGiorgio AM; TRACK-TBI Investigators; Badjatia N, Barber J, Bodien YG, Fabian B, Ferguson AR, Foreman B, Gardner RC, Gopinath S, Grandhi R, Russell Huie J, Dirk Keene C, Lingsma HF, MacDonald CL, Markowitz AJ, Merchant R, Ngwenya LB, Rodgers RB, Schneider ALC, Schnyer DM, Taylor SR, Temkin NR, Torres-Espin A, Vassar MJ, Wang KKW, Wong JC, Zafonte RD. Prior traumatic brain injury is a risk factor for in-hospital mortality in moderate to severe traumatic brain injury: a TRACK-TBI cohort study. *Trauma Surg Acute Care Open* 9(1):e001501, 2024.

Eagle SR, Sherry N, Kershaw EE, Basantani MK, Puccio A, McIntyre P, Henry RJ, Okonkwo DO. Impact of obese body mass index on inflammasome blood biomarkers and neurocognitive performance following traumatic brain injury with Glasgow coma scale 13 to 15. *J Neurol Sci* 464:123159, 2024.

Grashow R, Tan CO, Thomas JD, DiGregorio H, Lee H, Rotem RS, Marengi D, Terry DP, Eagle SR, Iverson GL, Whittington AJ, Zafonte RD, Weisskopf MG, Baggish AL. Career duration and later-life health conditions among former professional American-style football players. *Occup Environ Med* 81(10):498-506, 2024.

Preszler J, Manderino L, Elbin RJ, Eagle SR, Brunner MN, Gomes D, Collins MW, Kontos AP. Confirmatory Factor Analysis and Concurrent Validity of the Concussion Clinical Profiles Screening Tool (CP Screen). *Dev Neuropsychol* 49(8):331-341, 2024.

Eagle SR, Henry RJ. Applying Dynamical Systems Theory to Improve Personalized Medicine Following Mild Traumatic Brain Injury. *Neurotrauma Rep* 5(1):671-679, 2024.

Monti K, Conkright MW, Eagle SR, Lawrence DW, Dretsch LM. The role of nutrition in mild traumatic brain injury rehabilitation for service members and veterans. *NeuroRehabilitation* 55(3):281-294, 2024.

Sherry N, Eagle SR, Henry LC, Appleton H, González Martínez JA, Friedlander RM, Okonkwo DO, Zinn PO. Perceived Cognitive Function in Neurosurgical Patients. *Neurosurgery* [Online ahead of print], 2024.

Kegel N, Zynda AJ, Feder AH, Trbovich A, Eagle SR, Smith P, Fazio-Sumrok V, Kontos AP. Immediate post-concussion assessment and cognitive testing Pediatric (ImPACT Pediatric) change scores and factors associated with performance in patients aged 5-9 years following concussion: Preliminary findings. *Appl Neuropsychol Child* [Online ahead of print], 2024.

Research Activities

Dr. Eagle received a Congressionally Directed Medical Research Program (CDMRP) Health Services Research Award to improve implementation of the iSTAT Alinity Whole Blood TBI test in emergency departments.

Matt El-Kadi, MD, PhD

Clinical Professor
Vice Chair
Chief, Neurosurgery, UPMC Passavant
Director, UPMC Matt El-Kadi 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 Matt El-Kadi 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 has also been honored since 2019 as one of Marquis *Who's Who in America*. 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 outcomes.

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

Matt El-Kadi, MD, PhD

Ohio County Medical Society
Pennsylvania Medical Society
Pennsylvania Neurosurgical Society

Professional Activities
Board of Directors, UPMC Passavant and St. Margaret
Board of Directors, Passavant Foundation
Chairman, Passavant Hospital Foundation Finance Committee

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
Fellowship, Neurosurgery, University of Connecticut, 1994
Fellowship, Neurosurgery, Allegheny General Hospital, 1998
Residency, Neurosurgery, West Virginia University, 1999

Honors & Awards
Castle Connolly Top Doctors in America, 2012-25
UPMC Specialty Care, Wexford, renamed UPMC Matt El-Kadi Spine Center, 2024
UPMC Passavant dedicates the Matt El-Kadi MD, PhD, Surgical Family Lounge, 2024
Marquis *Who's Who in America*, 2019-20
UPMC Passavant Legacy of Caring Award, 2014
UPMC Champion of Nursing Award, 2011

David T. Fernandes Cabral, MD

Assistant Professor
Director, Resident Education

David T. Fernandes Cabral, MD, joined the University of Pittsburgh Department of Neurological Surgery at UPMC Mercy in July of 2024 after completing a seven-year residency at the University of Pittsburgh as well as a enfolded skull base fellowship. He 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.

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, traumatic brain injury, spine trauma, and teaching.

David T. Fernandes Cabral, MD

Hospital Privileges
UPMC Mercy
UPMC Presbyterian
UPMC Shadyside

Professional Organization Membership
American Association of Neurological Surgeons
American Medical Association
Congress of Neurological Surgeons
North America Skull Base Society

Education & Training
MD, Universidad Central de Venezuela, 2017
Post-Doctoral Fellowship, High-Definition Fiber Tractography, University of Pittsburgh, 2017
Enfolded Skull Base Fellowship, University of Pittsburgh, 2023-24
Skull Base Fellowship, University of Pittsburgh, 2024
Residency, Neurological Surgery, University of Pittsburgh, 2024

Honors & Awards
Best Faculty Teacher, Department of Neurological Surgery, 2025
Joseph Maroon Aequanimitas Award, University of Pittsburgh, 2024
Best Resident Teacher, Department of Neurological Surgery, 2024
Best Clinical Research Poster, Disorders of the Spine and Peripheral Nerves Session, Congress of Neurological Surgeons Annual Meeting, 2023
Cover Call Competition Winner, Nature Reviews Neurology, 2017
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: 2024-25
• Refereed Articles:
Barrios-Martinez JV, Almast A, Lin I, Youssef A, Aung T, Fernandes-Cabral D, Yeh FC, Chang YF, Mettenburg J, Modo M, Henry L, Gonzalez-Martinez JA. Structural connectivity changes in focal epilepsy: Beyond the epileptogenic zone. *Epilepsia* 66(1):226-239 2025.

Fernández de-Thomas RJ, Adida S, Cloney MB, Mitha R, Lavadi RS, Deng H, Lopez-Gross AS, Sen A, Fernandes-Cabral DT, Abou-Al-Shaar H, Gerszten PC, Okonkwo DO, Buell TJ, Hamilton DK, Agarwal N. Current Trends in the Use of Cervical Collar Immobilization After Cervical Spine Surgery: A Global Survey Analysis. *Clin Spine Surg* [Online ahead of print], 2025.

Abdallah HM, Fernandes Cabral DT, Gersey ZC, Abou-Al-Shaar H, O'keefe S, Mysels S, John I, Gardner PA, Solari MG, Zenonos GA. Reduction of giant parietooccipital fibrous dysplasia using dynamic mirror image guidance: a case report and review of the literature. *Br J Neurosurg* 38(6):1440-1446, 2024.

Fernandes Cabral DT, Zenonos GA, Barrios-Martinez J, Bonhomme GR, Yeh FC, Fernandez-Miranda JC, Friedlander RM. Implementation of high-definition fiber tractography for preoperative evaluation and surgical planning of brainstem cavernous malformation: long-term outcomes. *J Neurosurg* 142(4):968-976, 2024.

Robert M. Friedlander, MD

Chair, Walter E. Dandy Distinguished Professor
Director, Complex Brain Surgery Program
Co-Director, UPMC Neurological Institute

Robert Friedlander, MD, MA, is the Walter E. Dandy Distinguished Professor, chair 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-chair 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 a number of significant academic awards, most significantly an induction into the prestigious National Academy of Medicine in 2019. 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. He has also received 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, the H. Richard Winn Prize from the Society of Neurological Surgeons, and the Distinguished Chancellor University of Pittsburgh Research Award.

Dr. Friedlander is an elected member of the prestigious American Society for Clinical Investigation, and the Association of American Physicians. 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, brain tumors and Chiari malformations.

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.

Dr. Friedlander served on 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.

Robert M. Friedlander, MD

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.

Board Certifications
American Board of Neurological Surgeons

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

Professional Activities
Annual Meeting Committee, American Association of Neurological Surgeons
Research Committee, American Association of Neurological Surgeons
Publications Committee, Congress of Neurological Surgeons
Executive Committee, Congress of Neurological Surgeons
Chair, Scientific Advisory Board, NeuBase Therapeutics
Chief Scientific Officer, NeuBase Therapeutics
Clinical Trials Subcommittee, NINDS National Advisory Council
Fellowships and Training Subcommittee, NINDS National Advisory Council
Basic Science Subcommittee, NINDS National Advisory Council
Chair, AANS/CNS Joint Cerebrovascular Section, American Academy of Neurological Surgery
NAM Nominating Committee, National Academy of Medicine
Research Committee, Society of Neurological Surgeons
Scientific Advisory Board, Brain Aneurysm Foundation
Scientific Advisory Board, Worldwide Syringomyelia and Chiari Taskforce
Scientific Advisory Board, DiFusion Technologies

Robert M. Friedlander, MD

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

Honors & Awards
Castle Connolly Top Doctors in America, 2012-25
Distinguished Chancellor University of Pittsburgh Research Award, 2021
National Academy of Medicine induction, 2019
Honored Guest, HRH Crown Prince Alexander and HRH Crown Princess Katherine, Belgrade, Serbia, 2014
Honored Guest, U.S. Ambassador, Belgrade, Serbia, 2013
America's Top Surgeons, 2013
H. Richard Winn Prize for Neurosurgical Research, 2012

News Media Appearances: 2024-25
"Surviving a brain aneurysm at book club — and raising awareness of the risks," *Pittsburgh Post-Gazette*, March 29, 2025.
"Surgery for Chiari Malformation may improve psychological health," msn.com, February 21, 2025.
"Reawakening Dormant Nerve Cells: Groundbreaking Neurotechnology Restores Motor Function in SMA," *SciTechDaily*, February 8, 2025.
"Spinal Cord Stimulation Improves Leg Strength and Walking in Adults with SMA," *Genetic Engineering and Biotechnology News*, February 5, 2025.
"Neurostimulation improves movement in adults with spinal muscle atrophy," news-medical.net, February 5, 2025.

Publications: 2024-25
• Refereed Articles:
Hoz SS, Ma L, Agarwal P, Jacobs RC, Al-Bayati AR, Nogueira RG, Zenonos GA, Gardner PA, Friedlander RM, Lang MJ, Gross BA. Clinical comparison of flow diversion and microsurgery for retreatment of intracranial aneurysms. *J Clin Neurosci* 136:111296, 2025.

Prat-Ortega G, Ensel S, Donadio S, Borda L, Boos A, Yadav P, Verma N, Ho J, Carranza E, Frazier-Kim S, Fields DP, Fisher LE, Weber DJ, Balzer J, Duong T, Weinstein SD, Eliasson MJL, Montes J, Chen KS, Clemens PR, Gerszten P, Mentis GZ, Pirondini E, Friedlander RM, Capogrosso M. First-in-human study of epidural spinal cord stimulation in individuals with spinal muscular atrophy. *Nat Med* 31(4):1246-1256, 2025.

Mitha R, Kumar RP, Agarwal N, Gerszten PC, Hamilton DK, Friedlander RM, Sefcik R. Opportunities to Overcome Barriers to Lactation-Recommendations for Best Practices. *J Surg Educ* 82(4):103445 82(4):103445, 2025.

Jauhari A, Monek AC, Suofu Y, Amygdalos OR, Singh T, Baranov SV, Carlisle DL, Friedlander RM. Melatonin Deficits Result in Pathologic Metabolic Reprogramming in Differentiated Neurons. *J Pineal Res* 77(2):e70037, 2025.

Henry LC, McDowell MM, Stephenson TL, Crittenden JB, Byrd AL, Fernández-de Thomas RJ, Chang YF, Nowicki KW, Mantena R, Strick PL, Friedlander RM. Predecompression and postdecompression cognitive and affective changes in Chiari malformation type I. *J Neurosurg* 143(1):4-12, 2025.

Robert M. Friedlander, MD

Yablonska S, Strohlein CE, Baranov SV, Yeh SM, Patel A, Singh T, Jauhari A, Kim J, Khattar NK, Li F, Wang X, Chang YF, Lee CYD, Yang XW, Carlisle DL, Friedlander RM. Regulation of mutant huntingtin mitochondrial toxicity by phosphomimetic mutations within its N-terminal region. *J Neurosci* 45(8):e1254242024, 2025.

Agarwal P, Gaba F, Agarwal N, Crall V, Mazurkiewicz A, Friedlander RM. Physician Awareness Combined With Perioperative Infection Prevention Bundles Results in Durable Neurosurgical Infection Control and Cost Savings. *Neurosurgery* [Online ahead of print], 2025.

Fernandes Cabral DT, Zenonos GA, Barrios-Martinez J, Bonhomme GR, Yeh FC, Fernandez-Miranda JC, Friedlander RM. Implementation of high-definition fiber tractography for preoperative evaluation and surgical planning of brainstem cavernous malformation: long-term outcomes. *J Neurosurg* 142(4):968-976, 2024

Paul A. Gardner, MD

Peter J. Jannetta Professor
Neurosurgical Co-Director, Center for Cranial Base Surgery
Neurosurgical Co-Director, Pituitary Center of Excellence
Director, Surgical Neuroanatomy Lab
Co-Director, Endoscopic and Open Skull Base Fellowship

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 skull base 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, along with Carl Snyderman, MD, of the University of Pittsburgh Department of Ophthalmology, and George Zenonos, in the Department of Neurological Surgery, 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. He is also the primary editor of the recently released book *Vascular Challenges in Skull Base Surgery*, described as an “essential multidisciplinary guide for the prevention and management of vascular injury from master skull base surgeons,” published by Thieme.

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

Paul A. Gardner, MD

Hospital Privileges
UPMC Children's Hospital of Pittsburgh
UPMC Mercy
UPMC Presbyterian
UPMC Select Specialty

Professional Organization Membership
Acoustic Neuroma Association
American Academy of Neurological Surgeons
American Association of Neurological Surgeons
Congress of Neurological Surgeons
International Federation of Neuroendoscopy
North American Skull Base Society
Pituitary Network Society

Professional Activities
Skull Base Committee, AANS/CNS Tumor Section
Course Co-Director, Comprehensive Endoscopic Endonasal Course, UPMC
Course Co-Director, Complex Endoscopic Endonasal Course, UPMC
Course Co-Director, Comprehensive Endoscopic Skull Base Course, Indonesia National Brain Center, UPMC
Course Co-Director, UPMC Endoscopic Skull Base Surgery Hands-On Cadaver Dissection Course, Taipei, Taiwan
Course Faculty, Skull Base Fellows Course, Congress of Neurological Surgeons, Cleveland, Ohio
CNS Foundation Liaison, AANS/CNS Tumor Section
Member, Medical Advisory Board, Chordoma Foundation
Section Editor, *Journal of Neurological Surgery Part B: Skull Base*
Editorial Board, Member, *Journal of Neurological Surgery Part B: Skull Base: Operative Videos*
Associate/Assistant Editor, Skull Base Section, *Operative Neurosurgery*
Editorial Review Board, *Operative Neurosurgery: The Surgeon's Armamentarium*
Skull Base Liaison, Tumor Section, Congress of Neurological Surgeons
Fellowship Match Committee, Member, North American Skull Base Society
2024 Annual Meeting Scientific Program Committee, North American Skull Base Society
Co-Chair, Anterior Skull Base Track: Intradura/Intraaxia Tumor, North American Skull Base Society
Secretary, North American Skull Base Society
2026 Annual Meeting Scientific Program Committee, North American Skull Base Society
Chair, Sellar and Parasellar Track: Chordoma, North American Skull Base Society
Executive Liaison, Membership Committee, North American Skull Base Society
Advisory Board, Member, Collaborative Research Education and Technology Enhancement in Surgery (CREATES), University of Pittsburgh
International Telemedicine Services Workgroup Committee, UPMC
Surgical Services Oversight Committee, UPMC
Pituitary Center of Excellence, Designated Physician
Center for Cranial Base Surgery, Co-Director

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

Paul A. Gardner, MD

Honors & Awards

Castle Connolly Top Doctors in America, 2012-25
Pituitary Center of Excellence, Designated Physician
Fellow of the Congress of Neurological Surgeons

News Media Appearances: 2024-25

"Pittsburgh Start-Up noVRel Transforms Neurosurgery Through Augmented Reality," *The Tartan,* Carnegie Mellon University, April 14, 2025.

Publications: 2024-25

• Book Chapters:

Snyderman CH, Gardner PA. Decision making in endoscopic skull base reconstruction: a graduated approach. In: *Cerebrospinal Fluid Rhinorrhea: Comprehensive Guide to Evaluation and Management*, Sindwani R, Roxbury CR (eds), pp 199-206, Elsevier, 2024.

Algattas HN, Stefko ST, Zenonos GA, Wang EW, Snyderman CH, Gardner PA. Technical nuances: indications for transorbital compared to endoscopic endonasal approach. In: *Endoscopic Transorbital Surgery of the Orbit, Skull Base and Brain*, Schwartz TH, Kong DS, Moe KS (eds), pp 383-392, Springer Nature: Cham, 2024.

Snyderman CH, Gardner PA. Extended applications of endoscopic skull base surgery. In: *Rhinology: Diseases of the Nose, Sinuses, and Skull Base, 2nd Edition*, Hwang PH, Kennedy DW, Orlandi RR, Wormald PJ (eds), pp 841-853, Thieme, 2025.

Snyderman CH, Gardner PA. Management of carotid artery injury during endoscopic endonasal surgery. In: *Rhinology: Diseases of the Nose, Sinuses, and Skull Base, 2nd Edition*, Hwang PH, Kennedy DW, Orlandi RR, Wormald PJ (eds), Video 14, Thieme, 2025

Snyderman CH, Kassam AB, Carrau RL, Prevedello DM, Fernandez-Miranda JC, Gardner PA. Endoscopic approach to the odontoid. In: *Rhinology: Diseases of the Nose, Sinuses, and Skull Base, 2nd Edition*, Hwang PH, Kennedy DW, Orlandi RR, Wormald PJ (eds), Video 32, Thieme, 2025.

• Refereed Articles:

Kolia NR, Fleseriu CM, Thavaraputta S, Fazeli PK, Gardner PA, Snyderman CH, Wang EW. Sinonasal outcomes after endoscopic pituitary surgery in patients with Cushing's disease. *Ann Otol Rhinol Laryngol* 134(1):42-48, 2025.

Muthiah N, Gersey ZC, Le L, Abdallah H, Abou-Al-Shaar H, Stefko ST, Bonhomme GB, Kocasarac C, Wang EW, Snyderman CH, Gardner PA, Zenonos GA. Skull base chordomas presenting with abducens nerve deficits: clinical characteristics and predictive factors for deficit improvement or resolution. *J Neurosurg* 142(6):1682-1690 2025.

de Almeida JR, Hueniken K, Xie M, Monteiro E, Zadeh G, Kalyvas A, Gullane P, Snyderman C, Wang E, Gardner P, Fliss D, Ringel B, Gil Z, Na'ara S, Ooi E, Goldstein D, Witterick I. Multi-institutional comparison of quality of life between open versus endoscopic skull base approaches. *Laryngoscope Investig Otolaryngol* 10(1):e70082, 2025.

Daniels KE, Mocharnuk J, Balogun Z, Zenonos GA, Gardner PA, Wang EW, Snyderman CH. Long-term complications of extracranial pericranial flaps in skull base reconstruction. *Curr Opin Otolaryngol Head Neck Surg* 33(1):43-49, 2025.

Paul A. Gardner, MD

Pichugin A, Formentin C, Chan YK, Trondin A, Wang EW, Snyderman CH, Gardner PA, Zenonos GA. The connective tissue architecture of the cavernous sinus: an anatomical and unifying conceptualization. *World Neurosurg* 194:123573, 2025.

Findlay MC, Rennert RC, Lucke-Wold B, Couldwell WT, Evans JJ, Collopy S, Kim W, Delery W, Pacione DR, Kim AH, Silverstein JM, Kanga M, Chicoine MR, Gardner PA, Valappil B, Abdallah H, Sarris CE, Hendricks BK, Torok IE, Low TM, Crocker TA, Yuen KCJ, Vigo V, Fernandez-Miranda JC, Kshettry VR, Little AS, Karsy M. Impact of frailty on surgical outcomes of patients with Cushing disease using the multicenter registry of adenomas of the pituitary and related disorders registry. *Neurosurgery* 96(2):386-395, 2025.

Jackson C, Fernandes Cabral D, Stefko ST, Wang EW, Zenonos GA, Snyderman CH, Gardner PA. Combined transorbital neuroendoscopic and endoscopic endonasal resection of orbital hemangioma. *Neurosurg Focus Video* 12(2):V16, 2025.

Crossley J, Abou-Al-Shaar H, Stefko ST, Gardner PA, Choby G. Transorbital neuroendoscopic approach for recurrent sinonasal inverted papilloma. *Neurosurg Focus Video* 12(2):V18, 2025.

Tang A, Taori S, Fung N, Almeida JP, Champagne PO, Fernandez-Miranda JC, Gardner P, Hwang PH, Nayak JV, Patel C, Patel ZM, Peris Celda M, Pinheiro-Neto C, Sanusi O, Snyderman C, Thorp BD, Van Gompel JJ, Zenonos GA, Zwagerman NT, Wang EW, Geltzeiler M, Choby G. Pathologic dural invasion is associated with regional recurrence in olfactory neuroblastoma: a multi-institutional study. *Int Forum Allergy Rhinol* 15(4):373-383, 2025.

Abou-Al-Shaar H, Zenonos GA, Fernandez-Miranda JC, Gardner PA. Commentary: Is it justified to sacrifice the pituitary stalk during craniopharyngioma surgery? A systematic review and meta-analysis. *Neurosurgery* 96(4):e81-e82, 2025.

Phoominaonin I, Vargas Rosales AF, Choby GW, Wang EW, Zenonos GA, Snyderman CH, Gardner PA. Carotid plexus sympathetic nerves as a landmark for the abducens nerve within the cavernous sinus during endoscopic endonasal surgery: cadaveric anatomical study and surgical consideration. *Oper Neurosurg* (Hagerstown) 28(5):697-704, 2025.

Gudis DA, Bleier BS, Eloy JA, Evans JJ, Fernandez-Miranda JC, Gardner PA, Geltzeiler M, Grayson JW, Harvey RJ, Illing EA, Kennedy DW, Klatt-Cromwell C, Kuan EC, Lee J, Link MJ, Liu JK, Loftus P, London NR, McKean EL, McKinney KA, Nyquist GG, Patel ZM, Rabinowitz M, Rangarajan SV, Eng M, Rodriguez KD, Rowan NR, Schlosser RJ, Searyoh K, Sekula RF Jr, Smith TL, Snyderman C, Sreenath SB, Tang DM, Thorp BD, Wang EW, Wang MB, Woodworth BA, Choby G. June 4: International skull base surgery day. *Int Forum Allergy Rhinol* 15(5):481-482, 2025.

Hoz SS, Ma L, Agarwal P, Jacobs JC, Al-Bayati AR, Nogueira RG, Zenonos GA, Gardner PA, Friedlander RM, Lang MJ, Gross BA. Clinical comparison of flow diversion and microsurgery for retreatment of intracranial aneurysms. *J Clin Neurosci* 136:111296, 2025.

Gudis DA, Bleier BS, Eloy JA, Evans JJ, Fernandez-Miranda JC, Gardner PA, Geltzeiler M, Grayson JW, Harvey RJ, Illing EA, Kennedy DW, Klatt-Cromwell C, Kuan EC, Lee J, Link MJ, Liu JK, Loftus P, London NR, McKean EL, McKinney KA, Nyquist GG, Patel ZM, Rabinowitz M, Rangarajan SV, Eng M, Rodriguez KD, Rowan NR, Schlosser RJ, Searyoh K, Sekula RF Jr, Smith TL, Snyderman C, Sreenath SB, Tang DM, Thorp BD, Wang EW, Wang MB, Woodworth BA, Choby G. June 4: International skull base surgery day. *J Neurol Surg B Skull Base* 86(B3):243-244, 2025.

Paul A. Gardner, MD

Jani RH, Raju S, Kim M, Gardner P, Zenonos GA, Snyderman C, Wang EW, Patel C, Germanwala AV. Endoscopic endonasal approach for residual and recurrent craniopharyngioma after transcranial approach: a multi-institution experience. *J Neurol Surg B Skull Base* 86(B3):295-302, 2025.

Plute T, Abou-Al-Shaar H, Alarifi N, Patel A, Mallela AN, Baddour K, Zenonos GA, McCall AA, Gardner PA. Evaluation of clinical predictors of postoperative outcomes in tegmen defect patients with and without concurrent superior semicircular canal dehiscence and cerebrospinal fluid leak. *Am J Otolaryngol* 45(4):104317, 2024.

Tang A, Calcaterra M, Harris M, Gardner PA, Zenonos GA, Stefko ST, Geltzeiler M, Zandberg DP, Snyderman CH, Wang EW, Choby G. The role of induction chemotherapy for orbital invasion in sinonasal malignancies: a systematic review. *Int Forum Allergy Rhinol* 14(7):1226-1239, 2024.

Grunert R, Snyderman CH, Gardner P, Busse M, Ahner L, Kropla F, Mobius R, Jung S, Scholz S, Guresir E, Winkler D. NextLens - the next generation of surgical navigation: proof of concept of an augmented reality system for surgical navigation. *J Neurol Surg B Skull Base* 85(B4):363-369, 2024.

Tang A, Taori S, Dang S, Gardner PA, Zenonos GA, Davar D, Kuan EC, Snyderman CH, Wang EW, Choby G. Immunotherapy in the management of sinonasal mucosal melanoma: a systematic review. *Otolaryngol Head Neck Surg* 171(2):368-380, 2024.

Little AS, Karsy M, Evans JJ, Kim W, Pacione DR, Kim AH, Gardner PA, Hendricks BK, Sarris CE, Torok IE, Low TM, Crocker TA, Valappil B, Kanga M, Abdallah H, Collopy S, Fernandez-Miranda JC, Vigo V, Ljubimov VA, Zada G, Garret NE 3rd, Delery W, Yuen KCJ, Rennert RC, Couldwell WT, Silverstein JM, Khsettry VR, Chicoine MR; RAPID Consortium. Multicenter registry of adenomas of the pituitary and related disorders: initial description of Cushing disease cohort, surgical outcomes and surgeon characteristics. *Neurosurgery* 95(2):372-379, 2024.

Ravnik J, Rowbottom H, Snyderman CH, Gardner PA, Smigoc T, Glavan M, Ksela U, Kljaic N, Lanisnik B. The impact of surgical telementoring on reducing complication rate in endoscopic endonasal surgery of the skull base. *Diagnostics* 14(17):1874, 2024.

Melder K, Mace JC, Choby G, Almeida J, Champagne PO, Chan E, Ciporen J, Chaskes MB, Fernandez-Miranda J, Fung NK, Gardner P, Hwang P, Ji KSY, Kalyvas A, Kong KA, Patel C, Patel Z, Peris Celda M, Pinheiro-Neto CD, Snyderman C, Thorp BD, Van Gompel JJ, Zenonos G, Zwagerman NT, Sanusi O, Wang EW, Geltzeiler M. Recurrence morbidity of olfactory neuroblastoma. *Int Forum Allergy Rhinol* 14(9):1435-1445, 2024.

Wingrove PM, Arani KN, Snyderman CH, Gardner PA, Fernandes Cabral DT, Zenonos GA, Wang EW, Chabot J, Fernandez-Miranda JC, Chang YF, Hughes MA. Association of decreased enhancement of nasoseptal flap on postoperative MRI with risk of complication. *J Neurol Surg B Skull Base* 85(S 02):e2-e9, 2024.

Ali HM, Leland EM, Stickney E, Lohse CM, Ioyha E, Valappil B, Filimonov A, Goetschel K, Young SC, Shahin MN, Sanusi O, Ndongo Sonfack DJ, Nadeau S, Champagne PO, Geltzeiler M, Zwagerman NT, Gardner PA, Wang EW, Zenonos GA, Snyderman C, Van Gompel J, Link M, Peris-Celda M, Stokken J, Choby G, Pinheiro-Neto CD. Multi-center study on sellar reconstruction after endoscopic transsphenoidal pituitary surgery. *Int Forum Allergy Rhinol* 14(10):1558-1567, 2024.

Mocharnuk J, Daniels KE, Filimonov A, North LM, Gardner PA, Wang EW, Snyderman CH. The prognostic implications of neutrophil-to-lymphocyte ratio in olfactory neuroblastoma. *Otolaryngol Head Neck Surg* 171(4):1212-1216, 2024.

Paul A. Gardner, MD

Algattas HN, Gersey ZC, Fernandes-Cabral D, Alattar AA, Abdallah H, Muthiah N, Khiyami A, Mehrotra N, Abdulwahid T, Wang EW, Snyderman CH, Zenonos GA, Fazeli PK, Gardner PA. Endoscopic endonasal resection of Rathke cleft cysts: a single institution analysis of 148 consecutive patients. *J Neurosurg* 141(5):1292-1303, 2024.

Plute T, Bin-Alamer O, Mallela AN, Zenonos GA, Wang EW, Gardner PA, Couldwell WT, Snyderman CH, Abou-Al-Shaar H. A comprehensive analysis of academic attributes of the Presidents of the North American Skull Base Society. *J Neurol Surg B Skull Base* 85(6):555-562, 2024.

Balogun Z, Dharmarajan H, Kanwar A, Gardner PA, Zenonos GA, Snyderman CH, Traylor K, Wang EW. Self-reported olfactory outcomes in transplanum and transtuberculum approaches. *J Neurol Surg B Skull Base* 85(6):606-613, 2024.

Kshirsagar RS, Eide JG, Abiri A, Asmaro KP, Filip P, Pangal D, Ruzevick J, Adappa ND, Batra PS, Bergsneider MS, Craig JR, Fernandez-Miranda JC, Gardner PA, Grady MS, Halderman AA, Hsu FPK, Mohyeldin A, Palmer JN, Papagiannopoulos P, Snyderman CH, Tajudeen BA, Wang EW, Wang MB, Zada G, Zenonos GA, Kuan EC. A phenomenon not to be missed: delayed postoperative cerebrospinal fluid rhinorrhea following no identifiable intraoperative leak in sellar surgery. *Rhinology* 62(6):759-762, 2024.

Tang A, Abdallah HM, Chang YF, Zenonos GA, Gardner PA, Choby GW, Wang EW, Snyderman CH. Changes in pituitary adenoma patient presentation and outcomes during the COVID pandemic at a Pituitary Center of Excellence. *Pituitary* 27(6):986-991, 2024.

Abdallah HM, Fernandes Cabral DT, Gersey ZC, Abou-Al-Shaar H, O'Keefe S, Mysels S, John I, Gardner PA, Solari MG, Zenonos GA. Reduction of giant parietooccipital fibrous dysplasia using dynamic mirror image guidance: a case report and review of the literature. *Br J Neurosurg* 38(6):1440-1446, 2024.

Salcedo-Sifuentes JE, Shih R, Heaney AP, Bergsneider M, Wang MB, Donangelo I, Lee J, Delery W, Karsy M, Kshettry VR, Yuen KCJ, Evans JJ, Barkhoudarian G, Pacione DR, Gardner PA, Fernandez-Miranda JC, Benjamin C, Zada G, Rennert RC, Silverstein JM, Chicoine MR, Kim J, Li G, Little AS, Kim W. Cushing's disease clinical phenotype and tumor behavior vary with age: diagnostic and perioperative implications. *J Clin Endocrinol Metab* [Online ahead of print], 2025.

Kuan EC, Talati V, Patel JA, Ngyuen TV, Abiri A, Pang JC, Goshtasbi K, Craig JR, Papagiannopoulos P, Phillips KM, Tajudeen BA, Adappa ND, Palmer JN, Sedaghat AR, Wang EW, Anand V, Batra PS, Bergsneider M, Bernal-Sprekelsen M, Bleier BS, Cappabianca P, Carrau RL, Casiano RR, Castelnuovo P, Cavallo LM, Cohen MA, Dallan I, Eloy JA, El-Sayed IH, Evans JJ, Fernandez-Miranda JC, Ferrari M, Froelich S, Gardner PA, Georgalas C, Gray ST, Hanna EY, Harvey RJ, Hong SD, Hwang PH, Kelly DF, Kong DS, Lan MY, Lee JYK, Levine CG, Liu JK, Locatelli D, Meco C, McKean EL, Nicolai P, Nyquist GG, Omura K, Passeri T, Patel ZM, Peris Celda M, Pinheiro Neto C, Prevedello DM, Rabinowitz MR, Raza SM, Recinos PF, Rosen MR, Sargi ZB, Schlosser RJ, Schwartz TH, Sindwani R, Snyderman CH, Stamm AC, Thorp BD, Turri-Zanoni M, Wang MB, Wang WH, Witterick IJ, Won TB, Woodworth BA, Wormald PJ, Zada G, Su SY. Expert strategies: skull base reconstruction—global perspectives, insights and algorithms through a mixed-methods approach. *Int Forum Allergy Rhinol* [Online ahead of print], 2025.

Jimenez MA, Horowitz MA, Gendreau JL, Yamini B, Ahmed AK, Geltzeiler M, Sanusi O, Wang EW, Snyderman CH, Choby GW, Zenonos GA, Gardner PA, Rowan NR, Mukherjee D. Characterizing disparities in access to surgery for pituitary adenomas: a national cancer database analysis. *J Clin Endocrinol Metab* [Online ahead of print], 2025.

Paul A. Gardner, MD

Daza-Ovalle A, Bin-Alamer O, Wei Z, Abou-Al-Shaar H, Hadjipanayis CG, Gardner P, Niranjan A, Lunsford LD. Long-term outcomes of jugular paragangliomas undergoing Gamma Knife Radiosurgery: a single center experience. *Neurosurgery* [Online ahead of print], 2025.

Tang A, Abdallah HM, Gardner PA, Zenonos GA, Chang YF, Choby GW, Wang EW, Snyderman CH. Factors associated with a higher 30-day hospitalization period for pituitary adenoma patients: introducing a novel outcome metric. *Neurosurgery* [Online ahead of print], 2025.

Research Activities
Dr. Gardner continues his research into the molecular underpinnings of skull base tumors. This includes a recently submitted article including a case series and systematic review of high dose progesterone meningioma syndrome. Other recent publications on skull base tumor outcomes include articles showing improved outcomes with less radical resection of post-radiation vestibular schwannomas, and overall outcomes of a wide range of pathologies, including: Rathke's cleft cysts, tegmen tympani defects, pituitary adenomas and craniopharyngiomas.

Dr. Gardner also continues his anatomy research, publishing on a range of skull base anatomy discoveries, including the pattern of sympathetic nerves in the cavernous sinus.

Peter C. Gerszten, MD

Peter E. Sheptak Professor
Vice Chair, Quality Improvement
Director, Percutaneous Spine Service

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. His areas of clinical interest within the field of neurosurgery include spinal tumors, failed back syndrome, stereotactic radiosurgery of spinal lesions, minimally invasive spine surgical techniques, sacroiliac dysfunction, compression fractures, and percutaneous techniques including neuromodulation. 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. His current clinical research involves the use of electrical spinal cord stimulation for a variety of neurological disorders including stroke, spinal cord injury, and spinal muscular atrophy.

Dr. Gerszten currently serves on the editorial boards of *The Spine Journal,* the *Journal of the North American Spine Society, Neurosurgery,* the *Journal of the Congress of Neurological Surgery,* and *The International Journal of Spine Surgery*.

Specialized Areas of Interest
Neuromodulation; spinal cord stimulation for post-stroke paralysis; outcomes research applied to neurosurgical interventions; failed back syndrome; stereotactic radiosurgery of spinal lesions; minimally invasive spine surgical techniques.

Peter C. Gerszten, MD

Board Certifications
American Board of Neurological Surgery

Hospital Privileges
Excela Health
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 Board of Neurological Surgery
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

Professional Activities
Assistant Editor, *Neurosurgery*
Editorial Board, *The Spine Journal*
Senior Review Editor, *International Journal of Spine Surgery*
Associate Appointment, Carnegie Mellon University, The Neuroscience Institute Course
Course Lecturer, Principles and Practice of Gamma Knife Radiosurgery, UPMC
Course Lecturer, Spine Surgery Anatomy Course, University of Pittsburgh School of Medicine
Site Reviewer, Radiosurgery Accreditation Program, American College of Radiation Oncology and the Radiosurgery Society
UPMC Presbyterian Physician Unit Partner Program Leader, Unit 6D
Quality and Safety Leadership Committee, UPMC Presbyterian/Shadyside
Quality and Safety Surgical Cabinet Committee Clinical Leader, UPMC Presbyterian/Shadyside

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

Honors & Awards
Castle Connolly Top Doctors in America, 2018-25

Peter C. Gerszten, MD

News Media Appearances: 2024-25

"Pitt study the first to use spinal cord stimulation to treat deadly disease, SMA," *Pittsburgh Post-Gazette*, February 15, 2025.

"Stereotactic body radiation therapy for spinal metastases from gastrointestinal primary cancers." Journal of Neuro-Oncology *Tumor Talk* Webinar, June 9, 2025.

Publications: 2024-25

• Refereed Articles:

Adida S, Kann M, Taori S, Bhatia S, Sefcik RK, Burton SA, Flickinger JC, Gerszten PC. Safety and efficacy of Balloon-assisted Kyphoplasty followed by stereotactic body radiation therapy for pathological fractures. *Neurosurgery* 96(4):860-869, 2025.

Adida S, Taori S, Bhatia S, Kann M, Burton SA, Flickinger JC, Olson AC, Sefcik RK, Zinn PO, Gerszten PC. A case series and review of stereotactic body radiation therapy for contiguous multilevel spine metastases. *J Neurooncol* 171(2):299-309 2025.

Prat-Ortega G, Ensel S, Donadio S, Borda L, Boos A, Yadav P, Verma N, Ho J, Carranza E, Frazier-Kim S, Fields DP, Fisher LE, Weber DJ, Balzer J, Duong T, Weinstein SD, Eliasson MJL, Montes J, Chen KS, Clemens PR, Gerszten PC, Mentis GZ, Pirondini E, Friedlander RM, Capogrosso M. First-in-human study of epidural spinal cord stimulation in individuals with spinal muscular atrophy. *Nat Med* 31(4):1246-1256 2025.

Mita R, Kumar RP, Agarwal N, Gerszten PC, Hamilton DK, Friedlander RM, Sefcik R. Opportunities to overcome barriers to lactation—Recommendations for best practices. *J Surg Educ* 82(4):103445, 2025.

Adida S, Sefcik RK, Gerszten PC. Comment on "The 5-factor modified frailty index as a prognostic factor for stereotactic radiosurgery in meningioma management." *J Neurooncol* 173(2):493-494, 2025.

Adida S, Taori S, Sefcik RK, Burton SA, Flickinger JC, Gerszten PC. Management for chordomas of the spine and sacrum with stereotactic radiosurgery. *Neurosurg Focus* 58(5):E17, 2025.

Adida S, Taori S, Tirmizi A, Bayley J, Zinn PO, Flickinger JC, Burton SA, Choi S, Sefcik RK, Gerszten PC. Stereotactic body radiation therapy for spinal metastases from gastrointestinal primary cancers. *J Neurooncol* [Online ahead of print], 2025.

Fernández de-Thomas RJ, Adida S, Cloney MB, Mitha R, Lavadi RS, Deng H, Lopez-Gross AS, Sen A, Fernandes-Cabral DT, Abou-Al-Shaar H, Gerszten PC, Okonkwo DO, Buell TJ, Hamilton DK, Agarwal N. Current Trends in the Use of Cervical Collar Immobilization After Cervical Spine Surgery: A Global Survey Analysis. *Clin Spine Surg* [Epub ahead of print], 2025.

Adida S, Taori S, Tang A, Wong V, Sefcik RK, Zhang X, Gerszten PC. Analysis of injected cement volume and clinical outcomes following balloon-assisted kyphoplasty in a series of 368 patients. Clinical Neurology and *Neurosurgery* 243:108367, 2024.

Adida S, Taori S, Tang A, Wong VR, Sefcik, RK, Zhang X, Gerszten PC. Development of symptomatic adjacent and remote level compression fractures following balloon-assisted kyphoplasty in a series of 1,318 patients. *Pain Physician* 27(5):333-339, 2024.

Adida S, Taori S, Donohue J, Rajan A, Sefcik RK, Burton S, Flickinger J, Gerszten PC. Stereotactic radiosurgery for patients with spinal metastases from prostate cancer. *J Neurooncol* 170(3):631-639, 2024.

Peter C. Gerszten, MD

Ho JC, Grigsby EM, Damiani A, Liang L, Balaguer JM, Kallakuri S, Tang LW, Barrios-Martinez J, Karapetyan V, Fields D, Gerszten PC, Hitchens TK, Constantine T, Adams GM, Crammond DJ, Capogrosso M, Gonzalez-Martinez JA & Pirondini E. Potentiation of cortico-spinal output via targeted electrical stimulation of the motor thalamus. *Nat Commun* 15(1):8461, 2024.

Mahrous, AA, Liang L, Balaguer J-M, Ho JC, Grigsby EM, Karapetyan V, Damiani A, Fields DP, Gonzalez-Martinez JA, Gerszten PC, Bennett DJ, Heckman CJ, Pirondini E, Capogrosso M. Pharmacological blocking of spinal GABAA receptors in monkeys reduces sensory transmission to the spinal cord, thalamus, and cortex. *Cell Rep* 44(1):115100, 2024.

Taori S, Adida S, Kann M, Bhatia S, Sefcik RK, Burton SA, Flickinger JC, Zinn PO, Gerszten PC. Spine stereotactic radiosurgery provides long-term local control and overall survival for benign intradural tumors. *Neurosurgery* [Online ahead of print], 2024.

Research Activities

Dr. Gerszten has a research interest in spinal neuromodulation. His work explores the role of spinal cord electrical stimulation for a variety of clinical indications. Dr. Gerszten collaborates with members of the University of Pittsburgh Rehabilitation Neural Engineering Laboratory (RNEL) and the Neurosciences Institute of Carnegie Mellon University. Epidural electrical stimulation is currently used to treat pain caused by damage or injury to the cervical spinal nerves. The implantation of electrodes over the cervical dorsal root ganglia allows for the selective engagement of hand and arm muscles by providing the surviving neural circuits with appropriate electrical signals. By adjusting the location of the cervical leads as well as modifying the electrical stimulation of the spinal cord stimulator, patients have regained the ability to use paralyzed limbs.

Dr. Gerszten is co-investigator of the first ever clinical trial to implant cervical spinal cord stimulators in patients with post-stroke upper limb paralysis in order to regain arm function. The team has also begun clinical trials to evaluate the effect of spinal cord stimulation in patients with spinal cord injury and Spinal Muscular Atrophy (SMA). His work on the first-in-human study of epidural spinal cord stimulation to improve ambulation in individuals with spinal muscular atrophy was published this year in *Nature Medicine*. This year, he completed a similar clinical trial investigating the use of spinal cord stimulation to improve upper limb function in SMA patients.

Dr. Gerszten also collaborates with members of RNEL on a variety of non-human primate investigations. The team has developed a technique for robot assisted neurosurgery for high-accuracy minimally-invasive deep brain electrophysiology in monkeys. This research focuses on better defining the neuronal pathways of motor and sensory transmission within the spinal cord. The work has led to a novel deep brain neuromodulation modality for post-stroke patients. These experiments also determined that proprioceptive pulses consistently produced neural trajectories in the network that were disrupted by concurrent cutaneous branch stimulation. This disruption propagated to the somatosensory cortex, suggesting that peripheral electrical stimulation can disrupt natural information processing across the neural axis.

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. Such techniques include the use radiosurgery and expanded radiofrequency ablative techniques for patients with spinal tumors. Dr. Gerszten continues to expand and systematically analyze the clinical outcomes and safety profiles associated with the use of new spinal implant devices. Dr. Gerszten has a particular interest in documenting the safety and efficacy of minimally invasive sacroiliac joint fusions using titanium screw implants for sacroiliac joint dysfunction as well as percutaneous cement augmentation procedures.

Avniel Singh Ghuman, PhD

Associate Professor
Director, Cognitive Neurodynamics Lab

Avniel Singh Ghuman, PhD, joined the Department of Neurological Surgery in September of 2011. He received his undergraduate education in math and physics at The Johns Hopkins University and 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 (Magnetoencephalography) 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 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 in the real-world. 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 Taylor Abel, MD, and Jorge González-Martínez, 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

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

Avniel Singh Ghuman, PhD

News Media Appearances: 2024-25
"30 Years of Cognitive Shifts," Carnegie Mellon University, October 7, 2024.
"New Pitt Service Helps Investigators Do Research That's Ethically Sound" *PittWire*, May 15, 2025.

Publications: 2024-25
• Refereed Articles:
Rupp KM, Hect JL, Harford EE, Holt LL, Ghuman GS, Abel TJ. A Hierarchy of Processing Complexity and Timescales for Natural Sounds in the Human Auditory Cortex. *Proc Natl Acad Sci U S A* 122(18):e2412243122 2025.

Research Activities
The human brain effortlessly deciphers dynamic faces during complex, real-world social interactions to decipher the subtleties of social communication in real life. The brain's operations in such natural settings have remained largely elusive due to the challenges of studying natural interactions in controlled experiments.

To overcome these hurdles, we captured hours of multi-electrode intracranial brain recordings and wearable eye-tracking from individuals during spontaneous, natural interactions with their friends, family, etc. We developed a computational framework to untangle these high dimensional data and learn neuro-perceptual relationships between brain activity and dynamic faces. Models reconstructed the identity, expressions, and motion of faces participants looked at—from brain activity alone. Participants' dynamic brain activity was also predicted—solely from faces they looked at. This approach identified the 'social vision pathway,' a network of areas spanning parietal, temporal, and occipital cortex, as particularly engaged during natural social interactions.

Neuro-perceptual models revealed our brains encode people's real world facial expressions as deviations from their prototypical neutral expression. Furthermore, neural tuning for real world faces demonstrated a heightened sensitivity to subtle differences in expression near neutral over similar differences between already intense expressions: a Weber's law for facial expressions—that was confirmed behaviorally. This principle suggests our brains are finely tuned to nuances in facial expressions that represent the subtleties of social communication in real life.

Jorge A. González-Martínez, MD, PhD

Stuart Niles Rowe Professor
Vice-Chair, Department of Neurological Surgery
Director, Epilepsy & Movement Disorders Program
Co-Director, University of Pittsburgh Epilepsy Center
Director, Cortical Systems Laboratory

Jorge González-Martínez, MD, PhD, is a board-certified neurosurgeon subspecialized in epilepsy and functional neurosurgery. He is the director of the epilepsy/movement disorders surgery division and the current Stuart Niles Rowe Chair in Neurosurgery at the University of Pittsburgh.

The University of Pittsburgh's Epilepsy, Movement Disorders and Psychiatry Surgical Program, under the direction of Dr. González-Martínez encompasses the treatment of medically intractable epilepsy, movement disorders and psychiatry disorders. These pathological neurological conditions 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. Dr. González-Martínez has expertise in both adult and pediatric patients. Pediatric patients are treated at UPMC Children's Hospital of Pittsburgh.

Jorge A. González-Martínez, MD, PhD

Dr. González-Martínez has the country's largest experience in SEEG procedures, SEEG guided resections and neuromodulation surgeries, with more than 3,000 successful surgical procedures performed. To promote an optimal safety profile and seizure outcome, many procedures are performed under robotic guidance. In addition to developing and implementing the SEEG method in North America, Dr. González-Martínez is also a pioneer in robotic surgery, having performed more than 1,000 procedures using this technique. The University of Pittsburgh has the largest experience in robotic neurosurgery in the country and was one of the first institutions in adopting the novel technology.

In addition to clinical activities, The Epilepsy, Movement Disorders and Psychiatry Surgical 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, Carnegie Mellon University Department of Biomedical Engineering, John Hopkins University and Aix Marseille University in France. The program's research activities are led by Dr. González-Martínez and his research team and conducted through the University of Pittsburgh Cortical Systems Laboratory. 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. González-Martínez has published more than 230 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 serving on the executive committee of both the American Society of Stereotactic and the Functional Neurosurgery and the American Epilepsy Society for the last six years, developing high relevant projects and topics related to the field of functional neurosurgery and epilepsy.

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
MD, University of Sao Paulo Medical School, 1994
PhD, University of Sao Paulo Medical School, 2002
Neuro-oncology Fellowship, Wayne State University, 2001
Functional Neurosurgery Fellowship, Cleveland Clinic, 2002
Epilepsy Surgery Fellowship, Cleveland Clinic, 2003

Jorge A. González-Martínez, MD, PhD

Neurosurgery Residency, Cleveland Clinic, 2008
Epilepsy & Stereotactic Fellowship, University of Grenoble, France, 2009

Honors & Awards
Castle Connolly Top Doctors in America, 2020-25
Legacy Award, Cleveland Epilepsy Association, 2017
Harvey Cushing Award, Congress of Neurological Surgeons, 2005
Preuss Award, National Brain Tumor Foundation, 2002

News Media Appearances: 2024-25
"Brain injury patients gain arm, hand strength with deep brain stimulation, Pitt study finds," *Pittsburgh Post-Gazette*, October 19, 2024.
"Instant Improvement: Revolutionary Brain Tech Offers New Hope for Stroke and Injury Recovery," *SciTechDaily*, October 7, 2024.
"Deep Brain Stimulation Restores Arm Strength After Stroke," NeuroscienceNews.com, October 2, 2024.
"Deep brain stimulation shows immediate improvement in arm and hand function post-brain injury, study finds," msn.com, October 2, 2024.
"Deep brain stimulation instantly improves arm and hand function post-brain injury," ScienceDaily.com, October 1, 2024.

Publications: 2024-25
• Refereed Articles:
Aung T, Tang LW, Ho J, Henry LC, Ikegaya N, Modo M, González-Martínez J. Differential functional connectivity of amygdala in drug-resistant temporal lobe epilepsy. *Epilepsia* 66(6):1945-1958, 2025.

Ho JC, Aung T, Damiani A, Tang L, Mallela AN, Crammond DJ, González-Martínez JA. Refining centromedian nucleus stimulation for generalized epilepsy with targeting and mechanistic insights from intraoperative electrophysiology. *Nat Commun* 16(1):5272, 2025.

Wang HE, González-Martínez J, Jirsa V, Chauvel P, Alario FX, Liegeois-Chauvel C. Assessing Functional Connectivity Dynamics During Cognitive Tasks Involving the Dorsal Stream. *Entropy* (Basel) 27(6):566, 2025.

Mahrous AA, Liang L, Balaguer JM, Ho JC, Grigsby EM, Karapetyan V, Damiani A, Fields DP, González-Martínez JA, Gerszten PC, Bennett DJ, Heckman CJ, Pirondini E, Capogrosso M. Pharmacological blocking of spinal GABAA receptors in monkeys reduces sensory transmission to the spinal cord, thalamus, and cortex. *Cell Rep* 44(1):115100, 2025.

Myers P, Gunnarsdottir KM, Li A, Razskazovskiy V, Craley J, Chandler A, Wyeth D, Wyeth E, Zaghloul KA, Inati SK, Hopp JL, Haridas B, González-Martínez J, Bagíc A, Kang JY, Sperling MR, Barot N, Sarma SV, Husari KS. Diagnosing Epilepsy with Normal Interictal EEG Using Dynamic Network Models. *Ann Neurol* 97(5):907-918, 2025.

Barrios-Martinez JV, Almast A, Lin I, Youssef A, Aung T, Fernandes-Cabral D, Yeh FC, Chang YF, Mettenburg J, Modo M, Henry L, González-Martínez JA. Structural connectivity changes in focal epilepsy: Beyond the epileptogenic zone. *Epilepsia* 66(1):226-239 2025.

McCrea M, Reddy N, Ghobrial K, Ahearn R, Krafty R, Hitchens TK, González-Martínez J, Modo M. Mesoscale connectivity of the human hippocampus and fimbria revealed by ex vivo diffusion MRI. *Neuroimage* 310:121125, 2025.

Jorge A. González-Martínez, MD, PhD

Greenspon CM, Valle G, Shelchkova ND, Hobbs TG, Verbaarschot C, Callier T, Berger-Wolf EI, Okorokova EV, Hutchison BC, Dogruoz E, Sobinov AR, Jordan PM, Weiss JM, Fitzgerald EE, Prasad D, Van Driesche A, He Q, Liu F, Kirsch RF, Miller JP, Lee RC, Satzer D, González-Martínez J, Warnke PC, Ajiboye AB, Graczyk EL, Boninger ML, Collinger JL, Downey JE, Miller LE, Hatsopoulos NG, Gaunt RA, Bensmaia SJ. Evoking stable and precise tactile sensations via multi-electrode intracortical microstimulation of the somatosensory cortex. *Nat Biomed Eng* 9(6):935-951, 2025.

Jaffee S, Remick M, Tang OY, Harford EE, González-Martínez J, Al-Ramadhani R, Welch WP, Abel TJ. Outcomes of resective epilepsy surgery after focal stereotactic MR-guided laser interstitial thermal therapy for pediatric focal epilepsy. *J Neurosurg Pediatr* [Online ahead of print], 2025.

Chen JJ, Aung T, Constantine T, González-Martínez JA. Comparative feasibility and complication analyses of extra-operative (bedside) removal of stereo-electroencephalography (SEEG) electrodes. *Stereotact Funct Neurosurg* [Online ahead of print], 2025. [IF 1.9]

Downey JE, Schone HR, Foldes ST, Greenspon C, Liu F, Verbaarschot C, Biro D, Satzer D, Moon CH, Coffman BA, Youssofzadeh V, Fields D, Hobbs TG, Okorokova E, Tyler-Kabara EC, Warnke PC, González-Martínez J, Hatsopoulos NG, Bensmaia SJ, Boninger ML, Gaunt RA, Collinger JL. A Roadmap for Implanting Electrode Arrays to Evoke Tactile Sensations Through Intracortical Stimulation. *Hum Brain Mapp* 45(18):e70118, 2024.

Ikegaya N, Mallela AN, Warnke PC, Kunigk NG, Liu F, Schone HR, Verbaarschot C, Hatsopoulos NG, Downey JE, Boninger ML, Gaunt R, Collinger JL, González-Martínez JA. A novel robot-assisted method for implanting intracortical sensorimotor devices for brain-computer interface studies: principles, surgical techniques, and challenges. *J Neurosurg* 142(5):1280-1288, 2024.

Ekman FR, González-Martínez JA. Insular Epilepsy: Functions, Diagnostic Approaches, and Surgical Interventions. *J Integr Neurosci* 23(11):209, 2024.

Ho JC, Grigsby EM, Damiani A, Liang L, Balaguer JM, Kallakuri S, Tang LW, Barrios-Martinez J, Karapetyan V, Fields D, Gerszten PC, Hitchens TK, Constantine T, Adams GM, Crammond DJ, Capogrosso M, González-Martínez JA, Pirondini E. Potentiation of cortico-spinal output via targeted electrical stimulation of the motor thalamus. *Nat Commun* 15(1):8461, 2024.

Zhai SR, Sarma SV, Gunnarsdottir K, Crone NE, Rouse AG, Cheng JJ, Kinsman MJ, Landazuri P, Uysal U, Ulloa CM, Cameron N, Inati S, Zaghloul KA, Boerwinkle VL, Wyckoff S, Barot N, González-Martínez JA, Kang JY, Smith RJ. Virtual stimulation of the interictal EEG network localizes the EZ as a measure of cortical excitability. *Front Netw Physiol* 4:1425625, 2024.

Fogg DN, Mallela AN, Abou-Al-Shaar H, González-Martínez J. Robotic-assisted stereotactic drainage of cerebral abscess and placement of ventriculostomy. *Br J Neurosurg* 38(4):954-957, 2024.

Bradley Gross, MD

Associate Professor
Director, Endovascular Neurosurgery
Program Director, Endovascular Neurosurgery/Interventional Neurology Fellowship

Bradley Gross, MD, joined the Department of Neurological Surgery in July of 2016, specializing in cerebrovascular disease. His particular clinical and research interests include the comprehensive management of aneurysms, arteriovenous malformations, and arteriovenous fistulas 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.

Bradley Gross, MD

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, and an endovascular fellowship at the Barrow Neurological Institute

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

Board Certifications
American Board of Neurological Surgery

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
Phi Beta Kappa

Professional Activities
Editorial Board, *Journal of Neurology, Neurosurgery and Psychiatry*
Editorial Board, Associate Editor, *Stroke: Vascular and Interventional Neurology*
Editorial Board, Assistant Editor, *Neurosurgery*

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

Publications: 2024-25
• Refereed Articles
Ma L, Hoz SS, Doheim MF, Fadhil A, Sultany A, Al-Bayati AR, Nogueira RG, Lang MJ, Gross BA. Middle meningeal artery embolization for "trial-ineligible" chronic subdural hematomas. *Neurosurgery* 96(3):600-610, 2025.

Raygor KP, Abdelsalam A, Tonetti DA, Raper DMS, Guniganti R, Durnford AJ, Giordan E, Brinjikji W, Chen CJ, Abecassis IJ, Levitt MR, Polifka AJ, Derdeyn CP, Samaniego EA, Kwasnicki A, Alaraj A, Potgieser ARE, Chen S, Tada Y, Kansagra AP, Satomi J, Eatz T, Peterson EC, Starke RM, van Dijk JMC, Amin-Hanjani S, Hayakawa M, Gross BA, Fox WC, Kim L, Sheehan J, Lanzino G, Du R, Lai PMR, Bulters DO, Zipfel GJ, Abla AA: Microsurgical treatment of intracranial dural arteriovenous fistulas: a collaborative investigation from the multicenter consortium for dural arteriovenous fistula outcomes research. *Neurosurgery* 96:1023-1034, 2025.

Bradley Gross, MD

Sioutas GS, Salem MM, Kuybu O, Salih M, Khalife J, Carroll K, Duckworth EA, Vaishnav D, Essibayi MA, Hoang AN, Baker CM, Mendez Ruiz AA, Abecassis Z, Salah WK, Ruiz Rodriguez JF, Charcos I, Cortez GM, Narayanan S, Haim O, Tanweer O, Hanel R, Kan P, Tonetti DA, Nogueira RG, Jovin TG, Altschul DJ, Lang MJ, Srinivasan VM, Jankowitz BT, Thomas AJ, Levitt MR, Ogilvy CS, Gross BA, Burkhardt JK, Grandhi R. Order and timing of middle meningeal artery embolization as a perioperative adjunct to surgical evacuation for chronic subdural hematomas: A multicenter study. *Radiology* 315(1):e241571, 2025.

Hoz SS, Ma L, Agarwal P, Jacobs RC, Al-Bayati AR, Nogueira RG, Zenonos GA, Gardner PA, Friedlander RM, Lang MJ, Gross BA. Clinical comparison of flow diversion and microsurgery for retreatment of intracranial aneurysms. *J Clin Neurosci* 136:111296, 2025.

Al-Qudah AM, Tallapaneni PS, Crammond DJ, Balzer J, Anetakis KM, Shandal V, Biaesch J, Ghannam M, Nadkarni N, Gross BA, Lang M, Subramanium K, Sadhasivam S, Thirumala PD. Intraoperative neuromonitoring as an independent predictor for postoperative delirium in ICU following aneurysm clipping. *eNeurologicalSci* 38:100549, 2025.

Bhatia S, Nouduri ST, Sankar A, Kann MR, Hardi A, Hudson JS, Al-Bayati AR, Nogueira RG, Lang MJ, Gross BA. Endovascular thrombectomy for acute ischemic stroke with primary occlusion of the anterior cerebral artery: A meta-analysis. *J Stroke Cerebrovasc Dis* 34(2):108208, 2025.

Vivanco-Suarez J, Dibas M, Lopes DK, Hanel RA, Martínez-Galdámez M, Rodriguez-Calienes A, Cortez GM, Fifi JT, Devarajan A, Toth G, Patterson T, Altschul D, Pereira VM, Liu E, Puri AS, Kuhn AL, Guerrero WR, Khandelwal P, Bach I, Kan P, Edhayan G, Given C, Narayanan S, Gross BA, Farooqui M, Galecio-Castillo M, Derakhshani S, Ortega-Gutierrez S. Safety and effectiveness assessment of the surpass evolve (SEASE): a post-market international multicenter study. *J Neurointerv Surg* 17(3):277-283, 2025.

Mohammaden MH, Doheim MF, Abdelhamid H, Matsoukas S, Schuldt BR, Fifi JT, Kuybu O, Gross BA, Al-Bayati AR, Dolia J, Grossberg JA, Olive-Gadea M, Rodrigo-Gisbert M, Requena M, Monteiro A, Yu S, Siegler JE, Rodriguez-Calienes A, Galecio-Castillo M, Ortega-Gutierrez S, Cortez GM, Hanel RA, Aghaebrahim A, Hassan AE, Nguyen TN, Abdalkader M, Klein P, Salem MM, Burkhardt JK, Jankowitz BT, Colasurdo M, Kan P, Hafeez M, Tanweer O, Peng S, Alaraj A, Siddiqui AH, Nogueira RG, Haussen DC. Anesthesia modality in endovascular treatment for distal medium vessel occlusion stroke: intention-to-treat propensity score-matched analysis. *J Neurointerv Surg* 17(5):518-524, 2025.

Davies JM, Knopman J, Mokin M, Hassan AE, Harbaugh RE, Khalessi A, Fiehler J, Gross BA, Grandhi R, Tarpley J, Sivakumar W, Bain M, Crowley RW, Link TW, Fraser JF, Levitt MR, Chen PR, Hanel RA, Bernard JD, Jumaa M, Youssef P, Cress MC, Chaudry MI, Shakir HJ, Lesley WS, Billingsley J, Jones J, Koch MJ, Paul AR, Mack WJ, Osbun JW, Dlouhy K, Grossberg JA, Kellner CP, Sahlein DH, Santarelli J, Schirmer CM, Singer J, Liu JJ, Majjhoo AQ, Wolfe T, Patel NV, Roark C, Siddiqui AH. Adjunctive middle meningeal artery embolization for subdural hematoma. *N Engl J Med* 391(20):1890-1900, 2024.

Ma L, Hoz SS, Doheim MF, Fadhil A, Sultany A, Al-Bayati AR, Nogueira RG, Lang MJ, Gross BA. Impact of embolisate penetration, type and technique on results after standalone middle meningeal artery embolization for chronic subdural hematoma. *Neurosurgery* 95(6):1395-1406, 2024.

Ma L, Hoz SS, Grossberg JA, Lang MJ, Gross BA. Developmental venous anomalies. *Neurosurg Clin N Am* 35(3):355-361, 2024.

Bradley Gross, MD

Ma L, Hoz SS, Al-Bayati AR, Nogueira RG, Lang MJ, Gross BA. Flow diverters with surface modification in patients with intracranial aneurysms: a systematic review and meta-analysis. *World Neurosurg* 185:320-326, 2024.

Ma L, Nail TJ, Hoz SS, Puccio AM, Lang MJ, Okonkwo DO, Gross BA. Traumatic cerebral venous sinus thrombosis: management and outcomes. *World Neurosurg* 187:e949-e962, 2024.

Hoz SS, Hudson JS, Ma L, Lang MJ, Gross BA. Medications and "risk" of aneurysm rupture based on presentation: setting the record straight. *World Neurosurg* 188:e573-e577, 2024.

Ma L, Hoz SS, Al-Bayati AR, Nogueira RG, Lang MJ, Gross BA. Improved outcomes among octogenarians with ruptured aneurysms: endovascular treatment as right of first refusal in the 2nd post-trial decade. *World Neurosurg* 190:e883-890, 2024.

Ma L, Hoz SS, Doheim MF, Fadhill A, Sultany A, Al-Bayati AR, Nogueira RG, Lang MJ, Gross BA. Nonopacification of frontal and parietal branches after middle meningeal artery embolization: a radiographic benchmark. *World Neurosurg* 192:e513-522, 2024.

Ma L, Hoz SS, Al-Bayati AR, Nogueira RG, Lang MJ, Gross BA. Sustained efficacy of angioplasty for cerebral vasospasm after aneurysmal subarachnoid hemorrhage: risk features and device comparison. *J Clin Neurosci* 128:110784, 2024.

Varga G, Ma L, Gross BA. Clinical comparison of aspiration to stentriever-mediated aspiration thrombectomy for M2 occlusions. *J Stroke Cerebrovasc Dis* 33(11):107989, 2024.

Hendrix P, Koul P, Noto A, Li J, Schirmer CM, Lang MJ, Al-Bayati AR, Nogueira RG, Gross BA. Admission hyperglycemia effect on symptomatic intracranial hemorrhage in Tenecteplase versus alteplase before large vessel occlusion stroke thrombectomy. *J Neurol* 271(12):7605-7612, 2024.

Plute T, Nayar G, Weinberg J, Keister A, Abou-Al-Shaar H, Al-Bayati AR, Nogueira RG, Lang MJ, Nimjee S, Gross BA. Assessment of the safety and efficacy of the Zoom 45 and 55 reperfusion catheters for medium and distal mechanical thrombectomies: A multi-institutional study. *J Stroke Cerebrovasc Dis* 33(6):107698, 2024.

Hoz SS, Ma L, Ismail M, Al-Bayati AR, Nogueira RG, Lang MJ, Gross BA. Intracranial aneurysms and abducent nerve palsy. *Surg Neurol Int* 15:207, 2024.

Hoz SS, Ma L, Muthana A, Al-Zaidy MF, Ahmed FO, Ismail M, Jacobs RC, Agarwal P, Al-Bayati AR, Nogueira RG, Lang MJ, Gross BA. Canial nerve palsies and intracranial aneurysms: A narrative review of patterns and outcomes. *Surg Neurol Int* 15:277, 2024.

Hendrix P, Gross BA, Allahdadian S, Sioutas G, Koul P, Tarbay AC, Lang MJ, Srinivasan VM, Al-Bayati AR, Li J, Noto A, Nogueira RG, Burkhardt JK, Zang R, Schirmer CM. Tenecteplase versus alteplase before stroke thrombectomy: outcomes after system-wide transitions in Pennsylvania. *J Neurol* 271(8):5637-5641, 2024.

Hanel RA, Cortez GM, Jankowitz BT, Sauvageau E, Aghaebrahim A, Lin E, Jadhav AP, Gross B, Khaldi A, Gupta R, Frei D, Loy P, Price LL, Hetts SW, Zaidat OO. Anterior circulation location-specific results for stent-assisted coiling – carotid versus distal aneurysms: 1-year outcomes from the Neuroform Atlas Stent Pivotal Trial. *J Neurointerv Surg* 16(11):1125-1130, 2024.

Bradley Gross, MD

Chen H, Salem MM, Colasurdo M, Sioutas GS, Khalife J, Kuybu O, Carroll KT, Hoang AN, Baig AA, Salih M, Khorasanizadeh M, Baker C, Mendez Ruiz A, Cortez GM, Abecassis Z, Ruiz Rodríguez JF, Davies JM, Narayanan S, Cawley CM, Riina H, Moore J, Spiotta AM, Khalessi A, Howard BM, Hanel RA, Tanweer O, Tonetti D, Siddiqui AH, Lang M, Levy EI, Jovin TG, Grandhi R, Srinivasan VM, Levitt MR, Ogilvy CS, Jankowitz B, Thomas AJ, Gross BA, Burkhardt JK, Kan P.Standalone middle meningeal artery embolization versus middle meningeal artery embolization with concurrent surgical evacuation for chronic subdural hematomas: a multicenter propensity score matched analysis of clinical and radiographic outcomes. *J Neurointerv Surg* 16(12):1313-1319, 2024.

Salah WK, Findlay MC, Baker CM, Scoville JP, Bounajem MT, Ogilvy CS, Moore JM, Riina HA, Levy EI, Siddiqui AH, Spiotta AM, Cawley CM, Khalessi AA, Tanweer O, Hanel R, Gross BA, Kuybu O, Howard BM, Hoang AN, Baig AA, Khorasanizadeh M, Mendez Ruiz AA, Cortez G, Davies JM, Lang MJ, Thomas AJ, Tonetti DA, Khalife J, Sioutas GS, Carroll K, Abecassis ZA, Jankowitz BT, Ruiz Rodriguez J, Levitt MR, Kan PT, Burkhardt JK, Srinivasan V, Salem MM, Grandhi R. The influence of coagulopathy on radiographic and clinical outcomes in patients undergoing middle meningeal artery embolization as standalone treatment for non-acute subdural hematomas. *J Neurotrauma* 41(11-12):1375-1383, 2024.

Chintapalli R, Nguyen S, Taussky P, Grandhi R, Dammann P, Raygor K, Tonetti DA, Andersson T, White P, Ogilvy CS, Chapot R, Fox WC, Tawk RG, Lanzino G, Hanel R, Jadhav A, Hassan AE, Linfante I, Almefty R, Mascitelli J, Fargen K, Levitt MR, Burkhardt JK, Jankowitz BT, Jabbour P, Starke RM, Gross BA, Kan P, Killer-Oberpfalzer M, Rautio R, Dmytriw AA, Coulthard A, Dabus G, Raper D, Deuschl C, Kilburg C, Budohoski KP, Abla AA. Management of failed flow diversion for intracranial aneurysm beyond the first 6 months of follow-up: an international Delphi consensus. *J Neurosurg* 141(5):1225-1234, 2024

Dibas M, Vivanco-Suarez J, Lopes DK, Hanel RA, Rodriguez-Calienes A, Cortez GM, Fifi JT, Devarajan A, Toth G, Patterson TE, Altschul D, Pereira VM, Liu XYE, Puri AS, Kühn AL, Guerrero WR, Khandelwal P, Bach I, Kan PT, Edhayan G, Martinez-Galdamez M, Given C, Gross BA, Narayanan S, Galecio-Castillo M, Derakhshani S, Ortega-Gutierrez S. Treatment of unruptured small and medium-sized wide necked aneurysms using the 64-wire surpass evolve: a subanalysis from the SEASE international registry. *J Am Heart Assoc* 13(21):e036365, 2024.

Kim S, Nowicki KW, Kohyama K, Mittal A, Ye S, Wang K, Fujii T, Rajesh S, Cao C, Mantena R, Barbuto M, Jung Y, Gross BA, Friedlander RM, Wagner WR. Development of an injectable, ECM-derivative embolic for the treatment of cerebral saccular aneurysms. *Biomacromolecules* 25(8):4879-4890, 2024.

Pressman E, Gersey ZC, Jonzzon SB, Weinberg JH, Fogg DN, Flaherty EG, Gross BA, Chitale RV, Fusco MR, Froehler MT, Vignolles-Jeong J, Nimjee SM, Hanel RA, Cortez GM, Ravi S, Desai SK, Hassan AE, Monteiro A, Siddiqui AH, Matsoukas S, Majidi S, Smith T, Vakharia K, Mokin M. Decompressive craniectomy in symptomatic intracerebral hemorrhage after ischemic stroke: a multicenter retrospective cohort study. *J Neurosurg* 142(1):52-61, 2024.

Crane A, Shanahan RM, Hudson JS, Nowicki KW, Gersey ZC, Agarwal P, Jacobs RC, Lang MJ, Gross BA. Pharmaceutical modulation of intracranial aneurysm development and rupture. *J Clin Med* 13(11):3324, 2024.

Nogueira RG, Doheim MF, Al-Bayati AR, Lee JS, Haussen DC, Mohammaden M, Lang M, Starr M, Rocha M, da Camara CP, Gross BA, Bhatt NR. Distal medium vessel occlusion strokes: understanding the present and paving the way for a better future. *J Stroke* 26(2):190-202, 2024.

Bradley Gross, MD

Research Activities

• Embolization of the Middle Meningeal Artery With Onyx Liquid Embolic System for Subacute and Chronic Subdural Hematoma (EMBOLISE):

Embolise is a multicenter randomized control trial evaluating the safety and efficacy of embolization of the middle meningeal artery with Onyx liquid embolisate in the management of chronic subdural hematoma. Dr. Gross is the UPMC principal investigator on this multicenter study.

• US IDE Study of the Contour Neurovascular System for Intracranial Aneurysm Repair (NECC Trial):

The Contour Neurovascular System is a novel agent used in the intrasaccular treatment of intracranial aneurysms. UPMC is part of an initial multicenter effort employing this system. Dr. Gross is the UPMC principal investigator on this multicenter study.

• A Randomized, Controlled Trial to Evaluate the Safety and Efficacy of the Route 92 Medical Reperfusion System (SUMMIT MAX):

The Route 92 system is a novel acute stroke embolectomy system that utilizes an ultra-large bore catheter to remove clot. This randomized controlled trial will compare this system to standard systems currently employed for stroke embolectomy. Dr. Gross is the UPMC principal investigator on this multicenter study.

Costas G. Hadjipanayis, MD, PhD

L. Dade Lunsford Professor
Executive Vice Chair
Director, Center for Image-Guided Neurosurgery
Co-Director, UPMC Brain Tumor Center
Director, Brain Tumor Nanotechnology Laboratory, UPMC Hillman Cancer Center

Constantinos G. Hadjipanayis, MD, PhD, is a board-certified neurosurgeon-scientist who has devoted his entire career to the treatment of brain tumor patients. He completed his neurosurgical residency and graduate PhD training at the University of Pittsburgh School of Medicine with additional neurosurgical oncology training at the University of California San Francisco.

Dr. Hadjipanayis is executive vice-chair for the University of Pittsburgh Neurological Surgery, director of the UPMC Center for Image-Guided Neurosurgery (CIGNS), and serves as co-director of the UPMC Brain Tumor Center. Dr. Hadjipanayis also directs the Brain Tumor Nanotechnology Laboratory in the Hillman Cancer Center and has been the principal investigator of multiple clinical trials and university, private foundation, and NIH-funded grants focused on brain tumors.

He was recruited back to UPMC in October of 2022 from the Icahn School of Medicine at Mount Sinai in New York City where he served as the chair of the department of neurosurgery at Mount Sinai Union Square/Beth Israel and the director of neurosurgical oncology for the Mount Sinai Health System.

Dr. Hadjipanayis has focused much of his career on innovation, translational research, and intraoperative technology development. In 2011, he was the first to use 5-ALA (Gleolan) to perform fluorescence-guided surgery (FGS) in the United States and helped lead the FDA approval of Gleolan for glioma surgery in June 2017. He has been involved in a number of clinical trials studying novel therapies of glioblastoma (GBM). Dr. Hadjipanayis and Jan Drappatz, MD, associate director of UPMC Neuro-Oncology, launched the first U.S. intraoperative photodynamic therapy (PDT) study at the UPMC Hillman Cancer in 2024, introducing the new 5-ALA agent Pentalafen. In 2025, Dr. Hadjipanayis will launch a personalized vaccine-based immunotherapy for patients with newly diagnosed GBM. A new multicenter pediatric neurosurgical oncology trial will also be

Costas G. Hadjipanayis, MD, PhD

launched in 2025 for the visualization and detection of pediatric brain tumors. This will be the first U.S. multicenter pediatric clinical trial focused on 5-ALA FGS.

Dr. Hadjipanayis has brought new intraoperative technologies to UPMC for the first time that include the use of a voice-controlled, robotic-assisted exoscope for FGS of malignant brain tumors. Dr. Hadjipanayis was the first to use this technology for resection of a brain tumor in 2023 at UPMC Presbyterian. He also reinstituted laser interstitial thermal therapy (LITT) for brain tumors at UPMC Presbyterian. In 2025, Dr. Hadjipanayis and his team will be initiating a new clinical trial utilizing low-frequency focused ultrasound (FUS) for treatment of brain metastases in combination with immunotherapy.

Dr. Hadjipanayis and his lab at the UPMC Hillman Cancer Center are actively studying the development and use of magnetic hyperthermia therapy (MHT) for treatment of GBM in combination with adjuvant therapies. His lab is also actively working on the preclinical development of PDT and sonodynamic therapy for gliomas, including diffuse midline glioma (DMG) tumors. His lab has established a new collaboration at the Blue Pearl Pet Hospital in Pittsburgh. This large veterinary hospital will permit the preclinical study of novel therapies for canines with spontaneous gliomas which share similar characteristics as human gliomas.

Dr. Hadjipanayis is the current chair of the AANS/CNS Tumor Section, leading the largest group of neurosurgical oncologists in the world. He is an elected member of the American Academy of Neurological Surgeons, Neurosurgical Society of America (NSA), and the Society of Neurological Surgeons (SNS). He is quite active with the Neurosurgery Research Education Foundation (NREF) which funds important research of neurosurgery trainees and young faculty members. Dr. Hadjipanayis has been a tireless brain tumor advocate serving on the nonprofit boards of the Southeastern Brain Tumor Foundation (SBTF) and StacheStrong.

Dr. Hadjipanayis is dedicated to the development of neurosurgeon-scientists both nationally and at the University of Pittsburgh. Through the SNS and NREF, Drs. Hadjipanayis and Linda Liau, MD, PhD, (UCLA) launched the Neurosurgeon-Scientist Training Program (NSTP). This new program provides select research funding to neurosurgery residents from across the country who have demonstrated productive research in a mentored setting. At the University of Pittsburgh, Drs. Hadjipanayis, Page B. Pennell, MD, (Department of Neurology), and Julia Kofler, MD, (Division of Neuropathology), established the Neurology, Neurosurgery, and Neuropathology Pittsburgh Research Education Program (N3-PREP) which is intended to help advance the academic research careers of residents and fellows in the neuroscience fields. A longitudinal track beginning in the PGY-1 year, the NIH NINDS UE5 Research Education program will increase the interest of the matriculating residents across participating departments, transform the culture, and ultimately increase a diverse pool of residents well-prepared to receive the most from the benefits of direct NIH funding.

A CAST-approved neurosurgical oncology fellowship was established by Dr. Hadjipanayis at UPMC in 2023. This fellowship is currently only offered to neurosurgical residents in training at UPMC during their PGY-7 year.

Specialized Areas of Interest
Surgical management of brain and spinal cord tumors; robotic-assisted exoscope based microneurosurgery; stereotactic radiosurgery (Gamma Knife and LINAC-based); fluorescence-guided neurosurgery; laser-interstitial thermal therapy (LITT); intraoperative awake/cortical mapping; neuroendoscopy; hydrocephalus.

Costas G. Hadjipanayis, MD, PhD

Board Certifications
American Board of Neurological Surgery

Hospital Privileges
UPMC Children's Hospital of Pittsburgh
UPMC Magee-Womens Hospital
UPMC Passavant
UPMC Presbyterian
UPMC Shadyside

Professional Organization Membership
American Academy of Neurological Surgeons
American Board of Neurological Surgery
American Association of Neurological Surgeons
AANS/CNS Joint Section on Tumors
Congress of Neurological Surgeons
Neurosurgery Research Education Fund
Neurosurgical Society of America
Society of Neuro-Oncology
Society of Neurological Surgeons

Professional Activities
Chair, AANS/CNS Tumor Section

Education & Training
BA, Medical Scholar's Program, University of Delaware, 1994
MD, Sydney Kimmel Jefferson Medical College, 1998
General Surgery, University of Pittsburgh, 1999
Gamma Knife radiosurgery fellowship, University of Pittsburgh 2004
PhD, Biochemistry/Molecular Genetics, University of Pittsburgh, 2005
Neurological Surgery Residency, University of Pittsburgh, 2006
Surgical neuro-oncology fellowship, University of California, San Francisco, 2006

Honors & Awards
Castle Connolly Top Doctors in America, 2018-25
Super Doctor, superdoctor.com, 2021-22
Leica Award, AANS Annual Meeting, Philadelphia, 2022
Cullman Family Award For Excellence in Physician Communication, Mount Sinai Health System, 2019
Distinguished Physician of the Year, Hellenic Medical Society, 2019
Inaugural Brain Tumor Biotech Young Innovator Award, Weill Cornell Medicine, 2013
Health Care Hero Award Winner, Atlanta Business Chronicle, 2013
Young Investigator Award, American Brain Tumor Association, 2011
Translational Research Award, Winship Cancer Institute, Emory University, 2010
Robbins Scholar Award, Winship Cancer Institute, Emory University, 2010
Robert Ginsberg Surgical Oncology Award, Radiation Therapy Oncology Group, 2009
Philip Jory Award, Southeastern Brain Tumor Foundation, 2009
Distinguished Cancer Clinician and Scientist, Georgia Cancer Coalition, 2007
Basic Research Fellowship Award, American Brain Tumor Association, 2006
Mentored Clinical Scientist Development Award (K08), National Institute of Health, 2005
Inaugural Stuart Rowe Society Presentation Award, University of Pittsburgh, 2005
Ruth L. Kirschstein National Research Service Award (T32), National Institutes of Health, 2003
Resident Teacher of the Year Award, Department of Neurological Surgery, University of Pittsburgh, 1999

Costas G. Hadjipanayis, MD, PhD

Alpha Omega Alpha, Jefferson Medical College, 1997
Benjamin and Mary Siddons Measey Award, Jefferson Medical College, 1997
Hobart Amory Hare Medical Student Honor Society, Jefferson Medical College, 1996
Honor Society Award, Association of Pathology Chairs, 1996
Bernard B. Rotko Scholarship, Jefferson Medical College, 1996
Nicholas T. Padis Award, Hellenic University Club of Philadelphia, 1995
Golden Key National Honor Society, University of Delaware, 1994
Phi Beta Kappa, University of Delaware, 1994

News Media Appearances: 2024-25

"Imperial man is 1st in United States to get experimental treatment for brain cancer," WPXI-TV (Pittsburgh), July 11, 2024.

Publications: 2024-25

• Refereed Articles:

Yurtluk MD, Bin-Alamer O, Flickinger JC, Hadjipanayis CG, Niranjan A, Lunsford LD. Multistaged Stereotactic Radiosurgery for Complex Large Lobar Arteriovenous Malformations: A Case Series. *Neurosurgery* 96(1):223-232, 2025.

Leblond F, Dallaire F, Ember K, Le Moël A, Blanquez-Yeste V, Tavera H, Sheehy G, Tran T, Guiot MC, Weil AG, Dudley R, Hadjipanayis C, Petrecca K. Quantitative assessment of the generalizability of a brain tumor Raman spectroscopy machine learning model to various tumor types including astrocytoma and oligodendroglioma. *J Biomed Opt* 30(1):010501, 2025.

Skandalakis GP, Viganò L, Neudorfer C, Rossi M, Fornia L, Cerri G, Kinsman KP, Bajouri Z, Tavakkoli AD, Koutsarnakis C, Lani E, Komaitis S, Stranjalis G, Zadeh G, Barrios-Martinez J, Yeh FC, Serletis D, Kogan M, Hadjipanayis CG, Hong J, Simmons N, Gordon EM, Dosenbach NUF, Horn A, Bello L, Kalyvas A, Evans LT. White matter connections within the central sulcus subserving the somato-cognitive action network. *Brain* 148(5):1789-1800, 2025.

Almeida T, Reyes JS, Scanlon SE, Frederico SC, Huq S, Hadjipanayis CG. Laser interstitial thermal therapy for recurrent brain metastases following stereotactic radiosurgery: a systematic review. *Expert Rev Neurother* 25(4):465-475, 2025

Rivera D, Bouras A, Mattioli M, Anastasiadou M, Pacentra AC, Pelcher O, Koziel C, Schupper AJ, Chanenchuk T, Carlton H, Ivkov R, Hadjipanayis CG. Magnetic hyperthermia therapy enhances the chemoradiosensitivity of glioblastoma. *Sci Rep* 15(1):10532, 2025.

Taori S, Wei Z, Hadjipanayis CG, Niranjan A, Lunsford LD. Long-term outcomes following upfront single-session gamma knife stereotactic radiosurgery for large volume meningiomas. *J Neurooncol* 173(2):429-438, 2025.

Dabbagh Ohadi MA, Delbari P, Ahmadvand MH, Zamani R, Karimi A, Ohadi N, Hadjipanayis CG. Single fraction versus multifraction stereotactic radiosurgery for spinal metastases: systematic review and meta-analysis. *Neurosurg Focus* 58(5):E16, 2025.

Reyes JS, Lohia VN, Almeida T, Niranjan A, Lunsford LD, Hadjipanayis CG. Artificial intelligence in neurosurgery: a systematic review of applications, model comparisons, and ethical implications. *Neurosurg Rev* 48(1):455, 2025.

Costas G. Hadjipanayis, MD, PhD

Abou-Al-Shaar H, Albalkhi I, Shariff RK, Mallela AN, Fazeli PK, Tos SM, Mantziaris G, Meng Y, Bernstein K, Kaisman-Elbaz T, Abofani H, Lin YY, Lee CC, Tripathi M, Upadhyay R, Palmer JD, Nabeel AM, Reda WA, Tawadros SR, Abdelkarim K, El-Shehaby AMN, Emad RM, Peker S, Samanci Y, Wegner RE, Shepard MJ, Liscak R, Simonova G, Almeida T, Benjamin C, Kondziolka D, Sheehan JP, Niranjan A, Hadjipanayis CG, Lunsford LD. Outcomes of stereotactic radiosurgery for pituitary metastases: an international multi-institutional study. *Pituitary* 28(3):69, 2025.

Rodriguez B, Brown CS, Colan JA, Zhang JY, Huq S, Rivera D, Young T, Williams T, Subramaniam V, Hadjipanayis C. Fluorescence-Guided Surgery for Gliomas: Past, Present, and Future. *Cancers* (Basel) 17(11):1837, 2025.

Daza-Ovalle A, Bin-Alamer O, Wei Z, Abou-Al-Shaar H, Hadjipanayis CG, Gardner P, Niranjan A, Lunsford LD. Long-Term Outcomes of Jugular Paragangliomas Undergoing Gamma Knife Radiosurgery: A Single Center Experience. *Neurosurgery* [Epub ahead of print], 2025.

Xiong Z, Walsh KM, Sneiderman CT, Nisnboym M, Hadjipanayis CG, Agnihotri S, Eagar TN, Wang H, Pollack IF, Forsthuber TG, Li X, Raphael I, Kohanbash G. Immuno-epidemiologic mapping of HLA diversity across glioma patient cohorts. *Neuro Oncol* [Epub ahead of print], 2025..

Wei CZ, Shanahan R, Puccio D, Deng H, Lee CC, Yang HC, Cifarelli CP, Hack JD, Cifarelli DT, Peker S, Samanci Y, Mathieu D, Blanchard J, Perlow HK, Palmer JD, Tripathi M, Moreno NM, Martínez Álvarez R, Speckter H, Hernandez W, Liščák R, May J, Elhamdani S, Shepard MJ, Wegner R, Hadjipanayis CG, Lunsford LD, Niranjan A. A comparison of outcomes after radiosurgery in non-small cell lung cancer patients with one versus more than twenty brain metastases: an international multi-center study. *J Neurooncol* [Epub ahead of print], 2025.

Van Gompel JJ, Carlstrom LP, Hadjipanayis CG, Graffeo CS, Patel N, Carlson ML, Jacob J, Olson JJ. A comparison of outcomes after radiosurgery in non-small cell lung cancer patients with one versus more than twenty brain metastases: an international multi-center study. *Neurosurgery* [Online ahead of print], 2025.

Wei CZ, Deng H, Yeole U, Donohue JK, Jose S, Mehta M, Albano L, Taori S, Hadjipanayis CG, Niranjan A, Lunsford LD. Primary or Salvage Stereotactic Radiosurgery for Meningiomas Invading the Superior Sagittal Sinus. *Neurosurgery* [Online ahead of print], 2025.

David S, Ksantini N, Dallaire F, Ember K, Daoust F, Sheehy G, Hadjipanayis CG, Petrecca K, Wilson BC, Leblond F. Toward noncontact macroscopic imaging of multiple cancers using multispectral inelastic scattering detection. *J Biophotonics* 17(9):e202400087, 2024.

Yurtluk MD, Bin-Alamer O, Flickinger JC, Hadjipanayis CG, Niranjan A, Lunsford LD. Multistaged stereotactic radiosurgery for complex large lobar arteriovenous malformations: A case series. *Neurosurgery* 96(1):223-232, 2025.

Ohadi MAD, Dashtkoohi M, Babaei MR, Zamani R, Dashtkoohi M, Hadjipanayis CG. Sodium fluorescein-guided resection of brain metastases: A needed approach or an option? A systematic review and meta-analysis. *Acta Neurochir* (Wien) 166(1):334, 2024.

Scanlon SE, Shanahan RM, Bin-Alamer O, Bouras A, Mattioli M, Huq S, Hadjipanayis CG. Sonodynamic therapy for adult-type diffuse gliomas: past, present, and future. *J Neurooncol* 169(3):507-516, 2024.

Costas G. Hadjipanayis, MD, PhD

Taori S, Bin-Alamer O, Tang A, Niranjan A, Flickinger JC, Hadjipanayis CG, Lunsford LD. Repeat stereotactic radiosurgery for progressive vestibular schwannomas after primary gamma knife radiosurgery. *J Neurooncol* 169(3):591-599, 2024.

David S, Ksantini N, Dallaire F, Ember K, Daoust F, Sheehy G, Hadjipanayis CG, Petrecca K, Wilson BC, Leblond F. Toward noncontact macroscopic imaging of multiple cancers using multi-spectral inelastic scattering detection. *J Biophotonic*s 17(9):e202400087, 2024.

Rodriguez A, Ahluwalia MS, Bettegowda C, Brem H, Carter BS, Chang S, Das S, Eberhart C, Garzon-Muvdi T, Hadjipanayis CG, Hawkins C, Jacques TS, Khalessi AA, McDermott MW, Mikkelsen T, Orr BA, Phillips JJ, Rosenblum M, Shelton WJ, Solomon DA, von Deimling A, Woodworth GF, Rutka JT. Toward standardized brain tumor tissue processing protocols in neuro-oncology: a perspective for gliomas and beyond. *Front Oncol* 14:1471257, 2024.

Nader NE, Frederico SC, Miller T, Huq S, Zhang X, Kohanbash G, Hadjipanayis CG. Barriers to T Cell Functionality in the Glioblastoma Microenvironment. *Cancers* (Basel) 16(19):3273, 2024.

Wei Z, Taori S, Mehta M, Jose SG, Luy DD, Abou-Al-Shaar H, Hadjipanayis CG, Niranjan A, Lunsford LD. Primary and salvage radiosurgery for neurofibromatosis type 2-associated meningiomas. *J Neurosurg* 142(4):1125-1133 2024.

D. Kojo Hamilton, MD

Professor
Director and Chief, UPMC Neurosurgical Spine Services
Director, Residency Training Program
Co-Director, Spine Fellowship Program

D. Kojo Hamilton, MD, is a recognized leader in scoliosis, adult spinal deformity and trauma. He is also renowned for neurological surgery education and mentoring.

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 cranial training in Auckland City Hospital in Auckland, New Zealand.

He is board certified in neurological surgery, a member of the Society of Neurological Surgeons, a fellow of the American Association of Neurological Surgeons and a 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, 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.

D. Kojo Hamilton, MD

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
UPMC Magee-Womens Hospital
UPMC Mercy
UPMC Presbyterian
Veterans Affairs Hospital

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
International Spine Study Group
Lumbar Spine Research Society
Scoliosis Research Society
Society of Neurological Surgeons

Professional Activities
IMAST Committee, Scoliosis Research Society
MOC/CME Committee, American Association of Neurological Surgeons
Executive Committee, AANS/CNS Joint Section Spine and Peripheral Nerves
Scientific Program Committee, AANS/CNS Joint Section Spine and Peripheral Nerves
DSPN Drugs & Devices Committee, AANS/CNS Joint Section Spine and Peripheral Nerves
ABNS Exam/Extra-Mural Writing Committee, American Board of Neurological Surgery

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

Honors & Awards
Castle Connolly Top Doctors in America, 2016-25
Larry E. Davis Excellence in Leadership Award, University of Pittsburgh, 2024
UPMC Physician Excellence Award, UPMC Physician Excellence in Leadership, 2023
Faculty Teaching Award, Department of Neurological Surgery, 2020
Distinguished Alumni, Univ of Virginia Summer Medical and Dental Education Program

News Media Appearances: 2024-25
"How to Effectively Train Neurosurgery Residents," CNS *Optimizing Neurosurgical Practice* podcast, November 1, 2024
"New Study Highlights Dangers of Slap Fighting." Brain Injury Association of America, September 30, 2024.

D. Kojo Hamilton, MD

"'It's barbaric': Pitt study quantifies concussions in slap fighting," *Pittsburgh Post-Gazette*, September 27, 2024.
"Competitive slap fighting exposed: First study finds 78% show signs of brain injuries. *StudyFinds*, September 26, 2024.
"Slap in the Face Study Reveals 78% of Competitors Suffer Brain Damage," *Hypescience*, September 26, 2024.
"Pitt Study Is First to Record Signs of Concussion in Slap Fighters," *Pitt Health Sciences*, September 26, 2024.
"Cassella C. Study of 'Slap Fighting' Reveals Signs of Brain Injury in 78% of Participants," *ScienceAlert*, September 25, 2024.
"Study Says Almost 80% of Slap Fighting Contenders at Risk of Brain Damage," *Men's Health*, September 25, 2024.
"Slap fighting leads to brain injury: A knockout sport with neurological risks," MSN via India Today, September 25, 2024.
"Slap fighting leads to brain injury: A knockout sport with neurological risks," *India Today*, September 25, 2024.
"Slap fighting raises concerns over brain injuries among medical experts," *The Express Tribune*, September 25, 2024.
"Slap fighting study raises concerns over brain injuries," *Muscle and Fitness*, September 25, 2024.
"Estudo indica sinais de lesão cerebral em 80% dos atletas das ligas de tapa na cara," ESPN Brazil, September 24, 2024.
"Slap Fighting Study Raises Concerns Over Brain Injuries," *Brain Athlete Sportz*, September 24, 2024.
"Slap Fighting: Competitors Show Signs of Concussion As Fears About The Sport Grow," *IFLScience*, September 23, 2024.
"Slap fighting causes high risk of brain injury, doctors call for safeguards over alarming concussion rates," MSN, September 23, 2024.
"Doctors Warn Slap Fighting May (Shockingly!) Cause Brain Damage," *Oddee*, September 23, 2024.
"Slap Fighting Study Finds Brain Injury Signs in 80% of Competitors," *Vice*, September 23, 2024.
"Slap fighting causes high risk of brain injury, doctors call for safeguards over alarming concussion rates," *Malay Mail*, September 23, 2024.
"Brain Damage Risks: Why Doctors Fear the Rise of Slap Fighting," *Frontproof Media*, September 23, 2024.
"Study – PowerSlap Has Absurd Rates of Brain Injury," *Combat Sports Law*, September 22, 2024.
"Unique new sport, 'slap fighting,' could cause serious brain damage," WKRC, September 22, 2024.
"'They're soft': Local 'slap fighter' brushes off concerns raised by Pitt neurological researchers," WTAE-TV, September 20, 2024.
"Inside bizarre world of slap fighting: How 'ultimate test of toughness' has gained millions of followers and celebrity fans - as competitors are warned they risk brain damage," *DailyMail*, September 19, 2024.
"First academic study on slap fighting highlights risks to participants' neurological health," MDLinx, September 19, 2024.
"Slap fighting, championed by UFC founder, leaves most participants with concussion signs, Pitt study warns," *Philly Voice*, September 19, 2024.
"Pitt study shows concussion dangers of growing sport, slap fighting," KDKA News Radio, September 19, 2024.
"Pittsburgh researchers publish study to record signs of concussion in slap fighters," CBS Pittsburgh, September 18, 2024.
"First academic study on slap fighting highlights risks to participants' neurological health," *Medical Express*, September 18, 2024.
"Researchers publish study to record signs of concussion in slap fighters," *Yahoo News*, September 18, 2024.

D. Kojo Hamilton, MD

"Face it, slap fighters told, your brains are taking a beating too," *The Times* (London), September 18, 2024.
"Slap fighting may be fun to watch but it's not great for the participants' brains," *Consumer Affairs*, September 18, 2024.
"Concussion warning over face-slap fighting," MSN via BBC News, September 18, 2024.
"Health warning over face-slap fighting," *BBC News*, September 18, 2024.
"First academic study on slap fighting highlights risks to participants' neurological health," *ScienceDaily*, September 18, 2024.

Publications: 2024-25

• Refereed Articles:

Gajjar AA, Covell MM, Kumar RP, Tang OY, Ranganathan S, Muzyka L, Mualem W, Rehman I, Patel SV, Lavadi RS, Mitha R, Lieber BA, Hamilton DK, Agarwal N. Evidence Against a Traumatic Brain Injury "July Effect": An Analysis of 3,160,452 Patients from the National Inpatient Sample. *Neurosurgery* 96(2):447-453, 2025.

Carnovale B, Lavadi RS, Choudhary A, Gajjar AA, Kumar RP, Hudson JS, Shah M, Hamilton DK, Agarwal N. Accounts of Spine and Paraspinal Disease while Playing Golf. *World Neurosurg* 194:123343, 2025.

Lavadi RS, Carnovale B, Tirmizi Z, Gajjar AA, Kumar RP, Shah M, Hamilton DK, Agarwal N. Examining the Readability of AtlasGPT, The Premiere Resource for Neurosurgical Education. *World Neurosurg* 194:123469, 2025.

Rabon W, Rode M, Taylor T, Muluk P, Krishnamoorthy A, Easow H, Stout G, Chang Y, Hamilton DK, Thirumala PD, Agarwal N. Establishing Indicative Neurofilament Gradients Based on Severity of Spinal Cord Injury. *World Neurosurg* 195:123515, 2025.

Kann MR, Lavadi RS, Crane A, Aizooky T, Hardi A, Polavarapu H, Kumar RP, Mitha R, Shah M, Hamilton DK, Agarwal N. Fluid Biomarkers for Cervical Spondylotic Myelopathy. *Neurosurg Rev* 48(1):232, 2025.

Mitha R, Kumar RP, Agarwal N, Gerszten PC, Hamilton DK, Friedlander RM, Sefcik R. Opportunities to Overcome Barriers to Lactation – Recommendations for Best Practices. *J Surg Educ* 82(4):103445, 2025.

Gohel P, Lavadi RS, Jawad-Makki MA, Kumar RP, Waheed AA, Elkaim LM, Jaikumar V, Alan N, Buell TJ, Pennicooke BH, Hamilton DK, Agarwal N. Comprehensive Guidelines for Prehabilitation in Spine Surgery. *J Craniovertebr Junction Spine* 16(1):5-15, 2025.

Adida S, Hudson J, Legarreta A, Taori S, Shanahan RM, Jawad-Makki MH, Colan JA, Mitha R, Agarwal N, Okonkwo DO, Hamilton DK, Buell TJ. Revision Surgery for Proximal Junctional Failure: A Single-center Analysis. *Clin Neurol Neurosurg* 253:108880 2025.

Mir JM, Smith JS, Yung A, Onafowokan O, Lafage R, Gum J, Line BG, Diebo B, Daniels AH, Hamilton DK, Agarwal N, Buell TJ, Scheer JK, Eastlack RK, Mullin JP, Mundis GM, Hosogane N, Yagi M, Anand N, Mummaneni PV, Chou D, Klineberg EO, Kebaish KM, Gupta MC, Kim HJ, Lenke LG, Ames CP, Schwab FJ, Lafage V, Hostin RA, Bess S, Burton DC, Shaffrey CI, Passias PG, International Spine Study Group. The Impact of Thoracolumbar Inflection Point on Outcomes and Complications in Adult Spinal Deformity. *Neurosurgical Focus* 58(6):E8, 2025.

D. Kojo Hamilton, MD

Passias PG, Krol O, Williamson TK, Bennett-Caso C, Smith JS, Diebo B, Lafage V, Lafage R, Line B, Daniels AH, Gum JL, Protopsaltis TS, Hamilton DK, Soroceanu A, Scheer JK, Eastlack R, Mundis GM, Kebaish KM, Hostin RA, Gupta MC, Kim HJ, Klineberg EO, Ames, CP, Hart RA, Burton DC, Schwab FJ, Shaffrey CI, Bess S; International Spine Study Group. Proximal Junctional Kyphosis and Failure Prophylaxis Improves Cost Efficacy, While Maintaining Optimal Aligning, in Adult Spinal Deformity Surgery. *Neurosurgery* [Online ahead of print], 2025.

Fernández de-Thomas RJ, Adida S, Cloney MB, Mitha R, Lavadi RS, Deng H, Lopez-Gross AS, Sen A, Fernandes-Cabral DT, Abou-Al-Shaar H, Gerszten PC, Okonkwo DO, Buell TJ, Hamilton DK, Agarwal N. Current Trends in the Use of Cervical Collar Immobilization after Cervical Spine Surgery: A Global Survey Analysis. *Clin Spine Surg* [Online ahead of print], 2025.

Eastlack RK, Lakomkin N, Tran St, Jelousi M, Soroceanu A, Passias P, Protopsaltis T, Smith JS, Klineberg E, Bess S, Lafage V, Hamilton DK, Kim HJ, Burton D, Shaffrey CI, Ames CP, Mundis G. Necessity of posterior osteotomies for mild flexible cervical deformity correction. *J Neurosurg Spine* 41(6):757-764, 2024.

Kim AH, Hostin R, Yeramaneni S, Gum JL, Nayak P, Line BG, Bess S, Passias PG, Hamilton DK, Gupta MC, Smith JS, Lafage R, Diebo B, Lafage V, Klineberg EO, Daniels AH, Protopsaltis TS, Schwab FJ, Shaffrey CI, Ames CP, Burton DC, Kebaish KM, International Spine Study Group. Thoracolumbar fusions for adult lumbar deformity show superior QALY gain and lower costs compared with upper thoracic fusions. *Spine Deform* 12(6):1783-1791, 2024.

Lavadi RS, Johnson BR, Chalif JI, Shanahan R, Das A, Hamilton DK, Agarwal N, Fields DP. Comparing reactive versus empiric cerebrospinal fluid drainage strategies for spinal perfusion pressure optimization in patients with acute traumatic spinal cord injuries. *J Clin Neurosci* 127:110757, 2024.

Ali A, Kumar RP, Polavarapu H, Lavadi RS, Mahavadi A, Legarreta AD, Hudson JS, Shah M, Paul D, Mooney J, Dietz N, Fields DP, Hamilton DK, Agarwal N. Bridging the Gap: Can Large Language Models Match Human Expertise in Writing Neurosurgical Operative Notes? *World Neurosurg* 192:e34-e41, 2024.

Hills J, Mundis GM, Klineberg EO, Smith JS, Line B, Gum JL, Protopsaltis TS, Hamilton DK, Soroceanu A, Eastlack R, Nunley P, Kebaish KM, Lenke LG, Hostin RA, Gupta MC, Kim HJ, Ames CP, Burton DC, Shaffrey CI, Schwab FJ, Lafage V, Lafage R, Bess S, Kelly MP. The T4-L1-Hip Axis: Sagittal Spinal Realignment Targets in Long-Construct Adult Spinal Deformity Surgery: Early Impact. *J Bone Joint Surg Am* 106(23):e48, 2024.

Kim AH, Mo KC, Harris AB, Lafage R, Neuman BJ, Hostin RA, Soroceanu A, Kim HJ, Klineberg EO, Gum JL, Gupta MC, Hamilton DK, Schwab F, Burton D, Daniels A, Passias PG, Hart RA, Line BG, Ames C, Lafage V, Shaffrey CI, Smith JS, Bess S, Lenke L, Kebaish KM; International Spine Study Group. High-Dose TXA Is Associated with Less Blood Loss Than Low-Dose TXA without Increased Complications in Patients with Complex Adult Spinal Deformity. *J Bone Joint Surg Am* 106(23):2205-2214, 2024.

Kim AH, Hostin RA, Yeramaneni S, Gum JL, Nayak P, Line BG, Bess S, Passias PG, Hamilton DK, Gupta MC, Smith JS, Lafage R, Diebo BG, Lafage V, Klineberg EO, Daniels AH, Protopsaltis TS, Schwab FJ, Shaffrey CI, Ames CP, Burton DC, Kebaish KM; International Spine Study Group. Thoracolumbar fusions for adult lumbar deformity show superior QALY gain and lower costs compared with upper thoracic fusions. *Spine Deform* 12(6):1783-1791 2024.

D. Kojo Hamilton, MD

Research Activities
Educational and outcomes-driven research in adult spinal deformity continues to evolve, with a sustained focus on spinal alignment and decompression. Over the past year, particular emphasis has been placed on understanding the cumulative impact of perioperative complications. This body of work has not only deepened our insight into patient care but has also garnered national and international recognition—prompting meaningful discussions around redesigning clinical pathways to improve long-term outcomes.

As co-director of the Spine Computational Outcomes Learning Institute (SCOLI), Dr. Hamilton's educational mission is centered on advancing knowledge through technology-driven research to better understand the biomechanics of the human spine. His current initiatives include the development of intelligent metamaterial implants in partnership with Amir Alavi, PhD. These implants are designed to proactively address challenges like failed spinal fusion, enabling earlier interventions and improving surgical outcomes.

SCOLI also leads pioneering efforts in educational research using advanced neuroimaging to identify neurotrauma, alongside the application of biomarkers to enhance both the detection and treatment of neurological injury. Through these projects, SCOLI continues to serve as a platform for advancing spine education, clinical decision-making, and patient-centered outcomes.

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. Dr. Henry is the lead neuropsychologist in the department, overseeing the growth of neuropsychological services within the department and in collaboration with other departments. He is also involved with doctoral-level training for clinical psychology students from the University of Pittsburgh and Chatham University. Additionally, he is the instructor for the graduate-level cognitive assessment class at the University of Pittsburgh where he is an adjunct professor.

Specialized Areas of Interest
Neuropsychological function; clinical outcomes.

Hospital Privileges
UPMC Mercy
UPMC Presbyterian
UPMC Shadyside

Professional Organization Membership
American Psychological Association
International Neuropsychological Society
National Academy of Neuropsychology

Luke C. Henry, PhD

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

News Media Appearances: 2024-25
"Surgery for Chiari Malformation may improve psychological health," msn.com, February 21, 2025.

Publications: 2024-25
• Refereed Articles:
Henry LC, McDowell MM, Stephenson TL, Crittenden JB, Byrd AL, Fernández-de Thomas RJ, Chang YF, Nowicki KW, Mantena R, Strick PL, Friedlander RM. Predecompression and postdecompression cognitive and affective changes in Chiari malformation type I. *J Neurosurg* 143(1):4-12, 2025.

Aung T, Tang LW, Ho J, Henry LC, Ikegaya N, Modo M, Gonzalez Martinez J. Differential functional connectivity of amygdala in drug-resistant temporal lobe epilepsy. *Epilepsia* 66(6):1945-1958 2025.

Barrios-Martinez JV, Almast A, Lin I, Youssef A, Aung T, Fernandes-Cabral D, Yeh FC, Chang YF, Mettenburg J, Modo M, Henry L, Gonzalez-Martinez JA. Structural connectivity changes in focal epilepsy: Beyond the epileptogenic zone. *Epilepsia* 66(1):226-239, 2025.

Sherry N, Eagle SR, Henry LC, Appleton H, González Martínez JA, Friedlander RM, Okonkwo DO, Zinn PO. Perceived Cognitive Function in Neurosurgical Patients. *Neurosurgery* [Epub ahead of print], 2024.

Research Activities
Dr. Henry's primary work this year was the publication of "Predecompression and postdecompression cognitive and affective changes in Chiari malformation type I" in the *Journal of Neurosurgery*. The article was the culmination of several years of work and represents a significant step toward better understanding the role of the cerebellum in cognition and, importantly, how surgical intervention can change outcomes.

The epilepsy work represents the first years of collaboration taking a multilevel approach to understanding epilepsy from networks to function. Several exciting projects are in the works looking at the role of seizure onset in cognitive organization and development.

Kathryn Hoes, MD

Clinical Assistant Professor

Kathryn Hoes, MD, MBS, received her bachelors of science degree from the University of Pittsburgh in 2006 with a full academic scholarship. In addition to her dedicated science studies and premedical preparatory courses, she obtained a certificate in Latin American Studies during her time as an undergraduate. Spanish language proficiency was a part of this certification. She completed an accelerated masters of biomedical science degree at Rutgers University prior to medical school in order to obtain a deeper foundation in biomedical research which would play a vital role in her planned academic medical practice.

Following her initial medical training at Rutgers University (formerly Robert Wood Johnson Medical School) Dr. Hoes went on to neurosurgery residency at University of Texas Southwestern Medical Center. She served as chief resident in her final year of training. For additional expertise. Dr. Hoes completed a CAST certified fellowship in complex spinal surgery at Indiana

Kathryn Hoes, MD

University School of Medicine as part of Goodman Campbell Brain and Spine. The training consisted of complex spinal and minimally invasive procedures, spinal oncology, peripheral nerve disorders, spinal deformity, degenerative spinal disease, pediatric spinal disorders, and disc arthroplasty.

The type of care that is patient-centered, humanistic, and collaborative is important to Dr. Hoes. She integrates the breadth of her multifaceted training in an approach to brain, spine and peripheral nerve disorders with the patient's health goals as her primary consideration. Dr. Hoes prefers conservative care and the least invasive strategies possible to return her patients back to the lifestyle they are seeking. Medical education remains her priority.

Specialized Areas of Interest
Spinal tumors; degenerative spinal disorders; complex spine surgery; spinal instrumentation; peripheral nerve surgery; brain and spine trauma.

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
North American Spine Society

Professional Activities
Instructor, 2025 AANS Goodman Oral Board Preparation

Education & Training
BS, University of Pittsburgh, 2006
Masters, Biomedical Sciences, University of Medicine and Dentistry of New Jersey (Rutgers University), 2007
MD, University of Medicine and Dentistry of New Jersey (Rutgers University), 2011
Residency, University of Texas Southwestern Medical Center, 2018
Fellowship, Complex Spine Neurosurgery, Indiana University with Goodman Campbell Brain and Spine, 2019

Honors & Awards
Best Doctor, *Dallas 'D' Magazine*, 2022
Post Residency Clinical Fellowship Grant, Neurosurgery Research and Education Foundation, 2018-19
Alumni Award, Robert Wood Johnson Foundation, Rutgers University, 2011
Gold Humanism Honor Society, Arnold P. Gold Foundation, Rutgers University, 2010.
Graduation with Honors, Cum Laude, University of Pittsburgh, 2006
Helen Faison Scholarship,University of Pittsburgh, 2002-06.

Publications: 2024-25
• Refereed Articles:
Choudhary A, Carnovale B, Lavadi RJ, Hoes K. Evaluating the virtual global spine conference: Reflections on accessibility, engagement, and education. *World Neurosurgery: X* 26:100430, 2025.

Baoli Hu, PhD

Associate Professor
Director, Brain Tumor Evolution & Therapy Lab

Baoli Hu, PhD, joined the faculty of the University of Pittsburgh Department of Neurological Surgery at UPMC Children's Hospital of Pittsburgh in July of 2017 and was promoted to associate professor in February of 2024.

Dr. Hu received his bachelor's and master's degrees from the Northwest A&F University in Yangling, China in 2001. He earned his PhD degree in microbiology from Wuhan University in Wuhan, 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 tumor evolution, including tumor development, progression, and recurrence after the treatment; and developing new strategies for the treatment of these devastating diseases.

Specialized Areas of Interest
Cancer neuroscience; 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
Pediatric Brain Tumor Consortium

Professional Activities
Clinical Neuroimmunology and Brain Tumors Study Section, NIH
Grant Reviewer, Austrian Science Fund
NCI Clinical and Translational R21 and Omnibus R03 Review Study Section, NIH/NCI
Review Committee, Competitive Medical Research Fund, University of Pittsburgh
Ad Hoc Reviewer, The Children's Brain Tumor Network
Ad Hoc Reviewer, The Walter L. Copeland Fund, The Pittsburgh Foundation
Cell Image Core Advisory Committee, UPMC Children's Hospital of Pittsburgh

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

Baoli Hu, PhD

Honors & Awards

Pilot Award, RK Mellon Institute for Pediatric Research, 2024
Hillman Fellow for Innovative Developmental Cancer Research, 2023
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

Publications: 2024-25

• Refereed Articles:

Nisnboym M, Sneiderman CT, Jaswal AP, Xiong Z, Vincze SR, Sever RE, Zou H, Frederico SC, Agnihotri S, Hu B, Drappatz J, Pollack IF, Kohanbash G, Raphael I. Assessment of anti-CD69 antibody therapy alone or in combination with anti-PD-1 in murine GBM. *Expert Rev Clin Immunol* 21(2):239-247, 2025.

Raphael I, Sneiderman CT, Xiong Z, Raphael RA, Jackson SA, Mash M, Schwegman L, O'Brien C, Anderson KJ, Sever RAE, Hendrickse LD, Vincze SR, Diaz A, Felker J, Nechemia-Arbely Y, Hu B, Agnihotri S, Kamulla US, Uttam S, Hwang EI, Drappatz J, Rich JN, Broniscer A, Pierce TM, Taylor MD, Nisboym M, Forsthuber TG, Pollack IF, Chikina M, Rajasundaram R, Kohanbash G. T cell receptor landscape of childhood brain tumors. *Sci Transl Med* 17(790):eadp0675 2025.

Xiong Z, Sneiderman CT, Kuminkoski CR, Reinheimer J, Schwegman L, Sever RE, Habib A, Hu B, Agnihotri S, Rajasundaram D, Zinn PO, Forsthuber TG, Pollack IF, Li X, Raphael I, Kohanbash G. Transcript-targeted antigen mapping reveals the potential of POSTN splicing junction epitopes in glioblastoma immunotherapy. *Genes Immun* 26(3):190-199 2025.

Li D, Geng K, Hao Y, Gu J, Kumar S, Olson AT4, Kuismi CC, Kim HM, Pan Y, Sherman F, Williams AM, Li Y, Li F, Chen T, Thakurdin C, Ranieri M, Meynardie M, Levin DS, Stephens J, Chafitz A, Chen J, Donald-Paladino MS, Powell JM, Zhang ZY, Chen W, Ploszaj M, Han H, Gu SS, Zhang T, Hu B, Nacev BA, Kaiza ME, Berger AH, Wang X, Li J, Sun X, Liu Y, Zhang X, Bruno TC, Gray NS, Nabet B, Wong KK, Hua Zhang H. Targeted degradation of oncogenic KRASG12V triggers antitumor immunity in lung cancer models. *J Clin Invest* 135(2):e174249, 2024.

Research Activities

The research efforts in Dr. Hu's Brain Tumor Evolution Therapy Lab have mainly focused on the completion of two projects, which include 1) developing a new class of drugs for targeting the immune-suppressive microenvironment in glioblastoma and 2) understanding molecular mechanisms of medulloblastoma development and metastatic dissemination. The results of these projects have been generated for research grant applications and paper publications.

Besides two NIH grants, National Cancer Institute (NCI) R01 and the National Institute of Neurological Disorders and Stroke (NINDS) R21 grants, the Hu lab has also received a new 5-year R01 grant from NIH/NINDS. These grants have been continuously supporting the lab projects. Additionally, the research projects have also been funded and supported by the Andrew McDonough B+ Foundation, the Walter L. Copeland Foundation, the UPMC Hillman Developmental Pilot Program, and the RK Mellon Institute for Pediatric Research. Four manuscripts were published over the past year.

There were nine undergraduate students, seven medical students, one lab technician, one postdoctoral fellow, and one research scientist, who were mentored and trained. Among them, one undergraduate student was enrolled in the UPMC Children's Hospital of Pittsburgh's Summer Research Internship Program (SRIP), one undergraduate student was enrolled as

Baoli Hu, PhD

a CNUP Summer Undergraduate Research Fellow, and a postdoctoral fellow has received three grant awards, including the 2024 Walter L. Copeland Foundation Award, the UPMC Children's Hospital of Pittsburgh Research Advisory Committee (RCA) Award, and the 2025 Young Investigator Award from Alex's Lemonade Stand Foundation (ALSF).

Furthermore, along with other faculty members in the Division of Pediatric Neurosurgery, the UPMC Children's Hospital of Pittsburgh's brain tumor tissue bank continued to grow and expand.

Zhimin Huang, PhD

Assistant Professor
Director, Laboratory for NeuroControl and Monitoring

Zhimin Huang, PhD, joined the University of Pittsburgh Department of Neurological Surgery as a tenure-track assistant professor in January 2025 and leads the Laboratory for NeuroControl and Monitoring. Dr. Huang received his PhD in biochemistry and molecular biology from Shanghai Jiao Tong University in 2015. Since 2018, he has pursued postdoctoral training at both the University of Washington and Rice University.

Dr. Huang has made significant contributions to drug development and delivery, with three patents licensed to industry, and has developed several impactful tools, including:

1. Developing the first comprehensive bioinformatics resource, AlloSteric Database (ASD), for studying protein allosteric regulation,
2. Developing the rational design of MDL-800, the first-in-class allosteric activator of sirtuin-6; and
3. Developing Regionally Activated Interstitial Drugs (RAID)—a versatile technology enabling millimeter-precise and noninvasive brain therapeutics over extended periods.

Specialized Areas of Interest
Site-specific brain therapeutics, synthetic acoustic biomolecular actuators, real-time cell monitoring, therapeutic ultrasound, protein engineering, and noninvasive neuromodulation.

Professional Activities
BRAIN Initiative U24 Study Section, NIH
Invited peer review for the following journals: *Advanced Drug Delivery Reviews, Journal of Nanobiotechnology, Bioengineering & Translational Medicine, Bioinformaitcs, Computers in Biology and Medicine, Journal of Chemical Information and Modeling,* and *RSC Medicinal Chemistry*.

Education & Training
B.Eng, Biomedical Engineering, Tianjin Medical University, Tianjin, China, 2009
Visiting Graduate Student, University of Toronto, Toronto, Canada, 2014
PhD, Biochemistry and Molecular Biology, Shanghai Jiao Tong University, Shanghai, China, 2015
Senior Fellow, University of Washington, 2020
Postdoctoral Research Associate, Rice University, 2024

Honors & Awards
Foundation Faculty Starter Grant in Drug Delivery, PhRMA, 2025
Trainee Highlight Award Honorable Mention, 9th Annual BRAIN Initiative Meeting, 2023
Poster Award, International Symposium on Biomolecular Ultrasound and Sonogenetics, 2022
Excellent Graduates of Shanghai Colleges and Universities, Shanghai Municipal Education Commission, 2015

Zhimin Huang, PhD

Scholarship Award for Excellent Doctoral Student, Ministry of Education of China, 2012
National Scholarship for Graduate Student, Ministry of Education of China, 2012
Qiu Shi Graduate Student Scholarship, Qiu Shi Science and Technologies, Foundation, 2012
Excellent Oral Presentation Award, Second Session of Graduate Academic Forum, Shanghai Jiao-Tong University, 2012
First-class Scholarship for Excellent Graduate Students, Shanghai Jiao Tong University, 2011

News Media Appearances: 2024-25

"Q&A with Dr. Zhimin Huang: Engineering a Noninvasive, Targeted Approach to Treating Brain Diseases," PhRMA, June 9, 2025.

Publications: 2024-25

• Refereed Articles:

Wu K, Ge X, Duan X, Li J, Wang K, Chen Q, Huang Z, Zhang W, Wu Y, Li Q. Wip1 phosphatase activator QGC-8-52 specifically sensitizes p53-negative cancer cells to chemotherapy while protecting normal cells. *Drug Resist Updat* 79:101196, 2025.

Seo JP, Trippett JS, Huang Z, Lee S, Nouraein S, Wang RZ, Szablowski JO. Acoustically targeted measurement of transgene expression in the brain. *Sci Adv* 10(32):eadj7686, 2024.

Research Activities

At the Laboratory for NeuroControl and Monitoring, we develop noninvasive molecular tools to control and monitor endogenous processes in intact cells and tissues, aiming to deepen the understanding of brain function in both health and disease. By combining therapeutic ultrasound, protein engineering, and pharmacology, we achieve noninvasive, spatiotemporal, and molecularly precise control and monitoring of endogenous molecules in their natural environment. Dr. Huang's work aspires to establish new paradigms in neuroscience and advance therapies for brain disorders. Part of Dr. Huang's ongoing research is supported by the PhRMA Foundation Faculty Starter Grant in Drug Delivery.

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.

Specialized Areas of Interest

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

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

John H. Kanter, MD

Assistant Professor

John H. Kanter, MD, is a fellowship-trained neurosurgeon with subspecialty expertise in neurocritical care and neurotrauma. He joined the University of Pittsburgh Department of Neurological Surgery as an assistant professor in August 2025.

A native of Bradford Woods, Pa., Dr. Kanter earned his undergraduate degree from the University of Pittsburgh and his medical degree from Florida State University, where he developed a focused interest in the care of patients with traumatic brain injury and spinal cord injuries. He completed his neurosurgical residency at Dartmouth-Hitchcock Medical Center, where he also undertook enfolded fellowship training in neurocritical care. Following residency, he pursued additional fellowship training in traumatic brain injury (TBI) and spinal cord injury (SCI), and neurorehabilitation with Geoffrey Manley, MD, at the University of California San Francisco.

He brings a patient-centered, evidence-based approach to care, with a focus on precision medicine, optimizing long-term functional recovery through comprehensive coordinated care pathways, and intensive care management strategies.

In parallel with his clinical work, Dr. Kanter is an active clinician-scientist. His research aims to improve outcomes after TBI and SCI by integrating point-of-care biomarkers, advanced imaging techniques, and clinical algorithms into decision-making frameworks. He is a co-investigator on several multicenter initiatives, including TRACK-TBI and TRACK-SCI, and contributes to national collaborative efforts exploring ICU prognostication, ventilator weaning protocols, and the impact of loss to follow-up in longitudinal trauma studies. He has authored numerous peer-reviewed publications and is a frequent contributor to national meetings in neurotrauma and critical care.

Dr. Kanter is also deeply engaged in medical education and academic leadership. He serves as a mentor in the National Neurotrauma Society's TEAM Mentor-Mentee Program and is a member of the Neurocritical Care Society's Accreditation, Credentialing, and Training Committee. Through these roles, he is committed to advancing the training of future clinician-scientists and promoting high-quality systems of care for patients with life-threatening neurological injuries.

Specialized Areas of Interest
Neurocritical care; neurotrauma (traumatic brain injury and spinal cord injury); neurorehabilitation.

Hospital Privileges
UPMC Presbyterian

Professional Organization Membership
Alpha Omega Alpha Honor Society
American Association of Neurological Surgery
Congress of Neurological Surgery
Neurocritical Care Society
National Neurotrauma Society
North American Spine Society

Professional Activities
TEAM Mentor-Mentee Committee, National Neurotrauma Society
Accreditation, Credentialing, and Training Committee, Neurocritical Care Society

John H. Kanter, MD

Education & Training
BA, Anthropology, University of Pittsburgh, 2011
MD, Florida State University College of Medicine, 2016
Fellowship, CAST Neurocritical Care, Dartmouth-Hitchcock Medical Center, 2022
Residency, Neurological Surgery, Dartmouth-Hitchcock Medical Center, 2023
Fellow and Clinical Instructor, CAST Neurotrauma, University of California San Francisco, 2025

Honors & Awards
Gold Foundation Humanism and Excellence in Teaching, Geisel School of Medicine, 2022

Publications: 2024-25
• Refereed Articles:
Lui A, Bonney PA, Burke J, Kanter JH, Yue JK, Takegami N, Tarapore PE, Huang M, Mummaneni PV, Dhall SS, Hemmerle DD, Ferguson AR, Torres-Espin A, Duong-Fernandez X, Lai N, Saigal R, Pan J, Singh V, Kyritsis N, Talbott JF, Pascual LU, Huie JR, Whetstone WD, Bresnahan JC, Beattie MS, Weinstein PR, Manley GT, O'Banion LA, Kuo YH, Viljoen S, Grandhi R, Shammassian BH, DiGiorgio AM. The correlation of neurosurgery motor examinations with ISNCSCI motor examinations in patients with spinal cord injury: a multicenter TRACK-SCI study. *J Neurosurg Spine* 42(1):120-128, 2025.

Yue JK, Kanter JH, Barber JK, Huang MC, van Essen TA, Elguindy MM, Foreman B, Korley FK, Belton PJ, Pisică D, Lee YM, Kitagawa RS, Vassar MJ, Sun X, Satris GG, Wong JC, Ferguson AR, Huie JR, Wang KKW, Deng H, Wang VY, Bodien YG, Taylor SR, Madhok DY, McCrea MA, Ngwenya LB, DiGiorgio AM, Tarapore PE, Stein MB, Puccio AM, Giacino JT, Diaz-Arrastia R, Lingsma HF, Mukherjee P, Yuh EL, Robertson CS, Menon DK, Maas AIR, Markowitz AJ, Jain S, Okonkwo DO, Temkin NR, Manley GT. Clinical profile of patients with acute traumatic brain injury undergoing cranial surgery in the United States: report from the 18-centre TRACK-TBI cohort study. *Lancet Reg Health Am* 39:100915, 2024.

Yue JK, Lee YM, Sun X, van Essen TA, Elguindy MM, Belton PJ, Pisică D, Mikolic A, Deng H, Kanter JH, McCrea MA, Bodien YG, Satris GG, Wong JC, Ambati VS, Grandhi R, Puccio AM, Mukherjee P, Valadka AB, Tarapore PE, Huang MC, DiGiorgio AM, Markowitz AJ, Yuh EL, Okonkwo DO, Steyerberg EW, Lingsma HF, Menon DK, Maas AIR, Jain S, Manley GT. Performance of the IMPACT and CRASH prognostic models for traumatic brain injury in a contemporary multicenter cohort: a TRACK-TBI study. *J Neurosurg* 141(2):417-429, 2024.

Jones VM, Kanter JH, Russo GA, Simmons NE, Tafe LJ, Zanazzi GJ. A Pineal Parenchymal Tumor of Intermediate Differentiation in an Octogenarian Contains a Rare KBTBD4 Insertion. *Int J Surg Pathol* 32(5):962-969, 2024.

Research Activities
Throughout the 2024–25 academic year, Dr. Kanter led and contributed to several research initiatives focused on neurotrauma, critical care, and advanced neuromonitoring. His work included a scoping review of dynamic ICP, and multi-institutional studies through the TRACK-TBI and SCI network. Dr. Kanter will continue to bridge neurosurgery and critical care, advancing outcomes research and precision diagnostics in neurotrauma.

David L. Kaufmann, MD

Clinical Assistant Professor

David L. Kaufmann, MD, is clinical assistant professor of neurological surgery at the University of Pittsburgh School of Medicine. He has an interest in both cranial and spinal neurosurgery and has practiced at UPMC Mercy since 2000 where he served as the chief of neurosurgery from 2014-23. His practice has an emphasis on the treatment of degenerative disorders of the spine and neurotrauma. 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 and completed a general surgery internship at the Johns Hopkins Hospital in Baltimore. He performed his neurosurgical residency at the Albert Einstein College of Medicine at Montefiore Medical Center and the Hyman-Newman Institute for Neurology and Neurosurgery at Beth Israel Medical Center in New York. He is board certified in neurological surgery.

Dr. Kaufmann is a member of the American Association of Neurological Surgeons and the Congress of Neurological Surgeons.

Specialized Areas of Interest
Spinal decompression and fusion surgery; complex spine surgery; brain and spine trauma; brain tumors; neurosurgical treatment of pain.

Board Certifications
American Board of Neurological Surgeons

Hospital Privileges
UPMC Mercy

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

Education & Training
BA, Philosophy, Emory University, 1989
MA Candidate, Philosophy, Columbia University, 1990
MD, Albert Einstein College of Medicine, 1994
Internship, Johns Hopkins Hospital, 1995
Residency, Albert Einstein College of Medicine, Montefiore Medical Center and Beth Israel Medical Center, 2000

Gary Kohanbash, PhD

Associate 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.

Gary Kohanbash, PhD

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
Society for Immunotherapy of Cancer
Society for Neuro-Oncology
World Molecular Imaging Society

Professional Activities
Faculty Assembly Member, University of Pittsburgh
Senate Library Committee, University of Pittsburgh
Senate Member, University of Pittsburgh
Scientific Committee Member, Childhood Brain Tumor Tissue Consortium
Study Section, St. Baldrick's Foundation Fellowship
Study Section, American Brain Tumor Association
Study Section, NIH

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

Honors & 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 (TRCCC), 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 (TRCCC), 2009

News Media Appearances: 2024-25
"Pittsburgh researchers make breakthrough in T-cell cancer therapy, offering hope for young patients," WTAE-TV, March 28, 2025
"Classifying childhood brain cancers by immune response may improve diagnostics and treatments," *Science Daily*, March 19, 2025

Gary Kohanbash, PhD

Publications: 2024-25

• Refereed Articles:

Birikorang PA, Menendez DM, Edinger R, Kohanbash G, Edwards WB. Developing and Characterizing the Tumor-Targeting Efficiency of an Anti-EphA2-CD11b Bispecific Antibody. *Bioconjug Chem* 36(6):1208-1217, 2025.

Xiong Z, Sneiderman CT, Kuminkoski CR, Reinheimer J, Schwegman L, Sever RE, Habib A, Hu B, Agnihotri S, Rajasundaram D, Zinn PO, Forsthuber TG, Pollack IF, Li X, Raphael I, Kohanbash G. Transcript-targeted antigen mapping reveals the potential of POSTN splicing junction epitopes in glioblastoma immunotherapy. *Genes Immun* 26(3):190-199, 2025.

Kohanbash G, Frederico SC, Raphael I. NK cells link immune-checkpoint blockade immunotherapy and response in melanoma brain metastases. *J Immunother Cancer* 13(3):e011581, 2025.

Raphael I, Xiong Z, Sneiderman CT, Raphael RA, Mash M, Schwegman L, Jackson SA, O'Brien C, Anderson KJ, Sever RE, Hendrikse LD, Vincze SR, Diaz A, Felker J, Nazarian J, Nechemia-Arbely Y, Hu B, Kammula US, Agnihotri S, Rich JN, Broniscer A, Drappatz J, Abel TJ, Uttam S, Hwang EI, Pearce TM, Taylor MD, Nisnboym M, Forsthuber TG, Pollack IF, Chikina M, Rajasundaram D, Kohanbash G. The T cell receptor landscape of childhood brain tumors. *Sci Transl Med* 17(790):eadp0675, 2025.

Cottrell TR, Lotze MT, Ali A, Bifulco CB, Capitini CM, Chow LQM, Cillo AR, Collyar D, Cope L, Deutsch JS, Dubrovsky G, Gnjatic S, Goh D, Halabi S, Kohanbash G, Maecker HT, Maleki Vareki S, Mullin S, Seliger B, Taube J, Vos W, Yeong J, Anderson KG, Bruno TC, Chiuzan C, Diaz-Padilla I, Garrett-Mayer E, Glitza Oliva IC, Grandi P, Hill EG, Hobbs BP, Najjar YG, Pettit Nassi P, Simons VH, Subudhi SK, Sullivan RJ, Takimoto CH. Society for Immunotherapy of Cancer (SITC) consensus statement on essential biomarkers for immunotherapy clinical protocols. *J Immunother Cance*r 13(3):e010928, 2025.

Rani A, Raikwar SP, Yoo W, Ahmad S, Vagni VA, Janesko-Feldman KL, Carlson SW, Eberle A, Miller M, Helm J, Catapano J, Zusman BE, Desai S, Javelosa RAM, Afework S, McNally EA, Kohanbash G, Rajasundaram D, Waters MF, Ducruet A, Jadhav A, Kumar A, Phuah CL, Kochanek PM, Jha RM. Sexually Dimorphic Responses Reveal Multifaceted Benefits of Glibenclamide in Traumatic Brain Injury. *J Neurotrauma* [Online ahead of print], 2025.

Reyes-González JM, Rajkumar H, Lee W, Baidoo KE, Edinger RS, Diehl G, Nambiar D, Okada R, Edmondson EF, Fayn S, Buckley J, Jaswal AP, Cortez AG, Marsh IR, Josefsson A, Kohanbash G, Nedrow JR, Anderson CJ, Escorcia FE, Nguyen R, Patel RB. Evaluation of VLA-4 (Integrin α4β1) as a Shared Target for Radiopharmaceutical Therapy across Solid Tumors. *Mol Cancer Ther* 24(6):896-906, 2025.

Nisnboym M, Sneiderman CT, Jaswal AP, Xiong Z, Vincze SR, Sever RE, Zou H, Frederico SC, Agnihotri S, Hu B, Drappatz J, Pollack IF, Kohanbash G, Raphael I. Assessment of anti-CD69 antibody therapy alone or in combination with anti-PD-1 in murine GBM. *Expert Rev Clin Immunol* 21(2):239-247, 2025.

Sever RE, Rosenblum LT, Stanley KC, Cortez AG, Menendez DM, Chagantipati B, Nedrow JR, Edwards WB, Malek MM, Kohanbash G. Detection properties of indium-111 and IRDye800CW for intraoperative molecular imaging use across tissue phantom models. *J Biomed Opt* 30(Suppl 1):S13705, 2025.

Gary Kohanbash, PhD

Xiong Z, Walsh KM, Sneiderman CT, Nisnboym M, Hadjipanayis CG, Agnihotri S, Eagar TN, Wang H, Pollack IF, Forsthuber TG, Li X, Raphael I, Kohanbash G. Immuno-epidemiologic mapping of HLA diversity across glioma patient cohorts. *Neuro Oncol* [Online ahead of print], 2025.

Schlegel BT, Morikone M, Mu F, Tang WY, Kohanbash G, Rajasundaram D. bcRflow: a Nextflow pipeline for characterizing B cell receptor repertoires from non-targeted transcriptomic data. *NAR Genom Bioinform* 6(4):lqae137, 2024.

Nader NE, Frederico SC, Miller T, Huq S, Zhang X, Kohanbash G, Hadjipanayis CG. Barriers to T Cell Functionality in the Glioblastoma Microenvironment. *Cancers* (Basel) 16(19):3273, 2024.

Rosenblum LT, Sever RE, Gilbert R, Guerrero D, Vincze SR, Menendez DM, Birikorang PA, Rodgers MR, Jaswal AP, Vanover AC, Latoche JD, Cortez AG, Day KE, Foley LM, Sneiderman CT, Raphael I, Hitchens TK, Nedrow JR, Kohanbash G, Edwards WB, Malek MM. Dual-labeled anti-GD2 targeted probe for intraoperative molecular imaging of neuroblastoma. *J Transl Med* 22(1):940, 2024.

Frederico SC, Raphael I, Nisnboym M, Huq S, Schlegel BT, Sneiderman CT, Jackson SA, Jain A, Olin MR, Rood BR, Pollack IF, Hwang EI, Rajasundaram D, Kohanbash G. Transcriptomic observations of intra and extracellular immunotherapy targets for pediatric brain tumors. *Expert Rev Clin Immunol* 20(11):1411-1420, 2024.

Jha RM, Rajasundaram D, Sneiderman C, Schlegel BT, O'Brien C, Xiong Z, Janesko-Feldman K, Trivedi R, Vagni V, Zusman BE, Catapano JS, Eberle A, Desai SM, Jadhav AP, Mihaljevic S, Miller M, Raikwar S, Rani A, Rulney J, Shahjouie S, Raphael I, Kumar A, Phuah CL, Winkler EA, Simon DW, Kochanek PM, Kohanbash G. A single-cell atlas deconstructs heterogeneity across multiple models in murine traumatic brain injury and identifies novel cell-specific targets. *Neuron* 112(18):3069-3088.e4, 2024.

Research Activities

Dr. Kohanbash's Pediatric Neurosurgery ImmunoOncology Laboratory (PNIO) continues to expand and is excited to report on our multiple high impact publication this past year focused on improving outcomes for adults and children with primary brain tumors.

Michael J. Lang, MD

Assistant Professor
Director of Cerebrovascular Neurosurgery

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. Director of the department's cerebrovasular neurosurgery program, Dr. Lang 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.

Michael J. Lang, MD

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

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

Publications: 2024-25
• Refereed Articles:
Salah WK, Baker C, Scoville JP, Hunsaker JC, Ogilvy CS, Moore JM, Riina HA, Levy EI, Spiotta AM, Jankowitz BT, Michael Cawley C 3rd, Khalessi AA, Tanweer O, Hanel R, Gross BA, Kuybu O, Hoang AN, Baig AA, Khorasanizadeh MH, Mendez AA, Cortez G, Davies JM, Narayanan S, Howard BM, Lang MJ, Siddiqui AH, Thomas A, Kan P, Burkhardt JK, Salem MM, Grandhi R. Middle meningeal artery embolization as a perioperative adjunct to surgical evacuation of nonacute subdural hematomas: An multicenter analysis of safety and efficacy. *Interv Neuroradiol* 31(3):333-338, 2025.

Mohammaden MH, Martins PN, Aboul-Nour H, Al-Bayati AR, Hassan AE, Tekle W, Fifi JT, Majidi S, Kuybu O, Gross BA, Lang M, Cortez GM, Hanel RA, Aghaebrahim A, Sauvageau E, Tarek MA, Farooqui M, Ortega-Gutierrez S, Zevallos CB, Galecio-Castillo M, Sheth SA, Nahhas M, Salazar-Marioni S, Nguyen TN, Abdalkader M, Klein P, Hafeez M, Kan P, Tanweer O, Khaldi A, Li H, Jumaa M, Zaidi SF, Oliver M, Salem MM, Burkhardt JK, Pukenas B, Vigilante N, Penckofer M, Siegler JE, Peng S, Alaraj A, Grossberg JA, Nogueira R, Haussen DC. Balloon-mounted versus self-expandable stent in failed neurothrombectomy: a post hoc analysis of the SAINT study. *J Neurointerv Surg* 17(e2):e295-e302, 2025.

Michael J. Lang, MD

Hoz SS, Ma L, Agarwal P, Jacobs RC, Al-Bayati AR, Nogueira RG, Zenonos GA, Gardner PA, Friedlander RM, Lang MJ, Gross BA. Clinical comparison of flow diversion and microsurgery for retreatment of intracranial aneurysms. *J Clin Neurosci* 136:111296, 2025.

Sioutas GS, Salem MM, Kuybu O, Salih M, Khalife J, Carroll K, Duckworth EA, Vaishnav D, Essibayi MA, Hoang AN, Baker CM, Mendez Ruiz AA, Abecassis Z, Salah WK, Ruiz Rodriguez JF, Charcos I, Cortez GM, Narayanan S, Haim O, Tanweer O, Hanel R, Kan P, Tonetti DA, Nogueira RG, Jovin TG, Altschul DJ, Lang MJ, Srinivasan VM, Jankowitz BT, Thomas AJ, Levitt MR, Ogilvy CS, Gross BA, Burkhardt JK, Grandhi R. Order and Timing of Middle Meningeal Artery Embolization as a Perioperative Adjunct to Surgical Evacuation for Chronic Subdural Hematomas: A Multicenter Study. *Radiology* 315(1):e241571, 2025.

Ma L, Hoz SS, Doheim MF, Fadhil A, Sultany A, Al-Bayati AR, Nogueira RG, Lang MJ, Gross BA. Middle Meningeal Artery Embolization for "Trial-Ineligible" Chronic Subdural Hematomas. *Neurosurgery* 96(3):600-610, 2025.

Bhatia S, Nouduri ST, Sankar A, Kann MR, Hardi A, Hudson JS, Al-Bayati AR, Nogueira RG, Lang MJ, Gross BA. Endovascular thrombectomy for acute ischemic stroke with primary occlusion of the anterior cerebral artery: a meta-analysis. *J Stroke Cerebrovasc Dis* 34(2):108208, 2025.

Nguyen TN, Dabus G, McGuinness B, Caldwell J, Priest R, Rai A, Zaidat OO, Gross BA, Hanel RA, Lee SSH, Hussain MS, Shaikh H, Abdalkader M, Budzik RF, Kilburg C, Woodward BK, Colasurdo M, Liu J, Yoo AJ, Khandelwal P, Boo S, Vu P, Lin E, AlMajali M, Singh J, Al-Bayati AR, Lang MJ, Abraham MG, Hassan AE, Pema P, Martin CO, Grandhi R, Tonetti DA, Hixson HR, Aghaebrahim A, Sauvageau E, Ortega-Gutierrez S, Yavagal DR, Cheng-Ching E, Khalife J, Linfante I, Vulkanov V, Soomro JH, Fifi JT, Maidan L, Copelan AZ, Schirmer CM, Bain M, Toth G, Jayaraman MV, Novakovic-White R, Satti SR, Villelli N, Jabbour PM, Page M, Mcallister DJ, Araujo Contreras R, Samaniego EA, Liebeskind DS, Hetts SW, Nogueira RG, English J, Puri AS. SUMMIT MAX: A randomized trial of the super large bore HiPoint Reperfusion System versus Vecta System for aspiration thrombectomy. *Stroke* [Online ahead of print], 2025

Gajjar AA, Salem MM, Sioutas GS, Jabarkheel R, Kuybu O, Khalife J, Tonetti DA, Cortez G, Dmytriw AA, Ortega Moreno DA, Smith W, Regenhardt RW, Carroll KT, Abecassis ZA, Ruiz Rodriguez JF, Shekhtman O, Hoang AN, Khalessi AA, Baker C, Matejka M, Cancelliere NM, Griessenauer CJ, Grandhi R, Kan P, Tanweer O, Levitt MR, Stapleton CJ, Pereira VM, Jankowitz B, Riina HA, Patel AB, Hanel R, Thomas AJ, Lang MJ, Gross BA, Burkhardt JK, Srinivasan VM. International multi-center study of middle meningeal artery embolization for chronic subdural hematoma in cancer patients: Efficacy, safety, and outcomes in a high-risk population. *Interv Neuroradiol* [Online ahead of print], 2025.

Gomez-Paz S, Salem MM, Baker C, Kuybu O, Sioutas GS, Carroll KT, Salih M, Dmytriw AA, Khalife J, Smith W, Moreno DAO, Regenhardt RW, Cancelliere NM, Spiotta AM, Tanweer O, Stapleton CJ, Lang M, Pereira VM, Patel AB, Siddiqui AH, Levy EI, Ogilvy CS, Tonetti D, Thomas AJ, Srinivasan VM, Jankowitz BT, Levitt MR, Gross BA, Burkhardt JK, Grandhi R. Effect of race on procedural and clinical outcomes in middle meningeal artery embolization for primary and adjunctive treatment of chronic subdural hematoma. *Interv Neuroradiol* [Online ahead of print], 2025.

Patel PD, Salwi S, Sioutas G, Filo J, Doheim MF, Diamond A, Salem M, Ma L, Hoz SS, Sultany A, Nogueira RG, Al-Bayati AR, Lang MJ, Gooch MR, Tjoumakaris S, Ogilvy CS, Rosenwasser RH, Burkhardt JK, Jabbour P, Srinivasan VM. Particles, Liquids, and Antiplatelets: Restarting Antiplatelets on Postintervention Day 3 or Later is Associated with Improved Outcomes After Particle Embolization. *Neurosurgery* [Online ahead of print], 2025.

Michael J. Lang, MD

Ma L, Ganesh A, Al-Bayati AR, Nogueira RG, Lang MJ, Gross BA. The Transradial Approach for Endovascular Treatment of Vasospasm. *Oper Neurosurg* (Hagerstown) [Online ahead of print], 2025.

Ma L, Hoz SS, Doheim MF, Fadhill A, Sultany A, Al-Bayati AR, Nogueira RG, Lang MJ, Gross BA. Non-opacification of frontal and parietal branches after MMA embolization: A radiographic benchmark. *World Neurosurg* 192:e513-e522, 2024.

Ma L, Hoz SS, Doheim MF, Fadhil A, Sultany A, Al-Bayati AR, Nogueira RG, Lang MJ, Gross BA. Impact of Embolisate Penetration, Type, and Technique on Results After Standalone Middle Meningeal Artery Embolization for Chronic Subdural Hematoma. *Neurosurgery* 95(6):1395-1406, 2024.

Hendrix P, Koul P, Noto A, Li J, Schirmer CM, Lang MJ, Al-Bayati AR, Nogueira RG, Gross BA. Admission hyperglycemia effect on symptomatic intracranial hemorrhage in tenecteplase versus alteplase before large vessel occlusion stroke thrombectomy. *J Neurol* 271(12):7605-7612, 2024.

Chen H, Salem MM, Colasurdo M, Sioutas GS, Khalife J, Kuybu O, Carroll KT, Hoang AN, Baig AA, Salih M, Khorasanizadeh M, Baker C, Mendez Ruiz A, Cortez GM, Abecassis Z, Ruiz Rodríguez JF, Davies JM, Narayanan S, Cawley CM, Riina H, Moore J, Spiotta AM, Khalessi A, Howard BM, Hanel RA, Tanweer O, Tonetti D, Siddiqui AH, Lang M, Levy EI, Jovin TG, Grandhi R, Srinivasan VM, Levitt MR, Ogilvy CS, Jankowitz B, Thomas AJ, Gross BA, Burkhardt JK, Kan P. Standalone middle meningeal artery embolization versus middle meningeal artery embolization with concurrent surgical evacuation for chronic subdural hematomas: a multicenter propensity score matched analysis of clinical and radiographic outcomes. *J Neurointerv Surg* 16(12):1313-1319, 2024.

Ma L, Hoz SS, Al-Bayati AR, Nogueira RG, Lang MJ, Gross BA. Improved outcomes among octogenarians with ruptured aneurysms: endovascular treatment as right-of-first-refusal in the 2nd post-trial decade. *World Neurosurg* 190:e883-e890, 2024.

Ma L, Hoz SS, Al-Bayati AR, Nogueira RG, Lang MJ, Gross BA. Sustained efficacy of angioplasty for cerebral vasospasm after aneurysmal subarachnoid hemorrhage: Risk features and device comparison. *J Clin Neurosci* 128:110784, 2024.

Hudson JS, Nowicki KW, Lucke-Wold B, Gersey ZC, Dodd WS, Alattar A, McCarthy DJ, Agarwal P, Mehdi Z, Lang MJ, Hasan DM, Hoh BL, Gross BA. Clopidogrel Is Associated with Reduced Likelihood of Aneurysmal Subarachnoid Hemorrhage: a Multi-Center Matched Retrospective Analysis. *Transl Stroke Res* 15(5):936-940, 2024.

Hoz SS, Ma L, Muthana A, Al-Zaidy MF, Ahmed FO, Ismail M, Jacobs RC, Agarwal P, Al-Bayati AR, Nogueira RG, Lang MJ, Gross BA. Cranial nerve palsies and intracranial aneurysms: A narrative review of patterns and outcomes. *Surg Neurol Int* 15:277, 2024.

Hendrix P, Gross BA, Allahdadian S, Sioutas GS, Koul P, Tarbay AC, Lang MJ, Srinivasan VM, Al-Bayati AR, Li J, Noto A, Nogueira RG, Burkhardt JK, Zand R, Schirmer CM. Tenecteplase versus alteplase before stroke thrombectomy: outcomes after system-wide transitions in Pennsylvania. *J Neurol* 271(8):5637-5641, 2024.

Hoz SS, Hudson JS, Ma L, Lang MJ, Gross BA. Medications and "Risk" of Aneurysm Rupture Based on Presentation: Setting the Record Straight. *World Neurosurg* 188:e573-e577, 2024.

Michael J. Lang, MD

Ma L, Nail TJ, Hoz SS, Puccio AM, Lang MJ, Okonkwo DO, Gross BA. Traumatic Cerebral Venous Sinus Thrombosis: Management and Outcomes. *World Neurosurg* 187:e949-e962, 2024.

Ma L, Hoz SS, Grossberg JA, Lang MJ, Gross BA. Developmental Venous Anomalies. *Neurosurg Clin N Am* 35(3):355-361, 2024.

Salem MM, Helal A, Gajjar AA, Sioutas GS, Khalife J, Kuybu O, Caroll K, Nguyen Hoang A, Baig AA, Salih M, Baker C, Cortez G, Abecassis Z, Ruiz Rodriguez JF, Davies JM, Cawley CM, Riina HA, Spiotta AM, Khalessi AA, Howard BM, Hanel R, Tanweer O, Tonetti DA, Siddiqui AH, Lang MJ, Levy EI, Ogilvy CS, Srinivasan VM, Kan P, Gross BA, Jankowitz BT, Levitt MR, Thomas AJ, Grandhi R, Burkhardt JK. Embolic Materials' Comparison in Meningeal Artery Embolization for Chronic Subdural Hematomas: Multicenter Propensity Score-Matched Analysis of 1070 Cases. *Neurosurgery* [Online ahead of print], 2024.

Hendrix P, Koul P, Noto A, Li J, Schirmer CM, Lang MJ, Al-Bayati AR, Nogueira RG, Gross BA. Admission hyperglycemia effect on symptomatic intracranial hemorrhage in tenecteplase versus alteplase before large vessel occlusion stroke thrombectomy. *J Neurol* [Online ahead of print], 2024.

Salem MM, Sioutas GS, Gajjar A, Khalife J, Kuybu O, Carroll KT, Hoang AN, Baig AA, Salih M, Baker C, Cortez GM, Abecassis Z, Ruiz Rodriguez JF, Davies JM, Cawley CM, Riina H, Spiotta AM, Khalessi A, Howard BM, Hanel RA, Tanweer O, Tonetti D, Siddiqui AH, Lang M, Levy EI, Ogilvy CS, Srinivasan VM, Kan P, Gross BA, Jankowitz B, Levitt MR, Thomas AJ, Grandhi R, Burkhardt JK. Femoral versus radial access for middle meningeal artery embolization for chronic subdural hematomas: multicenter propensity score matched study. *J Neurointerv Surg* [Online ahead of print], 2024.

Benjamin B. Lee, MD, PhD

Clinical Assistant Professor

Benjamin Lee, MD, PhD, joined the University of Pittsburgh Center of Clinical Neurophysiology in August 2023. He specializes in intraoperative neurophysiological monitoring to adult and pediatric neurosurgical, orthopedic, ENT, vascular and interventional neuroradiology procedures, microelectrode recording and subcortical mapping for deep brain stimulation (DBS) electrode implantation, as well as motor and language mapping during awake craniotomy procedures.

Dr. Lee competed his adult neurology residency at SUNY Downstate Health Sciences University in Brooklyn, NY. Then completed a fellowship in clinical neurophysiology and epilepsy at the Massachusetts General Hospital in Boston, Mass.

Specialized Areas of Interest
Intraoperative neurophysiological monitoring; subcortical mapping with microelectrode recording.

Board Certifications
American Board of Psychiatry and Neurology

Hospital Privileges
JC Blair Memorial Hospital
Excela Health Hospital System
Indiana Regional Medical Center
Monongahela Valley Hospital
Trinity Health System

Benjamin B. Lee, MD, PhD

UPMC Altoona
UPMC Bedford
UPMC Children's Hospital of Pittsburgh
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
American Epilepsy Society

Education & Training
MD, PhD, SUNY Downstate Health Sciences University, 2017
Residency, Adult Neurology, SUNY Downstate Health Sciences University, 2021
Fellowship, Clinical Neurophysiology and Epilepsy, Massachusetts General Hospital, 2023

L. Dade Lunsford, MD

Lars Leksell & Distinguished Professor
Director Emeritus, Center for Image-Guided Neurosurgery

L. Dade Lunsford, MD, is the Lars Leksell Professor and Distinguished Professor at the University of Pittsburgh Department of Neurological Surgery. He is also director emeritus of the UPMC Center for Image-Guided Neurosurgery, and prior residency director and chair of the department. He is an internationally recognized authority on stereotactic surgery, radiosurgery, and minimally invasive surgery.

In 1981 Dr. Lunsford arranged installation of a dedicated CT scanner in a new state of the art stereotactic operating room, merging surgery with imaging for the first time. More than 10,000 patients have undergone various image-guided surgical procedures since that time.

In 1987, Dr. Lunsford was responsible for installing the Gamma Knife to the University of Pittsburgh Medical Center, the fifth unit ever built. This medical center was the first in the United States to offer this state-of-the-art, minimally invasive form of brain surgery. Since that time, more than 19,500 patients have undergone brain stereotactic radiosurgery using one of the continuously updated seven versions of the Gamma Knife. He and his team have trained more than 2,800 surgeons, oncologists, and physicists in the field of radiosurgery via training courses conducted six times per year.

L. Dade Lunsford, MD

Dr. Lunsford graduated from the University of Virginia in 1970 and then 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, MD. 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. For 16 years Dr. Lunsford chaired the UPMC Health System Technology and Innovative Practice (TIPAC) committee. He arranged for installation of the UPMC magnetoencephalography device 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 17 books.

Dr. Lunsford served as department chairman of the University of Pittsburgh Department of Neurological Surgery for ten years, before stepping down in July of 2006 to devote more time to his clinical work, clinical investigation, and resident and fellow training. He also served as the department residency program director from 1987 until 2020.

Since 2012, he has served as a team physician (neurosurgeon) for the National Hockey League's Pittsburgh Penguins. Prior to that he served as the Neurosurgical Team Physician for Pitt football.

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—considered 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, he delivered the inaugural Dan Leksell Lecture at the fourth meeting of the International Radiosurgery Research Foundation. In 2021, Dr. Lunsford received the Andrew Parsa award for mentorship from the AANS-CNS Section on Tumors and delivered the annual Ronald Bittner Lecture. In May 2022 he delivered the inaugural Lunsford Radiosurgery Lecture at the Miami Baptist Cancer Institute. In 2024, Dr. Lunsford received the Congress of Neurological Surgery Founders Award for his educational contributions to the field of neurosurgery.

Since 2002, Dr. Lunsford has been a Castle Connolly Top Doctor and recently retired from their Board of Medical Advisors.

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

L. Dade Lunsford, MD

Hospital Privileges
UPMC Presbyterian
UPMC Shadyside
UPMC St. Margaret (Consulting)

Professional Organization Membership
AANS/CNS Joint Section for Stereotactic and Functional Neurosurgery (chair, 1995-97)
Allegheny County Medical Society
American Academy of Neurological Surgery
American Association of Neurological Surgeons, Fellow
American College of Surgeons, Fellow
American Society for Stereotactic and Functional Neurosurgery (president, 1995-97)
Congress of Neurological Surgeons
Florida Medical Association
International Radiosurgery Research Foundation, (founding chair)
International Stereotactic Radiosurgery Society, (co-founder and president, 1991-1993)
North American Skull Base Society
Pennsylvania Medical Society
Pennsylvania Neurosurgical Society

Professional Activities
Course Co-Director, Principles and Practices of Gamma Knife Radiosurgery, UPMC
Team Co-Neurosurgeon, Pittsburgh Penguins, National Hockey League
Chair, Data Safety Monitoring Board, Insightec
Consultant, Teladoc, Inc.

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

Honors & Awards
Castle Connolly Top Doctors in America, 2012-25
Inaugural Lunsford Radiosurgery Lecture, Miami Baptist Cancer Institute, 2022
Andy T. Parsa Mentorship Award, AANS/CNS Section on Tumors, 2021
Ronald L. Bittner Lecturer, AANS/CNS Section on Tumors, 2021
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., 2005-16
Best Doctors in America, 2005-16
Top Doctor, *The Global Directory of Who's Who*, Neurological Surgery, 2013-16
Best Doctors in America database, 2010-16
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

L. Dade Lunsford, MD

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
Who's Who in the World, 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: 2024-25

• Book Chapters:

Lunsford, LD, Faramand, A, Kano, H, Flickinger, JC, Niranjan, AJ. Radiosurgery principles for AVM management: Techniques, goals, and outcomes. In: *Intracranial Arteriovenous Malformations: Essentials for Patients and Practitioners*, Stieg, PE, Khalessi, AA, Apuzzo, MLJ (eds), pp 146-153, Elsevier, 2024.

• Refereed Articles:

Yurtluk MD, Bin-Alamer O, Flickinger JC, Hadjipanayis CG, Niranjan A, Lunsford LD. Multistaged Stereotactic Radiosurgery for Complex Large Lobar Arteriovenous Malformations: A Case Series. *Neurosurgery* 96(1):223-232, 2025.

Daza-Ovalle A, Bin-Alamer O, Wei Z, Abou-Al-Shaar H, Hadjipanayis CG, Gardner P, Niranjan A, Lunsford LD. Long-Term Outcomes of Jugular Paragangliomas Undergoing Gamma Knife Radiosurgery: A Single Center Experience. *Neurosurgery* [Epub ahead of print], 2025.

Tripathi M, Sheehan JP, Niranjan A, Ren L, Pikis S, Lunsford LD, Peker S, Samanci Y, Langlois AM, Mathieu D, Lee CC, Yang HC, Deng H, Rai A, Kumar N, Sahu JK, Sankhyan N, Deora H. Gamma Knife Radiosurgery for Hypothalamic Hamartoma: A Multi-Institutional Retrospective Study on Safety, Efficacy, and Complication Profile. *Neurosurgery* 96(2):426-437, 2025.

Düzkalir AH, Samanci Y, Nabeel AM, Reda WA, Tawadros SR, Abdelkarim K, El-Shehaby AMN, Emad RM, Martínez Moreno N, Martínez Álvarez R, Mathieu D, Niranjan A, Lunsford LD, Wei Z, Shanahan RM, Liscak R, May J, Dono A, Blanco AI, Esquenazi Y, Dayawansa S, Sheehan J, Tripathi M, Shepard MJ, Wegner RE, Upadhyay R, Palmer JD, Peker S. Pleomorphic Xanthoastrocytoma: Multi-Institutional Evaluation of Stereotactic Radiosurgery. *Neurosurgery* 96(2):416-425, 2025.

Hallak H, Mantziaris G, Pikis S, Islim AI, Peker S, Samanci Y, Nabeel AM, Reda WA, Tawadros SR, El-Shehaby AMN, Abdelkarim K, Emad RM, Mathieu D, Lee CC, Liscak R, Alvarez RM, Kondziolka D, Tripathi M, Speckter H, Bowden GN, Benveniste RJ, Lunsford LD, Jenkinson MD, Sheehan J. A retrospective comparison of active surveillance to stereotactic radiosurgery for the management of elderly patients with an incidental meningioma. *Acta Neurochir* (Wien) 167(1):37, 2025.

Sitaraman S, Pahwa B, Lunsford LD, Rao V. Significance, applications, and contributions of Gamma Knife radiosurgery in advancing neurosurgical care in lower-middle-income countries: a systematic review. *Neurosurg Focus* 58(3):E9, 2025.

L. Dade Lunsford, MD

Mansouri A, Ozair A, Bhanja D, Wilding H, Mashiach E, Haque W, Mikolajewicz N, de Macedo Filho L, Mahase SS, Machtay M, Metellus P, Dhermain F, Sheehan J, Kondziolka D, Lunsford LD, Niranjan A, Minniti G, Li J, Kalkanis SN, Wen PY, Kotecha R, McDermott MW, Bettegowda C, Woodworth GF, Brown PD, Sahgal A, Ahluwalia MS. Stereotactic radiosurgery for patients with brain metastases: current principles, expanding indications and opportunities for multidisciplinary care. *Nat Rev Clin Oncol* [Epub ahead of print], 2025.

Wei Z, Jose S, Abou-Al-Shaar H, Deng H, Luy D, Kondziolka D, Niranjan A, Lunsford LD. Intracerebral and pituitary metastatic eccrine carcinoma: prolonged survival using stereotactic radiosurgery. *Br J Neurosurg* 39(2):240-245, 2025.

Langlois AM, Iorio-Morin C, Kallos J, Niranjan A, Lunsford LD, Peker S, Samanci Y, Park DJ, Barnett GH, Liscak R, Simonova G, Pikis S, Mantziaris G, Sheehan J, Lee CC, Yang HC, Bowden GN, Mathieu D. Stereotactic Radiosurgery for World Health Organization Grade 2 and 3 Oligodendroglioma: An International Multicenter Study. *Neurosurgery* 96(4):870-880, 2025.

Perron R, Iorio-Morin C, Chytka T, Simonova G, Chiang V, Singh C, Niranjan A, Wei Z, Lunsford LD, Peker S, Samanci Y, Peterson J, Ross R, Rusthoven CG, Lee CC, Yang HC, Yener U, Sheehan J, Kondziolka D, Mathieu D. International multicenter study of stereotactic radiosurgery for bladder cancer brain metastases. *J Neurooncol* [Epub ahead of print], 2025.

Singh R, Dayawansa S, Pham D, Mantziaris G, Peker S, Samanci Y, Duzkalir AH, Mathieu D, Langlois AM, Egnot ML, Warnick RE, Speckter H, Lazo E, Mendez L, Blanco AI, Amsbaugh MJ, Liu C, Becerril-Gaitan A, Esquenazi Y, Chen CJ, Zaki P, Liang Y, Wegner R, Tripathi M, Wei Z, Jajoo SA, Niranjan A, Lunsford LD, Palmer JD, Sheehan JP. Dosimetric predictors of toxicity for brainstem metastases and AVMs treated with stereotactic radiosurgery: An international, multi-institutional analysis. *Radiother Oncol* 206:110795, 2025.

Reyes JS, Lohia VN, Almeida T, Niranjan A, Lunsford LD, Hadjipanayis CG. Artificial intelligence in neurosurgery: a systematic review of applications, model comparisons, and ethical implications. *Neurosurg Rev* 48(1):455, 2025.

Abou-Al-Shaar H, Albalkhi I, Shariff RK, Mallela AN, Fazeli PK, Tos SM, Mantziaris G, Meng Y, Bernstein K, Kaisman-Elbaz T, Abofani H, Lin YY, Lee CC, Tripathi M, Upadhyay R, Palmer JD, Nabeel AM, Reda WA, Tawadros SR, Abdelkarim K, El-Shehaby AMN, Emad RM, Peker S, Samanci Y, Wegner RE, Shepard MJ, Liscak R, Simonova G, Almeida T, Benjamin C, Kondziolka D, Sheehan JP, Niranjan A, Hadjipanayis CG, Lunsford LD. Outcomes of stereotactic radiosurgery for pituitary metastases: an international multi-institutional study. *Pituitary* 28(3):69, 2025.

Donohue JK, Wei Z, Deng H, Niranjan A, Lunsford LD. Management of sarcomatoid Malignant pleural mesothelioma brain metastases with stereotactic radiosurgery: an Illustrative case. *Br J Neurosurg* 39(3):372-374, 2025.

Taori S, Wei Z, Hadjipanayis CG, Niranjan A, Lunsford LD. Long-term outcomes following upfront single-session gamma knife stereotactic radiosurgery for large volume meningiomas. *J Neurooncol* 173(2):429-438, 2025.

Tos SM, Hajikarimloo B, Mantziaris G, Shaaban A, Pham D, Dayawansa S, Wei Z, McKendrick LM, Niranjan A, Lunsford LD, Peker S, Samanci Y, Liscak R, May J, Mathieu D, Picozzi P, Franzini A, Warnick RE, Schoenhals JE, Palmer JD, Xu Z, Sheehan JP. Comparative analysis of stereotactic radiosurgery outcomes for supratentorial hemangioblastomas in von hippel-lindau disease and sporadic cases: A multi-center international study. *J Clin Neurosci* 129:110879, 2024.

L. Dade Lunsford, MD

Bin-Alamer O, Abou-Al-Shaar H, Singh R, Bowden G, Mathieu D, Perlow HK, Palmer JD, Elhamdani S, Shepard M, Liang Y, Nabeel AM, Reda WA, Tawadros SR, Abdel Karim K, El-Shehaby AMN, Emad Eldin R, Elazzazi AH, Warnick RE, Gozal YM, Daly M, McShane B, Addis-Jackson M, Karthikeyan G, Smith S, Picozzi P, Franzini A, Kaisman-Elbaz T, Yang HC, Hess J, Templeton K, Wei Z, Pikis S, Mantziaris G, Simonova G, Liscak R, Peker S, Samanci Y, Chiang V, Lee CC, Trifiletti DM, Niranjan A, Lunsford LD, Sheehan JP. Local control and patient survival after stereotactic radiosurgery for esophageal cancer brain metastases: an international multicenter analysis. *J Neurosurg* 142(5):1357-1365, 2024.

Albano L, Losa M, Barzaghi LR, Barrile E, Bindal SK, Wei Z, Pompeo E, Villanacci F, Del Vecchio A, Flickinger JC, Niranjan A, Mortini P, Lunsford LD. Single Versus Fractionated Gamma Knife Radiosurgery for Nonfunctioning Pituitary Adenomas Close to the Optic Pathway: A Multicenter Propensity Score Matched Study. *Neurosurgery* 95(2):357-364, 2024.

Taori S, Bin-Alamer O, Tang A, Niranjan A, Flickinger JC, Hadjipanayis CG, Lunsford LD. Repeat stereotactic radiosurgery for progressive vestibular schwannomas after primary gamma knife radiosurgery. *J Neurooncol* 169(3):591-599, 2024.

Orrego Gonzalez E, Mantziaris G, Shaaban A, Starke RM, Ding D, Lee JYK, Mathieu D, Kondziolka D, Feliciano C, Grills IS, Barnett GH, Lunsford LD, Liščák R, Lee CC, Martinez Álvarez R, Peker S, Samanci Y, Cockroft KM, Tripathi M, Palmer JD, Zada G, Cifarelli CP, Nabeel AM, Pikis S, Sheehan JP. Comparison of Repeat Versus Initial Stereotactic Radiosurgery for Intracranial Arteriovenous Malformations: A Retrospective Multicenter Matched Cohort Study. *Neurosurgery* 95(4):904-914, 2024.

Hamel A, Tourigny JN, Niranjan A, Lunsford LD, Wei Z, Srinivasan PN, Liscak R, May J, Martínez Moreno N, Martínez Álvarez R, Lee CC, Yang HC, Tripathi M, Kumar N, Mashiach E, Kondziolka D, Briggs RG, Yu C, Zada G, Franzini A, Pecchioli G, Bowden GN, Dayawansa S, Sheehan J, Mathieu D. Long-Term Outcomes of Stereotactic Radiosurgery for Pineocytomas: An International Multicenter Study. *Neurosurgery* [Epub ahead of print], 2024.

Grogan D, Dumot C, Mantziaris G, Tos SM, Tewari A, Dayawansa S, Sheehan K, Sheehan D, Peker S, Samanci Y, Nabeel AM, Reda WA, Tawadros SR, AbdelKarim K, El-Shehaby AMN, Emad RM, Abdelsalam AR, Liscak R, May J, Mashiach E, Vasconcellos FN, Bernstein K, Kondziolka D, Speckter H, Mota R, Brito A, Bindal SK, Niranjan A, Lunsford LD, Benjamin CG, Almeida TAL, Mathieu D, Tourigny JN, Tripathi M, Palmer JD, Mao J, Matsui J, Crooks J, Wegner RE, Shepard MJ, Sheehan J. Outcomes Associated With Stereotactic Radiosurgery After Multiple Resections of Nonfunctioning Pituitary Macroadenomas: An International, Multicenter Case Series. *Neurosurgery* [Epub ahead of print], 2024.

Gecici NN, Hameed NUF, Habib A, Deng H, Lunsford LD, Zinn PO. Comparative Analysis of Efficacy and Safety of Frame-Based, Frameless, and Robot-Assisted Stereotactic Brain Biopsies: A Systematic Review and Meta-Analysis. *Oper Neurosurg* (Hagerstown) [Epub ahead of print], 2024.

Wei Z, Taori S, Mehta M, Jose SG, Luy DD, Abou-Al-Shaar H, Hadjipanayis CG, Niranjan A, Lunsford LD. Primary and salvage radiosurgery for neurofibromatosis type 2-associated meningiomas. *J Neurosurg* [Epub ahead of print], 2024.

Pravat Kumar Mandal, PhD

Research Assistant Professor

Pravat Kumar Mandal, PhD, joined the University of Pittsburgh Department of Neurological Surgery as a research assistant professor in September of 2024. He received his PhD from the Indian Institute of Technology Madras in Chennai, India in 1995.

Dr. Mandal is a Tata Innovation Fellow and has developed the Indian Brain Template BRAHMA, the big data analytics BHARAT, and the brain imaging-based database and data analytics SWADESH. He has worked on medical image analysis and developed novel technology for brain neurochemical signal processing. He has one patent granted by the United States Patent Office as well as the European Union Patent office.

The seminal work of Dr. Mandal is the identification of glutathione depletion in the hippocampus as an early diagnostic biomarker of Alzheimer's disease. He also identified biomarkers for Parkinson's disease patients by noninvasive imaging technique to map iron and glutathione.

Dr. Mandal's major research areas include brain neurochemical profile; brain iron mapping and clinical correlation; healthy aging marker; mild cognitive impairment; Alzheimer's disease; brain trauma and repetitive head injury; and Parkinson's disease.

Hospital Privileges
UPMC Presbyterian

Professional Organization Membership
International Society for Magnetic Resonance in Medicine
Society of Biological Psychiatry
Society for Neuroscience

Education & Training
BSc Chemistry (Hon), Burdwan University, 1985
MSc, (Physical Chemistry), Burdwan University, 1988
PhD, Indian Institute of Technology, Madras, 1995

Honors & Awards
Global Artificial Intelligence Award, All India Council for Robotics & Automation, 2019

Publications: 2024-25
• Refereed Articles:
Mandal PK, Arora Y, Samkaria A, Maroon JC, Fodale V, Mehta Y, Chang YF. Oxidative Stress Monitoring Platform: A Longitudinal In vitro Multinuclear (1H/19F) MR Spectroscopic Study. *Cell Biochem Biophys* 83(2):2281-2288, 2025.

Mandal PK, Maroon JC, Guha Roy R, Patira R, Gogniat MA, Sindhu B. The Missing Link in Antiamyloid Therapy. *ACS Chem Neurosci* 16(3):276-280, 2025.

Arora Y, Samkaria A, Maroon JC, Mandal PK. Longitudinal Monitoring of Glutathione Stability in Different Microenvironments. *Neurochem Res* 50(1):9, 2024.

Mandal PK, Maroon JC, Samkaria A, Arora Y, Sharma S, Pandey A. Iron Chelators and Alzheimer's Disease Clinical Trials. *J Alzheimers Dis* 100(s1):S243-S249, 2024.

Pravat Kumar Mandal, PhD

Research Activities

Dr. Mandal is conducting research on the impact of oxidative stress on repetitive brain impacts (RBI) and neurodegenerative disorders such as Alzheimer's disease and Parkinson's disease.

Oxidative stress is caused due to the imbalance in the production of reactive oxygen species (ROS) and the impaired ability of the biological system's inability to detoxify ROS resulting in neuronal damage. In this context, the role of the master antioxidant glutathione (GSH), and prooxidant (iron) is paramount for the understanding of the molecular cause of RBI, Alzheimer's and Parkinson's. Magnetic resonance spectroscopy (MRS) research, along with susceptibility mapping, have reported significant depletion of GSH and elevation of iron in the hippocampus (for Alzheimer's) and in the substantia niagra (for Parkinson's).

Brain GSH enrichment is a potent strategy for halting these diseases. Based on Dr. Mandal's ongoing clinical research, he has initiated clinical trials involving GSH enrichment through oral supplementation of gamma glutamylcysteine (GGC). GGC is the precursor of GSH.

Currently, Dr. Mandal is conducting two clinical trials, 1) Patients with Repetitive Head Impact Orally Supplemented with Gamma glutamylcysteine: An Open Label Trial with MR Spectroscopy and Neuropsychological Testing, and 2) Enrichment of Glutathione Using Gamma-Glutamylcysteine Supplementationin in Parkinson's Disease Patients.

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 was team neurosurgeon to the Pittsburgh Steelers for over 40 years. He has been honored by the neurosurgical societies of Japan, Korea, Thailand, Egypt, Brazil, Lebanon and China for his neurosurgical contributions, and 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

Joseph C. Maroon, MD

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 300 papers, 67 book chapters and seven books. His most recent book, published in February of 2017 and re-released in December of 2018, is titled *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—climbed 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.

In May of 2025, Dr. Maroon was honored as an Ellis Island Medal of Honor recipient. The honor, officially recognized by both Houses of Congress as one of our nation's most prestigious awards, celebrates "Americans who are selflessly working for the betterment of our country and its citizens."

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

Joseph C. Maroon, MD

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

Professional Activities

National Science Advisory Panel, The Chuck Noll Foundation for Brain Injury Research
Medical Consultant, Viatris Laboratories
Consulting Neurosurgeon, Pittsburgh Steelers
Consulting Neurosurgeon, WWE
Senior Vice President, American Academy of Anti-Aging Medicine
Senior Advisor, NFL Head, Neck and Spine Committee
World Advisory Board, International Sports Hall of Fame
Chairman, Medical and Scientific Advisory Board, Stemedica
Consulting Neurosurgeon, Operation Backbone

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

Honors & Awards

Ellis Island Medal of Honor, Ellis Island Honors Society, 2025.
Distinguished Medical Alumni Award, Indiana University School of Medicine, 2022
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
Castle Connolly Best Doctors in America, *Pittsburgh Magazine*, 2017-19
Lifetime Leadership Award for Concussion Research, UPMC Sports Medicine Concussion Program, 2016
Listed in *The Best Doctors in America*, 2000-14
Honorary President, World Association of Lebanese Neurosurgeons, 1999-2012
Ohio Valley Athletic Conference Hall of Fame Class of 2012
Pioneer Award, 25th Anniversary UPMC Center for Cranial Base Surgery, 2012
Distinguished Alumni Service Award, Indiana University, Bloomington, 2011
National Fitness Hall of Fame, 2010
Western Pennsylvania Chapter of the Sports Hall of Fame, 2009
Healthcare Hero Finalist, *The Pittsburgh Business Times*, 1999 and 2002
Lou Holtz/Upper Ohio Valley Hall of Fame inductee, 1999

News Media Appearances: 2024-25

"Steelers neurosurgeon Dr. Joseph Maroon honored with prestigious award," TribLive.com, June 27, 2025.

Joseph C. Maroon, MD

"World Rugby uses Prevent Biometrics mouth guards to collect data on head impacts," *Sports Business Journal*, October 28, 2024.

"'It's barbaric': Pitt study quantifies concussions in slap fighting," *Pittsburgh Post-Gazette*, September 27, 2024.

"Competitive slap fighting exposed: First study finds 78% show signs of brain injuries," StudyFinds.org, September 26, 2024.

"Slap fighting causes high risk of brain injury, doctors call for safeguards over alarming concussion rates," msn.com, September 23, 2024.

"Unique new sport, 'slap fighting,' could cause serious brain damage," local12.com (WKRC-TV, Cincinnati, Ohio), September 22, 2024.

"Inside bizarre world of slap fighting: How 'ultimate test of toughness' has gained millions of followers and celebrity fans - as competitors are warned they risk brain damage,"dailymail.com (London, England), September 19, 2024

"Concussion warning over face-slap fighting," BBC, September 18, 2024.

"Dr. Maroon to Newsmax: Biden Should End Reelection Bid," *Newsmax Wake Up America*, July 12, 2024.

Publications: 2024-25

• Refereed Articles:

Mandal PK, Arora Y, Samkaria A, Maroon JC, Fodale V, Mehta Y, Chang YF. Oxidative Stress Monitoring Platform: A Longitudinal In vitro Multinuclear (1H/19F) MR Spectroscopic Study. Ce*ll Biochem Biophys* 83(2):2281-2288, 2025.

Zuckerman SL, Jo J, Rigney GH, Bailes JE, Bonfield CM, Cantu RC, Chan PCH, Cordover AM, Coric D, Feuer H, Gardocki RJ, Hecht AC, Hsu WK, Joseph JR, Lehman RA Jr, Levi AD, Liew SM, Louie PK, Ludwig SC, Maroon J, Miele VJ, Mullin J, Nemani VM, Phillips FM, Qureshi S, Riew KD, Rogers MA, Sasso RC, Smith GA, Turner JD, Vaccaro AR, Watkins RG 4th, Theodore N, Okonkwo DO, Sills AK, Davis GA. Return-to-Sport Recommendations for Athletes With Cervical Spine Trauma: A Modified Delphi Consensus Survey of Expert Opinion. *Neurosurgery* [Online ahead of print], 2025.

Carnovale B, Choudhary A, Lavadi RS, Shah MJ, Maroon JC. Letter to the Editor Regarding "Assessing Patients Perception: Analyzing the Quality, Reliability, Comprehensibility, and Mentioned Medical Concepts of Traumatic Brain Injury Videos on YouTube". *World Neurosurg* 188:232, 2024.

Mandal PK, Maroon JC, Samkaria A, Arora Y, Sharma S, Pandey A. Iron Chelators and Alzheimer's Disease Clinical Trials. *J Alzheimers Dis* 100(s1):S243-S249, 2024.

Lavadi RS, Kumar RP, Kann MR, Shah MJ, Hamilton DK, Maroon JC, Agarwal N. Video Analysis of Concussion Among Slap Fighting Athletes. *JAMA Surg* 159(12):1435-1436, 2024.

Arora Y, Samkaria A, Maroon JC, Mandal PK. Longitudinal Monitoring of Glutathione Stability in Different Microenvironments. *Neurochem Res* 50(1):9, 2024.

Duraj T, Kalamian M, Zuccoli G, Maroon JC, D'Agostino DP, Scheck AC, Poff A, Winter SF, Hu J, Klement RJ, Hickson A, Lee DC, Cooper I, Kofler B, Schwartz KA, Phillips MCL, Champ CE, Zupec-Kania B, Tan-Shalaby J, Serfaty FM, Omene E, Arismendi-Morillo G, Kiebish M, Cheng R, El-Sakka AM, Pflueger A, Mathews EH, Worden D, Shi H, Cincione RI, Spinosa JP, Slocum AK, Iyikesici MS, Yanagisawa A, Pilkington GJ, Chaffee A, Abdel-Hadi W, Elsamman AK, Klein P, Hagihara K, Clemens Z, Yu GW, Evangeliou AE, Nathan JK, Smith K, Fortin D, Dietrich J, Mukherjee P, Seyfried TN. Clinical research framework proposal for ketogenic metabolic therapy in glioblastoma. *BMC Med* 22(1):578, 2024.

Joseph C. Maroon, MD

Bailey C, Soden D, Maroon J, Selman W, Tangen C, Gunstad J, Briskin S, Miskovsky S, Miller E, Pieper AA. Elevated Autoantibodies to the GluA1 Subunit of the AMPA Receptor in Blood Indicate Risk of Cognitive Impairment in Contact Sports Athletes, Irrespective of Concussion. *Neurotrauma Rep* 5(1):552-562, 2024.

Antony MichealRaj, PhD

Assistant Professor

Antony MichealRaj, PhD, joined the faculty of the University of Pittsburgh Department of Neurological Surgery in September of 2021.

Dr. MichealRaj graduated from the Madurai Kamaraj University with a bachelor of science degree in zoology. He then earned his master of science degree in biotechnology in 2007 from the University of Madras and PhD in genetics from the University of Delhi where he functionally characterized the rare and common variants of dopaminergic pathway genes associated with schizophrenia and other neurological disorders. He subsequently completed his postdoctoral training in neuro-oncology and tumor metabolism at the Arthur and Sonia Labatt Brain Tumor Research Centre at the Hospital for Sick Children (SickKids) in Toronto.

While at Hospital for Sick Children, Dr. MichealRaj studied molecular disease mechanisms of pediatric brain tumors ependymoma and medulloblastoma using clinically relevant disease models of patients and mouse models. His independent research lab at University of Pittsburgh of School of Medicine is focused on unravelling molecular and metabolic dependency of pediatric brain tumors and their mechanistic role in tumor initiation, maintenance and recurrence/resistance.

Specialized Areas of Interest

Functional genomics and metabolism of pediatric and adolescent central nervous system tumors; ependymoma, medulloblastoma and DIPGs.

Professional Organization Membership

American Association for Cancer Research
Children's Brain Tumor Consortium
International Society of Pediatric Oncology
Society of Neuro-Oncology

Education & Training

BSc, Zoology, Madurai Kamaraj University, 2004
MSc, Biotechnology, Loyola College, University of Madras, 2007
PhD, Genetics, University of Delhi, 2014
Postdoctoral Fellowship, Hospital for Sick Children, Toronto, 2021

Publications: 2024-25

• Refereed Articles

Lee JJY, Tao R, You Z, Haldipur P, Erickson AW, Farooq H, Hendriske LD, Abeysundara N, Richman CM, Wang EY, Das Gupta N, Hadley J, Batts M, Mount CW, Wu X, Rasnitsyn A, Bailey S, Cavalli FMG, Morrissy S, Garzia L, Michealraj KA, Visvanathan A, Fong V, Palotta J, Suarez R, Livingston BG, Liu M, Luu B, Daniels C, Loukides J, Bendel A, French PJ, Kros JM, Korshunov A, Kool M, Chico Ponce de León F, Perezpeña-Diazconti M, Lach B, Singh SK, Leary SES, Cho BK, Kim SK, Wang KC, Lee JY, Tominaga T, Weiss WA, Phillips JJ, Dai S, Zadeh G, Saad AG, Bognár L, Klekner A, Pollack IF, Hamilton RL, Ra YS, Grajkowska WA, Perek-Polnik M, Thompson RC, Kenney AM, Cooper MK, Mack SC, Jabado N, Lupien M, Gallo M, Ramaswamy V, Suva ML, Suzuki H, Millen KJ, Huang LF, Northcott PA, Taylor MD. ZIC1 is a context-dependent medulloblastoma driver in the rhombic lip. *Nat Genet* 57(1):88-102, 2025.

Antony MichealRaj, PhD

Visvanathan A, Saulnier O, Chen C, Haldipur P, Orisme W, Delaidelli A, Shin S, Millman J, Bryant A, Abeysundara N, Wu X, Hendrikse LD, Patil V, Bashardanesh Z, Golser J, Livingston BG, Nakashima T, Funakoshi Y, Ong W, Rasnitsyn A, Aldinger KA, Richman CM, Van Ommeren R, Lee JJY, Ly M, Vladoiu MC, Kharas K, Balin P, Erickson AW, Fong V, Zhang J, Suárez RA, Wang H, Huang N, Pallota JG, Douglas T, Haapasalo J, Razavi F, Silvestri E, Sirbu O, Worme S, Kameda-Smith MM, Wu X, Daniels C, MichaelRaj AK, Bhaduri A, Schramek D, Suzuki H, Garzia L, Ahmed N, Kleinman CL, Stein LD, Dirks P, Dunham C, Jabado N, Rich JN, Li W, Sorensen PH, Wechsler-Reya RJ, Weiss WA, Millen KJ, Ellison DW, Dimitrov DS, Taylor MD. Early rhombic lip Protogenin+ve stem cells in a human-specific neurovascular niche initiate and maintain group 3 medulloblastoma. *Cell* 187(17):4733-4750.e26, 2024.

Johnston MJ, Lee JJY, Hu B, Nikolic A, Hasheminasabgorji E, Baguette A, Paik S, Chen H, Kumar S, Chen CCL, Jessa S, Balin P, Fong V, Zwaig M, Michealraj KA, Chen X, Zhang Y, Varadharajan S, Billon P, Juretic N, Daniels C, Rao AN, Giannini C, Thompson EM, Garami M, Hauser P, Pocza T, Ra YS, Cho BK, Kim SK, Wang KC, Lee JY, Grajkowska W, Perek-Polnik M, Agnihotri S, Mack S, Ellezam B, Weil A, Rich J, Bourque G, Chan JA, Yong VW, Lupien M, Ragoussis J, Kleinman C, Majewski J, Blanchette M, Jabado N, Taylor MD, Gallo M. TULIPs decorate the three-dimensional genome of PFA ependymoma. *Cell* 187(18):4926-4945.e22, 2024.

Richman CM, Dirks PB, Taylor MD, Michealraj KA. Protocol for the derivation of primary cancer stem cell lines from human ependymal tumors. *STAR Protoc* 5(3):103260, 2024.

Vincent J. Miele, MD

Clinical Associate Professor
Chief, Neurosurgery, UPMC Mercy

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 led to invited written editorials in prominent media such as the *New York Times*. He 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 focusing 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.

Vincent J. Miele, MD

Dr. Miele also has a strong background in cranial neurosurgery and treats 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, Bethel Park and UPMC Mercy in southwestern Pennsylvania.

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 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

Honors & Awards
Castle Connolly Top Doctors in America, 2016-25
Best Faculty Teaching Award, Department of Neurological Surgery, 2021

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.

John J. Moossy, MD

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.

In March of 2025, the John J. Moossy Award for Excellence in Neurosurgery was established in his honor at the University of Pittsburgh Department of Neurological Surgery. The award honors Dr. Moossy, for his many years serving as a valued mentor and instrumental contributor to the education of countless residents.

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

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

Honors & Awards
John J. Moossy Award for Excellence in Neurosurgery established at the University of Pittsburgh Department of Neurological Surgery, 2025
Best Doctors in America, *Pittsburgh Magazine*, 2014-17
Department of Neurological Surgery, Resident Teaching Award, 2001-03
Rudolph Matas Prize in History of Medicine, 1980

Vinayak Narayan, MD

Clinical Assistant Professor

Vinayak Narayan, MD, joined the faculty at the University of Pittsburgh Department of Neurological Surgery as a clinical assistant professor in August 2023. Dr. Narayan specializes in cerebrovascular and cranial base neurosurgery, interventional neuroradiology and stereotactic and functional neurosurgery. His neurosurgical expertise after completing the dual vascular fellowship training allows him to perform minimally invasive neurointerventional and endoscopic surgeries as well as open cerebrovascular and skull base surgeries, thereby providing patients a comprehensive and personalized approach in the treatment of neurovascular and skull base diseases. Dr. Narayan's knowledge and skill in functional neurosurgery and neuromodulation can also provide the best possible outcome in patients with movement disorders, intractable epilepsy and chronic pain. Dr. Narayan is affiliated with UPMC Neurological Institute, Harrisburg.

Dr. Narayan graduated with honors from the renowned medical school, Government Medical College, Trichur in India. He then completed the neurosurgery residency program at the National Institute of Mental Health and Neurosciences (NIMHANS), Bangalore which is an Institute of National Importance (INI), and the most prestigious neurosciences institute in India. After earning the double masters degree in neurosurgery, he moved to the United States and completed postdoctoral fellowship in cerebrovascular and skull base surgery as well as neurointerventional surgery at the Louisiana State University Health Sciences Center Shreveport, Louisiana, and at Rutgers Robert Wood Johnson Medical School and University Hospital, New Jersey. Dr. Narayan also completed three prestigious clinical fellowship programs: stereotactic and functional neurosurgery (The Ohio State University Wexner Medical Center, Columbus, Ohio), interventional neuroradiology (NYU Langone Health and Bellevue Hospital Center, New York) and cerebrovascular neurosurgery (Northwell Health Lenox Hill Hospital, New York), which are accredited by the Committee on Advanced Subspecialty Training (CAST).

Dr. Narayan enjoys scientific writing and has authored numerous neurosurgical publications, book chapters and abstracts. His clinical and translational research productivity can be viewed in the National Library of Medicine's publication database. He has been on the editorial board of various neurosurgical journals and medical book publishers. His research interests include neurological outcomes in the management of cerebrovascular as well as skull base diseases, neurosonography and impact of advanced neuromodulation in Parkinson's disease and essential tremor. Outside of neurological surgery, Dr. Narayan is passionate about music, riding motorcycle and biking.

Specialized Areas of Interest

Cerebrovascular and cranial base neurosurgery; interventional neuroradiology; stereotactic and functional neurosurgery.

Hospital Privileges

UPMC Carlisle
UPMC Community General
UPMC Hanover
UPMC Lititz
UPMC Memorial
UPMC Neurological Institute, Harrisburg
UPMC West Shore

Vinayak Narayan, MD

Professional Organization Membership

American Association of Neurological Surgeons
American College of Surgeons
American Heart Association
American Medical Association
American Roentgen Ray Society
American Society of Neuroradiology
Congress of Neurological Surgeons
National Academy of Medical Sciences, India
Neurological Society of India
Neurotrauma Society of India
North American Skull Base Society
Royal College of Surgeons of Edinburgh
Sigma Xi, The Scientific Research Honor Society
Society of Neuro Interventional Surgery

Professional Activities

UPMC Stroke Committee, Central Pennsylvania
Editorial Board, Section Editor (Cerebrovascular & Endovascular Neurosurgery, Stereotactic and Functional Neurosurgery), *World Neurosurgery*
Editorial Board, Review Editor, *Frontiers in Surgery*, Section Neurosurgery
Editorial Board, Member, *Journal of Advance Medical Sciences*
Research Peer Reviewer, American Heart Association
Invited Faculty, North American Skull Base Society (NASBS) Annual Meeting 2025
Invited Faculty, 6th Annual Winter Neurosurgical Forum
Invited Faculty, Meritus Health 2024 Stroke Symposium
Invited Expert Reviewer, Thieme Medical Publishers (Vascular Neurosurgery)
Fellow, American College of Surgeons
Fellow, Royal College of Surgeons of Edinburgh
International Fellow, American Association of Neurological Surgeons

Education & Training

MD (Honors), Government Medical College, Trichur, India, 2011
Residency, Neurological Surgery, National Institute of Mental Health and Neurosciences (NIMHANS), India, 2017
Postdoctoral Fellowship, Cerebrovascular and Skull Base Surgery, Louisiana State University Health Sciences Center, Shreveport, 2018
Postdoctoral Fellowship, Neuro Interventional Surgery, Louisiana State University Health Sciences Center, Shreveport, 2018
Postdoctoral Fellowship, Cerebrovascular and Skull Base Surgery, Rutgers Robert Wood Johnson Medical School and University Hospital, 2019
Fellowship, Stereotactic and Functional Neurosurgery, The Ohio State University Wexner Medical Center, 2020
Fellowship, Interventional Neuroradiology, NYU Langone Health and Bellevue Hospital Center, 2022
Fellowship, Cerebrovascular Neurosurgery, Northwell Health Lenox Hill Hospital, 2023

Honors & Awards

Member-at-Large, Sigma Xi, The Scientific Research Honor Society, 2021
Meritorious certificate, LSUHSC, 2018
Top Poster Abstract, AANS/CNS Section on Pediatric Neurological Surgery, 2018
Outstanding contribution in reviewing articles, *World Neurosurgery*, 2018
Diplomate of National Board of Examinations, India, 2017

Vinayak Narayan, MD

Herbert Krause Award, NSICON, India, 2016
Neurological Surgery Thesis Cum Laude, NIMHANS, 2016
State Board of Medical Research Award, India, 2008

Publications: 2024-25

• Book Chapters:

Narayan V, Hanft S, Gupta G, Nanda A. The microsurgical resection of colloid cysts of third ventricle: Transcallosal approach. In: *Colloid Cysts of the Third Ventricle*, Nakaji P, Beaumont TL, Ralph Dacey Jr, RJ, (eds), Thieme Medical Publishers, pp 65-72, 2025.

• Refereed Articles:

Shao MM, Huda S, Narayan V, Serulle Y, Ben-Shalom N. Innovative endovascular management of giant superficial temporal artery pseudoaneurysm presented with periorbital ulcerative mass. *J Craniofac Surg* 35(7):2116-2118, 2024.

Cody Nesvick, MD

Assistant Professor
Surgical Co-Director, Neurovascular Center of Excellence
Co-Director, Pediatric Skull Base Program
Director, Laboratory of Applied Epigenomics

Cody Nesvick, MD, is an assistant professor of neurological surgery at the University of Pittsburgh and is surgical co-director of the Pediatric Skull Base Program and Neurovascular Center of Excellence at UPMC Children's Hospital of Pittsburgh.

Originally from Tennessee, Dr. Nesvick completed medical school at the University of Tennessee Health Science Center in Memphis and a research fellowship at the National Institute of Health through the Medical Research Scholars Program. Following graduation, he completed his neurosurgical residency at Mayo Clinic, during which he also completed a three-year National Cancer Institute-funded post-doctoral research fellowship in neuro-oncology. Post-residency, Dr. Nesvick pursued further subspecialty training in pediatric neurosurgery at the Hospital for Sick Children (University of Toronto) and open and endoscopic skull-base oncology at Emory University.

In addition to his clinical practice, Dr. Nesvick heads the Applied Epigenomics Laboratory at the John G. Rangos, Sr. Research Center, where his team studies molecular mechanisms of tumorigenesis in atypical teratoid rhabdoid tumor (ATRT) and other pediatric brain tumors. As a surgeon-scientist, Dr. Nesvick's vision is to provide the most comprehensive care for children with complex cranial disorders through technical excellence, cross-specialty collaboration and bench-to-bedside translational efforts.

Specialized Areas of Interest

Pediatric brain tumors, intraventricular tumors, pineal-region tumors, endoscopic endonasal approaches, craniopharyngioma, skull-base tumors, moyamoya disease, arteriovenous malformations and minimally invasive neurosurgery.

Hospital Privileges

UPMC Children's Hospital of Pittsburgh
UPMC Magee-Women's Hospital
UPMC Presbyterian

Cody Nesvick, MD

Professional Organization Membership
Alpha Omega Alpha Medical Honor Society
American Association of Neurological Surgeons
AANS Young Neurosurgeons Committee, Pediatric Neurosurgery Subcommittee
International Society for Pediatric Neurosurgery
North American Skull Base Society

Education & Training
BA, University of Tennessee, College Scholars, 2011
NIH-HHMI Medical Research Scholars Program, National Institutes of Health, 2014
Doctor of Medicine, University of Tennessee Health Sciences Center, 2016
Residency, Neurological Surgery, Mayo Clinic, 2023
Research Fellowship, Neuro-Oncology (National Cancer Institute T32), Mayo Clinic, 2023
Fellowship, Pediatric Neurosurgery, The Hospital for Sick Children, University of Toronto, 2024
Fellowship, Skull-Base Oncology, Emory University, 2025

Honors & Awards
Megan Rose Bradley Foundation Award, AANS Pediatric Section Meeting, 2021
Scientific Showcase Top Abstract, Tumor/Neoplasms Panel, AANS Pediatric Section Meeting, 2020.

Publications: 2024-25
• Refereed Articles:
Riviere-Cazaux C, Dong X, Mo W, Kumar R, Dai C, Carlstrom L, Munoz-Casabella A, Ghadimi K, Nesvick CL, Andersen K, Hoplin M, Canaday N, Jusue-Torres I, Malik M, Campian J, Ruff M, Uhm J, Eckel-Passow J, Kaufmann T, Routman D, Kizilbash S, Sener U, Warrington A, Jenkins R, Du P, Jia S, Burns T. Longitudinal glioma monitoring via cerebrospinal fluid cell-free DNA. *Clin Cancer Res* 31(5):881-889 2025.

Lozano C, Nesvick CL, De Sequeria A, Vogt LM, Laughlin S, Jain P, Kulkarni AV, Rutka JT, Ibrahim GM, Drake J. Stroke-like Migraine Attacks after Radiation Therapy (SMART) Syndrome in a Pediatric Patient with a Ventriculoperitoneal Shunt. *J Neurosurg Case Lessons* 9(21):CASE25189, 2025.

Nesvick CL, Zhang L, Yan Y, Wixom A, Hamdan FH, Ge J, Anderson JB, Gaspar-Maia A, Johnsen S, Daniels DJ. SWI/SNF complexes govern ontology-specific transcription factor function in MYC-subtype atypical teratoid rhabdoid tumor. *Neuro Oncol* [Online ahead of print], 2025.

Nakano Y, Burns I, Nobre L, Siddaway R, Rana M, Nesvick CL, Bondoc A, Ku M, Yuditskiy R, Ku DTL, Shing MMK, Cheng KKF, Ng H, Das A, Bennett J, Ramaswamy V, Huang A, Malkin D, Ertl-Wagner B, Dirks P, Bouffet E, Bartels U, Tabori U, Hawkins C, Liu APY. High detection rate of circulating tumor DNA from cerebrospinal fluid of children with central nervous system germ cell tumors. *Acta Neuropathol Commun* 12(1):178 2024.

Jabal MS, Mohammed MA, Nesvick CL, Kobeissi H, Graffeo CS, Pollock BE, Brinjikji W. DSA quantitative analysis and predictive modeling of obliteration in cerebral AVM following stereotactic radiosurgery. *AJNR Am J Neuroradiol* 45(10):1521-1527 2024.

Research Activities
Dr. Nesvick's laboratory studies epigenetic mechanisms of disease in pediatric brain tumors, with a specific focus on atypical teratoid rhabdoid tumor (ATRT), a highly lethal brain and spinal cord cancer of very young children. Like many cancers, ATRT results from dysregulation of enhancers, which are key regions of the genome that must be activated for normal development. However, ATRT is highly unique in its molecular simplicity, and Dr. Nesvick's work seeks

Cody Nesvick, MD

to understand and exploit this feature to improve our understanding and better treat children with this disease.

Dr. Nesvick's clinical research has two key objectives:

1. To enhance surgical access to brain tumors in challenging locations by using advanced endoscopic endonasal surgery and minimally invasive neurosurgical techniques.

2. To collaborate closely with neuro-oncologists, radiation oncologists and research teams to translate molecular insights into clinical action and improved patient outcomes. This includes playing key roles in national, multi-institutional clinical trial initiatives.

Ajay Niranjan, MD

Professor
Director, UPMC Brain Mapping Center
Director, Radiosurgery Research
Associate Director, Center for Image-Guided Neurosurgery

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 a bachelor of surgery degree. He completed general surgery residency in 1989 and neurological surgery residency in 1992. Dr. Niranjan joined the University of Pittsburgh as a fellow in image-guided neurosurgery in 1997 and completed his fellowship in 2000 joining the faculty in July of 2000.

Dr. Niranjan has co-authored over 300 articles in refereed journals, over 170 book chapters and five books. 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 (MEG) 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; radiosurgery for brain vascular malformations; radiosurgery 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

Professional Activities
Executive Director, International Radiosurgery Research Foundation
Course Co-Director, Principles and Practices of Gamma Knife Radiosurgery, UPMC

Education & Training
MBBS, King George's Medical College, 1985
Residency, General Surgery, King George's Medical College, 1989

Ajay Niranjan, MD

Residency, Neurological Surgery, King George's Medical College, 1992
Fellowship, University of Pittsburgh, 2000
MBA, University of Pittsburgh, 2009

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

Publications: 2024-25
• Refereed Articles:
Hoang A, Wei Z, Hadjipanayis CG, Niranjan A, Lunsford LD. Stereotactic Radiosurgery for Patients with Brain Metastases from Sarcomas. *Cancers* (Basel) 17(13):2118, 2025.

Shaaban A, Tos SM, Mantziaris G, Pham D, Dayawansa S, Nabeel AM, Reda WA, Tawadros SR, Karim KA, El-Shehaby AMN, Emad RM, Wei Z, McKendrick LM, Niranjan A, Lunsford LD, Peker S, Samanci Y, Liscak R, May J, Mathieu D, Lee CC, Yang HC, Dono A, Blanco AI, Esquenazi Y, Moreno NM, Álvarez RM, Picozzi P, Franzini A, Tripathi M, Sumi T, Uzuka T, Kano H, Bailey D, Zacharia BE, Cifarelli CP, Cifarelli DT, Hack JD, Speckter H, Lazo E, Warnick RE, Schoenhals JE, Palmer JD, Asthagiri AR, Xu Z, Sheehan JP. Outcomes After Stereotactic Radiosurgery for Intracranial Hemangioblastoma in Von Hippel-Lindau Disease and Sporadic Cases: An International Multicenter Study. *Neurosurgery* [Online ahead of print], 2025.

Becerril-Gaitan A, Peesh P, Liu C, Lee CC, Yang HC, Niranjan A, Lunsford LD, Wei Z, Hoang A, Sheehan J, Dayawansa S, Peker S, Samanci Y, Starke RM, Abdelsalam A, Kondziolka D, Bernstein K, Ming Y, Ikeda G, Kano H, Tripathi M, Liscak R, May J, Wang Q, Li W, Welch B, O'Con J, Amin-Hanjani S, Nguyen Q, Lanzino G, Brinjikji W, Hayakawa M, Samaniego E, Du R, Lai R, Derdeyn C, Abla A, Gross B, Albuquerque F, Lawton M, Kim L, Levitt M, Alaraj A, Winkler E, Chalouhi N, Hoh B, Bulters D, Durnford A, Satomi J, Tada Y, van Dijk M, Potgieser ARE, Laurent D, Osbun J, Bahmani B, Zipfel G, Chen CJ. Stereotactic radiosurgery versus observation for intracranial low-grade dural arteriovenous fistulas. *J Neurol Neurosurg Psychiatry* [Online ahead of print], 2025.

Taori S, Wei Z, Hadjipanayis CG, Niranjan A, Lunsford LD. Long-term outcomes following upfront single-session gamma knife stereotactic radiosurgery for large volume meningiomas. *J Neurooncol* 173(2):429-438, 2025.

Donohue JK, Wei Z, Deng H, Niranjan A, Lunsford LD. Management of sarcomatoid Malignant pleural mesothelioma brain metastases with stereotactic radiosurgery: an Illustrative case. *Br J Neurosurg* 39(3):372-374, 2025.

Reyes JS, Lohia VN, Almeida T, Niranjan A, Lunsford LD, Hadjipanayis CG. Artificial intelligence in neurosurgery: a systematic review of applications, model comparisons, and ethical implications. *Neurosurg Rev* 48(1):455, 2025.

Abou-Al-Shaar H, Albalkhi I, Shariff RK, Mallela AN, Fazeli PK, Tos SM, Mantziaris G, Meng Y, Bernstein K, Kaisman-Elbaz T, Abofani H, Lin YY, Lee CC, Tripathi M, Upadhyay R, Palmer JD, Nabeel AM, Reda WA, Tawadros SR, Abdelkarim K, El-Shehaby AMN, Emad RM, Peker S, Samanci Y, Wegner RE, Shepard MJ, Liscak R, Simonova G, Almeida T, Benjamin C, Kondziolka D, Sheehan JP, Niranjan A, Hadjipanayis CG, Lunsford LD. Outcomes of stereotactic radiosurgery for pituitary metastases: an international multi-institutional study. *Pituitary* 28(3):69, 2025.

Gecici NN, Habib A, Niranjan A, Balzer J, Sherry N, Zinn PO. Optimizing brain mapping: integrating real-time neuropsychological assessment in awake craniotomy. *Neurosurg Focus Video* 12(1):V6, 2025.

Ajay Niranjan, MD

Mansouri A, Ozair A, Bhanja D, Wilding H, Mashiach E, Haque W, Mikolajewicz N, de Macedo Filho L, Mahase SS, Machtay M, Metellus P, Dhermain F, Sheehan J, Kondziolka D, Lunsford LD, Niranjan A, Minniti G, Li J, Kalkanis SN, Wen PY, Kotecha R, McDermott MW, Bettegowda C, Woodworth GF, Brown PD, Sahgal A, Ahluwalia MS. Stereotactic radiosurgery for patients with brain metastases: current principles, expanding indications and opportunities for multidisciplinary care. *Nat Rev Clin Oncol* 22(5):327-347, 2025.

Singh R, Dayawansa S, Pham D, Mantziaris G, Peker S, Samanci Y, Duzkalir AH, Mathieu D, Langlois AM, Egnot ML, Warnick RE, Speckter H, Lazo E, Mendez L, Blanco AI, Amsbaugh MJ, Liu C, Becerril-Gaitan A, Esquenazi Y, Chen CJ, Zaki P, Liang Y, Wegner R, Tripathi M, Wei Z, Jajoo SA, Niranjan A, Lunsford LD, Palmer JD, Sheehan JP. Dosimetric predictors of toxicity for brainstem metastases and AVMs treated with stereotactic radiosurgery: An international, multi-institutional analysis. *Radiother Oncol* 206:110795, 2025.

Wei Z, Jose S, Abou-Al-Shaar H, Deng H, Luy D, Kondziolka D, Niranjan A, Lunsford LD. Intracerebral and pituitary metastatic eccrine carcinoma: prolonged survival using stereotactic radiosurgery. *Br J Neurosurg* 39(2):240-245, 2025.

Langlois AM, Iorio-Morin C, Kallos J, Niranjan A, Lunsford LD, Peker S, Samanci Y, Park DJ, Barnett GH, Liscak R, Simonova G, Pikis S, Mantziaris G, Sheehan J, Lee CC, Yang HC, Bowden GN, Mathieu D. Stereotactic Radiosurgery for World Health Organization Grade 2 and 3 Oligodendroglioma: An International Multicenter Study. *Neurosurgery* 96(4):870-880, 2025.

Yurtluk MD, Bin-Alamer O, Flickinger JC, Hadjipanayis CG, Niranjan A, Lunsford LD. Multistaged Stereotactic Radiosurgery for Complex Large Lobar Arteriovenous Malformations: A Case Series. *Neurosurgery* 96(1):223-232, 2025.

Wei Z, Taori S, Mehta M, Jose SG, Luy DD, Abou-Al-Shaar H, Hadjipanayis CG, Niranjan A, Lunsford LD. Primary and salvage radiosurgery for neurofibromatosis type 2-associated meningiomas. *J Neurosurg* 142(4):1125-1133, 2024.

Hamel A, Tourigny JN, Niranjan A, Lunsford LD, Wei Z, Srinivasan PN, Liscak R, May J, Martínez Moreno N, Martínez Álvarez R, Lee CC, Yang HC, Tripathi M, Kumar N, Mashiach E, Kondziolka D, Briggs RG, Yu C, Zada G, Franzini A, Pecchioli G, Bowden GN, Dayawansa S, Sheehan J, Mathieu D. Long-Term Outcomes of Stereotactic Radiosurgery for Pineocytomas: An International Multicenter Study. *Neurosurgery* 97(1):174-181, 2024.

Grogan D, Dumot C, Mantziaris G, Tos SM, Tewari A, Dayawansa S, Sheehan K, Sheehan D, Peker S, Samanci Y, Nabeel AM, Reda WA, Tawadros SR, AbdelKarim K, El-Shehaby AMN, Emad RM, Abdelsalam AR, Liscak R, May J, Mashiach E, Vasconcellos FN, Bernstein K, Kondziolka D, Speckter H, Mota R, Brito A, Bindal SK, Niranjan A, Lunsford LD, Benjamin CG, Almeida TAL, Mathieu D, Tourigny JN, Tripathi M, Palmer JD, Mao J, Matsui J, Crooks J, Wegner RE, Shepard MJ, Sheehan J. Outcomes Associated With Stereotactic Radiosurgery After Multiple Resections of Nonfunctioning Pituitary Macroadenomas: An International, Multicenter Case Series. *Neurosurgery* 97(1):182-190, 2024.

Tos SM, Hajikarimloo B, Mantziaris G, Shaaban A, Pham D, Dayawansa S, Wei Z, McKendrick LM, Niranjan A, Lunsford LD, Peker S, Samanci Y, Liscak R, May J, Mathieu D, Picozzi P, Franzini A, Warnick RE, Schoenhals JE, Palmer JD, Xu Z, Sheehan JP. Comparative analysis of stereotactic radiosurgery outcomes for supratentorial hemangioblastomas in von hippel-lindau disease and sporadic cases: A multi-center international study. *J Clin Neurosci* 129:110879, 2024.

Ajay Niranjan, MD

Pikis S, Mantziaris G, Protopapa M, Tos SM, Kowalchuk RO, Ross RB, Rusthoven CG, Tripathi M, Langlois AM, Mathieu D, Lee CC, Yang HC, Peker S, Samanci Y, Zhang MY, Braunstein SE, Wei Z, Niranjan A, Lunsford DL, Sheehan J. Stereotactic radiosurgery for brain metastases from human epidermal receptor 2 positive breast Cancer: an international, multi-center study. *J Neurooncol* 170(1):199-208, 2024.

Taori S, Bin-Alamer O, Tang A, Niranjan A, Flickinger JC, Hadjipanayis CG, Lunsford LD. Repeat stereotactic radiosurgery for progressive vestibular schwannomas after primary gamma knife radiosurgery. *J Neurooncol* 169(3):591-599, 2024.

Albano L, Losa M, Barzaghi LR, Barrile E, Bindal SK, Wei Z, Pompeo E, Villanacci F, Del Vecchio A, Flickinger JC, Niranjan A, Mortini P, Lunsford LD. Single Versus Fractionated Gamma Knife Radiosurgery for Nonfunctioning Pituitary Adenomas Close to the Optic Pathway: A Multicenter Propensity Score Matched Study. *Neurosurgery* 95(2):357-364, 2024.

David O. Okonkwo, MD, PhD

Professor
Director, Neurotrauma Clinical Trials Center
Director, Scoliosis and Spinal Deformity Program
Executive Vice President, UPMC Enterprises
Beckwith Medical Technology Innovation and Advancement Endowed Chair, UPMC Enterprises

David Okonkwo, MD, PhD, is professor of neurological surgery and executive vice president of UPMC Enterprises. Dr. Okonkwo is also director of the Neurotrauma Clinical Trials Center at the University of Pittsburgh, director of neurotrauma at UPMC and director of the scoliosis and spinal deformity program at UPMC Presbyterian. In addition, Dr. Okonkwo is team neurosurgeon for the Pittsburgh Steelers.

Dr. Okonkwo completed his undergraduate studies at the University of Virginia and earned both his MD and his PhD from Virginia Commonwealth University. He completed his residency in neurological surgery at the University of Virginia and a fellowship at Auckland Public Hospital in New Zealand. He joined UPMC and the University of Pittsburgh in 2006.

Dr. Okonkwo's clinical interests are sports medicine, traumatic injuries to the brain and spine as well as scoliosis and spinal deformity surgery. His research endeavors involve developing biomarkers and novel therapeutic interventions for brain and spinal cord injury. Through his patents, creativity and advice, Dr. Okonkwo has spent two decades developing technologies and treatments to transform management of concussions, traumatic brain injuries and complex spinal disorders. His innovation and commercialization efforts have yielded several medical devices now in global distribution.

Dr. Okonkwo joined UPMC Enterprises in 2018 with a focus on med-tech and the neurosciences. As executive vice president of UPMC Enterprises and member of UPMC's Health Technology Advancement Program (HTAP), Dr. Okonkwo champions the talent and vision of the UPMC ecosystem to forge strategic industry partnerships that align with UPMC's clinical excellence and operational mandates.

Dr. Okonkwo has published more than 500 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.

David O. Okonkwo, MD, PhD

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

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

Professional Activities
Team Neurosurgeon, Pittsburgh Steelers

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

Honors & Awards
Arthur Rettig Award, National Football League Physician Society, 2025
Castle Connolly Top Doctors in America, 2018-25

News Media Appearances: 2024-25
"Detecting hidden brain injuries," *Nature*, August 29, 2024.
"The Truth About Concussions," WJCT-TV (Jacksonville, Fla.), 'What's Health Got to Do With It." May 3, 2025.

Publications: 2024-25
• Refereed Articles:
Adida S, Hudson JS, Legarreta AD, Taori S, Shanahan RM, Jawad-Makki MH, Colan JA, Mitha R, Agarwal N, Okonkwo DO, Hamilton DK, Buell TJ. Revision surgery for proximal junctional failure: A single-center analysis. *Clin Neurol Neurosurg* 253:108880, 2025.

Neal MD, Okonkwo DO, Guyette FX, Luther JF, Vincent LE, Puccio AM, Harner AM, Agnone AG, Brubaker DP, Love ET, Leeper CM, Brown JB, Forsythe R, Spinella PC, Yazer MH, Wisniewski SR, Sperry JL; and the Cold Stored Platelet for Traumatic Brain Injury (CRISP-TBI) study group. Early Cold Stored Platelet Transfusion Following Traumatic Brain Injury: A Randomized Clinical Trial. *Ann Surg* 281(5):796-805, 2025.

David O. Okonkwo, MD, PhD

Krieger D, Shepard P, Kontos A, Collins MW, Puccio A, Eagle SR, Schneider W, Okonkwo DO. Sensory driven neurophysiological mechanisms of concussion: a parsimonious and falsifiable theory. *Front Neurol* 16:1547786, 2025.

Eagle SR, Barber J, Temkin N, McCrea MA, Giacino JT, Okonkwo DO, Madhok D, Yue JK, Zerbato JM, Manley GT, Nelson LD; TRACK-TBI Investigators. Follow up rates and patient interest in clinical care after mild traumatic brain injury presenting to a level 1 trauma center: a TRACK-TBI prospective cohort study. *Front Neurol* 16:1558204, 2025.

Dolmans RGF, Barber J, Foreman B, Temkin NR, Okonkwo DO, Robertson CS, Manley GT, Rosenthal ES. Sedation Intensity in Patients with Moderate to Severe Traumatic Brain Injury in the Intensive Care Unit: A TRACK-TBI Cohort Study. *Neurocrit* Care 42(2):551-561, 2025.

Eagle SR, Gardner RC, Jain S, Sun X, Puccio A, Brent D, Nelson LD, McCrea MA, Giacino JT, Okonkwo DO, Yue JK, Manley GT, Stein MB; TRACK-TBI Investigators. Association of blood-based glial fibrillary acidic protein level with depression and suicidal ideation following traumatic brain injury with Glasgow Coma Scale score 13 to 15: a TRACK-TBI study. *Brain Commun* 7(2):fcaf123, 2025.

Cloney MB, Buell TJ, Paul DA, Nail TJ, Polavarapu H, Jawad-Makki MA, Adida S, Okonkwo DO. Simultaneous Traumatic Fractures of the Atlas and Axis: Presentation, Management, and Outcomes from a Series of 103 Consecutive Patients. *World Neurosurg* 195:123580, 2025.

Eagle SR, Svirsky SE, Puccio AM, Borrasso A, Edelman K, Beers S, Agoston D, Soose R, Collins M, Kontos A, Schneider W, Okonkwo DO. Predictive Blood Biomarkers of Targeted Intervention for Chronic Mental Health Symptoms following Traumatic Brain Injury. *J Neurotrauma* 42(5-6):e454-e460, 2025.

Cantu RC, Sills AK, Alosco ML, Arbogast KB, Bazarian JJ, Bieniek KF, Crandall JR, Iverson GL, Katz DI, Keene CD, Leddy JJ, Mack CD, McKee AC, Meehan WP, Mez J, Nowinski CJ, Okonkwo DO, Solomon GS, Stein TD, Tartaglia MC, Zafonte RD, Daneshvar DH. Prevention of concussion and long-term effects of repetitive traumatic brain injury: Unanimous consensus from the Cantu Concussion Summit. *PM&R* 17(5):563-566, 2025

Prapiadou S, Mayerhofer E, Georgakis MK, Kals M, Radmanesh F, Izzy S, Richardson S, Okonkwo DO, Puccio AM, Temkin N, Palotie A, Ripatti S, Diaz-Arrastia R, Stein MB, Manley GT, Menon D, Rosand J, Parodi L, Anderson CD. Exploring synaptic pathways in traumatic brain injury: a cross-phenotype genomics approach. *J Neurotrauma* 42(1-2):131-142, 2025.

Eastlack RK, Kumar JI, Mundis GM, Nunley PD, Uribe JS, Park PJ, Tran S, Wang MY, Than KD, Okonkwo DO, Kanter AS, Anand N, Fessler RG, Fu KG, Chou D, Mummaneni PV. The impact of lower thoracic versus upper lumbar upper instrumented vertebra in minimally invasive correction of adult spinal deformity. *J Neurosurg Spine* 42(4):462-469, 2025.

Khalifé M, Lafage R, Daniels AH, Diebo BG, Elysée J, Ames CP, Bess SR, Burton DC, Eastlack RK, Gupta MC, Hostin RA, Kebaish K, Kim HJ, Klineberg EO, Mundis G Jr, Okonkwo DO, Guigui P, Ferrero E, Skalli W, Assi A, Vergari C, Shaffrey CI, Smith JS, Schwab FJ, Lafage V; ISSG. Assessing Abnormal Proximal Junctional Angles in Adult Spinal Deformity: A Normative Data Approach to Define Proximal Junctional Kyphosis. *Spine* (Phila Pa 1976) 50(2):103-109, 2025.

Eagle SR, Zynda AJ, Sandulli L, Hickey RW, Kegel NE, Nelson L, McCrea M, Collins MW, Okonkwo DO, Thomas DG, Kontos AP. The Role of Body Mass Index on Physical Activity, Symptoms, and Related Outcomes Following Pediatric Concussion. *J Pediatr* 277:114386, 2025.

David O. Okonkwo, MD, PhD

Zuckerman SL, Jo J, Rigney GH, Bailes JE, Bonfield CM, Cantu RC, Chan PCH, Cordover AM, Coric D, Feuer H, Gardocki RJ, Hecht AC, Hsu WK, Joseph JR, Lehman RA Jr, Levi AD, Liew SM, Louie PK, Ludwig SC, Maroon J, Miele VJ, Mullin J, Nemani VM, Phillips FM, Qureshi S, Riew KD, Rogers MA, Sasso RC, Smith GA, Turner JD, Vaccaro AR, Watkins RG 4th, Theodore N, Okonkwo DO, Sills AK, Davis GA. Return-to-Sport Recommendations for Athletes With Cervical Spine Trauma: A Modified Delphi Consensus Survey of Expert Opinion. *Neurosurgery* [Online ahead of print], 2025.

Eagle SR, Huber D, McCrea M, Okonkwo DO, Harezlak J, McAllister T, Pasquina P, Broglio S, Meier TB; CARE Consortium Investigators. Effect of Obese Body Mass Index on Clinical Outcomes and Inflammatory Blood Biomarkers following Sport-Related Concussion in Collegiate Athletes and Military Cadets: Findings from the NCAA-DoD CARE Consortium. *Sports Med* [Online ahead of print], 2025.

Eagle SR, Lamb B, Huber D, McCrea MA, Tarima S, deRoon-Cassini TA, Okonkwo DO, Nelson LD. Distinct symptom recoveries based upon highest level of care in patients with sport-related concussion or traumatic brain injury and Glasgow Coma Scale 13-15. *Clin Neurol Neurosurg* [Online ahead of print], 2025.

Fernández de-Thomas RJ, Adida S, Cloney MB, Mitha R, Lavadi RS, Deng H, Lopez-Gross AS, Sen A, Fernandes-Cabral DT, Abou-Al-Shaar H, Gerszten PC, Okonkwo DO, Buell TJ, Hamilton DK, Agarwal N. Current Trends in the Use of Cervical Collar Immobilization After Cervical Spine Surgery: A Global Survey Analysis. *Clin Spine Surg* [Online ahead of print], 2025.

Serlin Y, Imtiaz H, Maclean MA, Pease MW, Okonkwo DO, Puccio AM, Eagle S, Castellano JF, Inati SK, Friedman A. Paroxysmal Cortical Slowing Predicts Posttraumatic Epilepsy After Severe Traumatic Brain Injury. *Neurocrit Care* [Online ahead of print], 2025.

Zuckerman SL, Jo J, Rigney GH, Bailes JE, Bonfield CM, Cantu RC, Chan PCH, Cordover AM, Coric D, Feuer H, Gardocki RJ, Hecht A, Hsu WK, Joseph JR, Lehman RA Jr, Levi AD, Liew SM, Louie PK, Ludwig SC, Maroon J, Miele VJ, Mullin J, Nemani VM, Phillips FM, Qureshi S, Riew KD, Rogers MA, Sasso RC, Smith GA, Turner JD, Vaccaro AR, Watkins RG 4th, Theodore N, Okonkwo DO, Sills AK, Davis GA. Cervical Disc Replacement in Athletes: A Modified Delphi Consensus Survey of Expert Opinion. *Spine J* [Online ahead of print], 2025.

Okonkwo DO, Mares A, Wasserman EB, Shrestha R, Terry DP, Solomon G, Sills A, Eagle SR. No Association Between Fencing Response After Concussion and Recovery Time, Concussion Severity, or Clinical Outcomes in Professional American Football Players. *Neurosurgery* [Online ahead of print], 2025.

Harrop JS, Kim KD, Okonkwo DO, Goldstein IM, Lee KS, Toselli RM. Acute Implantation of a Bioresorbable Polymer Scaffold in Patients With Complete Thoracic Spinal Cord Injury: A Randomized Controlled Trial (INSPIRE 2.0). *Neurosurgery* [Online ahead of print], 2025.

Paul DA, Cloney MB, Anand SK, Fernández-de Thomas R, Puccio L, Okonkwo DO, Buell TJ. Minimally Invasive Tubular Decompression for Ventral Cervical Epidural Abscess Using Stereotactic Navigation: 2-Dimensional Operative Video. *Oper Neurosurg* (Hagerstown) [Online ahead of print], 2025.

Harris M, Yue JK, Jain S, Sun X, Puccio AM, Gardner RC, Wang KKW, Okonkwo DO, Yuh EL, Mukherjee P, Nelson LD, Taylor SR, Markowitz AJ, Diaz-Arrastia R, Manley GT, Korley FK; TRACK-TBI Investigators. Effect of blood alcohol on the diagnostic accuracy of glial fibrillary acidic protein and ubiquitin carboxy-terminal hydrolase L1 for traumatic intracranial hemorrhage: A TRACK-TBI study. *Acad Emerg Med* [Online ahead of print], 2025.

David O. Okonkwo, MD, PhD

Sardi JP, Berlin C, Buell TJ, Yen CP, Okonkwo DO, Hamilton DK, Smith JS. Use of Supplemental Rod Constructs in Adult Spinal Deformity Surgery: A Review. *Oper Neurosurg* (Hagerstown) [Online ahead of print], 2025.

Onafowokan OO, Lafage R, Tretiakov P, Smith JS, Line BG, Diebo BG, Daniels AH, Gum JL, Protopsaltis TS, Hamilton DK, Buell T, Soroceanu A, Scheer J, Eastlack RK, Mullin JP, Mundis G, Hosogane N, Yagi M, Anand N, Okonkwo DO, Wang MY, Klineberg EO, Kebaish KM, Lewis S, Hostin R, Gupta MC, Lenke LG, Kim HJ, Ames CP, Shaffrey CI, Bess S, Schwab FJ, Lafage V, Burton D, Passias PG; International Spine Study Group. Comparative Analysis of Outcomes in Adult Spinal Deformity Patients with Proximal Junctional Kyphosis or Failure Initially Fused to Upper Versus Lower Thoracic Spine. *J Clin Med* 13(24):7722, 2024.

Kals M, Wilson L, Levey DF, Parodi L, Steyerberg EW, Richardson S, He F, Sun X, Jain S, Palotie A, Ripatti S, Rosand J, Manley GT, Maas AIR, Stein MB, Menon DK, Okonkwo DO; Genetic Associations In Neurotrauma (GAIN) Consortium (with contribution from the CENTER-TBI and TRACK-TBI studies). Genetic vulnerability and adverse mental health outcomes following mild traumatic brain injury: a meta-analysis of CENTER-TBI and TRACK-TBI cohorts. *EClinicalMedicine* 78:102956, 2024.

Snider SB, Deng H, Hammond FM, Kowalski RG, Walker WC, Zafonte RD, Okonkwo DO, Giacino JT, Puccio AM, Bodien YG. Time to Command-Following and Outcomes After Traumatic Brain Injury. *JAMA Netw Open* 7(12):e2449928, 2024.

Puccio EA, Brown JB, Callaway CW, Frisch AN, Okonkwo DO, Barton DJ. External evaluation of Brain Injury Guideline (BIG) low risk criteria for traumatic brain injury. *Am J Emerg Med* 86:104-109, 2024.

Passias PG, Tretiakov P, Onafowokan OO, Das A, Lafage R, Smith JS, Line BG, Nayak P, Diebo B, Daniels AH, Gum JL, Hamilton DK, Buell TJ, Soroceanu A, Scheer JK, Eastlack RK, Mullin JP, Schoenfeld AJ, Mundis GM, Hosogane N, Yagi M, Mummaneni PV, Chou D, Fu KM, Than KD, Anand N, Okonkwo DO, Wang MY, Klineberg E, Kebaish KM, Lewis S, Hostin R, Gupta M, Lenke L, Kim HJ, Ames CP, Shaffrey CI, Bess S, Schwab F, Lafage V, Burton D. When is staging complex adult spinal deformity advantageous? Identifying subsets of patients who benefit from staged interventions. *J Neurosurg Spine* 42(2):185-192, 2024.

Pease M, Arefan D, Hammond FM, Castellano JF, Okonkwo DO, Wu S. Computational Prognostic Modeling in Traumatic Brain Injury. *Adv Exp Med Biol* 1462:475-486, 2024.

Di Ieva A, Suero Molina E, Somerville MA, Beheshti A, Staartjes VE, Serra C, Theodore N, Elliott JM, Wesselink EO, Russo C, Pilitsis JG, Bennett CC, Wu S, Hammond FM, Lozano AM, Cusimano MD, Davidson JM, Castellano JF, Okonkwo DO, Arefan D, Lee CC, Zanier O, Da Mutten R, Matula C, Rutka JT, Pease M, Liu S, Stummer W, Matulionyte R, Yang H, Yuwen C, Cheng X, Fan H, Wang X, Ge Z, Cepeda S, Sheehan JP, Yang JY, Hamer RP, Cohen-Gadol A, Hansford JR, Savage G, Sowman PF, Stewart C, Kateb B, Sherif C, Perperidis A, Guller A, Hanft S, D'Amico RS, Sav A, Cong C, Song Y, Nicolosi F, Wiedmann MKH, Barone DG, Noorani I, Magnussen J, Krieg SM, Meling TR, De Ridder D, Lawton MT, Rosenfeld JV. Declaration of Computational Neurosurgery. *Adv Exp Med Biol* 1462:11-20, 2024.

Eagle SR, Sherry N, Kershaw EE, Basantani MK, Puccio A, McIntyre P, Henry RJ, Okonkwo DO. Impact of obese body mass index on inflammasome blood biomarkers and neurocognitive performance following traumatic brain injury with Glasgow coma scale 13 to 15. *J Neurol Sci* 464:123159, 2024.

David O. Okonkwo, MD, PhD

Yue JK, Kanter JH, Barber JK, Huang MC, van Essen TA, Elguindy MM, Foreman B, Korley FK, Belton PJ, Pisică D, Lee YM, Kitagawa RS, Vassar MJ, Sun X, Satris GG, Wong JC, Ferguson AR, Huie JR, Wang KKW, Deng H, Wang VY, Bodien YG, Taylor SR, Madhok DY, McCrea MA, Ngwenya LB, DiGiorgio AM, Tarapore PE, Stein MB, Puccio AM, Giacino JT, Diaz-Arrastia R, Lingsma HF, Mukherjee P, Yuh EL, Robertson CS, Menon DK, Maas AIR, Markowitz AJ, Jain S, Okonkwo DO, Temkin NR, Manley GT; TRACK-TBI Investigators. Clinical profile of patients with acute traumatic brain injury undergoing cranial surgery in the United States: report from the 18-centre TRACK-TBI cohort study. *Lancet Reg Health Am* 39:100915, 2024.

Ruiter-Lopez L, Donohue JK, Vempalli H, Thurston RC, Levine MD, Snedaker K, Donnelly KZ, Okonkwo DO, Anto-Ocrah M. Resilience and Concussion Recovery in Minority Women: Promoting Health Equity. *Neurotrauma Rep* 5(1):989-997, 2024.

Okonkwo DO, McAllister P, Achrol AS, Karasawa Y, Kawabori M, Cramer SC, Lai A, Kesari S, Frishberg BM, Groysman LI, Kim AS, Schwartz NE, Chen JW, Imai H, Yasuhara T, Chida D, Nejadnik B, Bates D, Stonehouse AH, Richardson RM, Steinberg GK, Poggio EC, Weintraub AH. Mesenchymal Stromal Cell Implants for Chronic Motor Deficits After Traumatic Brain Injury: Post Hoc Analysis of a Randomized Trial. *Neurology* 103(7):e209797, 2024.

Yue JK, Etemad LL, Elguindy MM, van Essen TA, Belton PJ, Nelson LD, McCrea MA, Vreeburg RJG, Gotthardt CJ, Tracey JX, Coskun BC, Krishnan N, Halabi C, Eagle SR, Korley FK, Robertson CS, Duhaime AC, Satris GG, Tarapore PE, Huang MC, Madhok DY, Giacino JT, Mukherjee P, Yuh EL, Valadka AB, Puccio AM, Okonkwo DO, Sun X, Jain S, Manley GT, DiGiorgio AM; TRACK-TBI Investigators; Badjatia N, Barber J, Bodien YG, Fabian B, Ferguson AR, Foreman B, Gardner RC, Gopinath S, Grandhi R, Russell Huie J, Dirk Keene C, Lingsma HF, MacDonald CL, Markowitz AJ, Merchant R, Ngwenya LB, Rodgers RB, Schneider ALC, Schnyer DM, Taylor SR, Temkin NR, Torres-Espin A, Vassar MJ, Wang KKW, Wong JC, Zafonte RD. Prior traumatic brain injury is a risk factor for in-hospital mortality in moderate to severe traumatic brain injury: a TRACK-TBI cohort study. *Trauma Surg Acute Care Open* 9(1):e001501, 2024.

O'Meara K, Puccio AM, Ren D, Deslouches S, Jha R, Okonkwo DO, Conley YP. The Influence of CYP2B6 Variants and Administration of Propofol on Patient Outcomes after Traumatic Brain Injury. *Neurotrauma Rep* 5(1):680-685, 2024.

Lonser RR, Theodore N, Falvey E, Harris OA, Okonkwo DO, Zuckerman SL. Introduction. Concussion and return to play. *Neurosurg Focus* 57(1):E1, 2024.

Chan AK, Sampath SG, Mummaneni PV, Park P, Uribe JS, Turner JD, Le VP, Eastlack RK, Fessler RG, Than KD, Fu KM, Wang MY, Kanter AS, Okonkwo DO, Nunley PD, Anand N, Mundis GM Jr, Passias PG, Bess S, Shaffrey CI, Chou D; International Spine Study Group. Prevalence and Prognosis of Coronal Malalignment Following Lateral Lumbar Interbody Fusion for Minimally Invasive Treatment of Adult Spinal Deformity. *Spine* (Phila Pa 1976) [Online ahead of print], 2024.

Martin G. Piazza, MD

Assistant Professor
Surgical Director, Pediatric Surgical Movement Disorders Program
Surgical Director, Pediatric Neurosurgery Spine Program

Martin Piazza, MD, is an assistant professor of pediatric neurosurgery in the University of Pittsburgh Department of Neurological Surgery. He is the surgical director of the Pediatric Surgical Movement Disorders and Neurosurgery Spinal Programs at UPMC Children's Hospital of Pittsburgh.

Martin G. Piazza, MD

A native of Washington D.C., Dr. Piazza received his undergraduate degree in chemistry with a certificate in materials science and engineering from Princeton University. He earned his medical doctorate from Wake Forest School of Medicine. During medical school, Dr. Piazza spent a year at the National Institutes of Health in Bethesda, Maryland as a fellow in the Medical Research Scholars Program. During this time, he performed research in the Surgical Neurology Branch focused on edema associated with pediatric and adult brain tumors. Dr. Piazza is a graduate of the University of North Carolina Hospitals neurosurgery residency program. He completed fellowships in pediatric neurosurgery at UPMC Children's Hospital of Pittsburgh and in pediatric spinal deformity at Shriners Children's Philadelphia.

As well as general pediatric neurosurgery, Dr. Piazza has a strong interest in the neurosurgical management of children with neurodevelopmental disabilities, including but not limited to spasticity, dystonia, and neuromuscular scoliosis. He has a long history of advocacy for this population; and he provides comprehensive, multidisciplinary care with colleagues from neurology, orthopedic surgery, and rehab medicine.

Dr. Piazza is committed to leveraging multidisciplinary care for his patients to improve quality of life and meet patient goals both in and out of the operating room. His research focuses on decision analysis to create tools that incorporate individual patient and family goals to determine the best treatment plans for children with neurodevelopmental disabilities and other complex neurosurgical diseases.

Outside of neurosurgery, Dr. Piazza enjoys spending time with his wife Kirstin, a nurse PhD, their son and dog.

Specialized Areas of Interest
Spasticity, pediatric movement disorders, pediatric spinal deformity, scoliosis, general pediatric neurosurgery.

Hospital Privileges
UPMC Children's Hospital of Pittsburgh

Professional Organization Membership
American Association of Neurological Surgeons
AANS/CNS Joint Section on Pediatric Neurosurgery

Education & Training
AB, Chemistry, Materials Science and Engineering, Princeton University, 2010
MS, Physiology & Biophysics, Georgetown University, 2011
Fellowship, NIH Medical Research Scholars Program, 2014
MD, Wake Forest School of Medicine, 2016
Fellowship, Pediatric Spinal Deformity, Shriners Children's Philadelphia
Residency, University of North Carolina Hospitals, 2023

Honors & Awards
Basic and Clinical Aspects of Dystonia Grant Award, Dystonia Medical Research Foundation, 2025
AANS/CNS Traveling Fellowship in Pediatric Neurosurgery, Primary Children's Hospital, 2022

Martin G. Piazza, MD

Publications: 2024-25

• Refereed Articles:

Piazza MG, Thambireddy S, Mandava A, Abel TJ, Kellogg RG. Intraventricular baclofen for the treatment of pediatric spasticity in cerebral palsy: technique and outcomes. *J Neurosurg Pediatr* 35(3):298-303, 2025.

Pan E, Piazza MG, Kellogg RJ, Wisniewski S, Abel TJ. A survey of preferences and expectations for surgical interventions targeting atonic seizures in Lennox-Gastaut syndrome. *Childs Nerv Syst* 40(8):2491-2495, 2024.

Piazza MG, Ravindra VM, Earl ER, Ludwick A, Sarriera Valentin G, Dailey AT, Kestle JRW, Russell KW, Brockmeyer DL, Iyer RR. Validation of the Subaxial Cervical Spine Injury Classification score in children: a single-institution experience at a level 1 pediatric trauma center. *J Neurosurg Pediatr* 34(4):365-372, 2024.

Ian F. Pollack, MD

A. Leland Albright Distinguished Professor
Vice Chair, Academic Affairs
Co-Director, Neurosurgical Oncology
Professor of Clinical and Translational Science

Ian Pollack, MD, is the A. Leland Albright Professor of Neurosurgery at the University of Pittsburgh School of Medicine.

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 410 papers in refereed journals, numerous book chapters and invited papers, and has edited three 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* as well as *Brain and Spinal Tumors of Childhood*, a multinational state-of-the-art text.

He is currently a site principal investigator on NIH grants focusing on novel therapies for brain tumors, including immunotherapy in childhood brain tumors. Dr. Pollack was named vice chair 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, and served on the American Board of Pediatric Neurosurgery from 2012-2022, and as chair the final year, and then served as chair of the ABPNS nominating committee. He is also a former director on the Accreditation Council for Pediatric Neurosurgery Fellowships.

Ian F. Pollack, MD

Dr. Pollack was chief of pediatric neurosurgery at UPMC Children's Hospital of Pittsburgh for over 20 years before passing those duties on to Taylor Abel, MD, on February 1, 2024.

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 Surgeon
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

Professional Activities
Institutional PI, Pediatric Brain Tumor Consortium
Steering Committee, Pediatric Brain Tumor Consortium
Executive Committee, Pediatric Brain Tumor Consortium
Co-Chair, Neurosurgery and Local Delivery Committee, Pediatric Brain Tumor Consortium
Institutional PI, Hydrocephalus Clinical Research Network
Institutional PI, Synostosis Research Group
Past-Chair and Nominating Committee Chair, American Board of Pediatric Neurological Surgery
Director, Accreditation Council for Pediatric Neurosurgery Fellowships

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

Ian F. Pollack, MD

Honors & Awards

Castle Connolly Top Doctors in America, 2002-25
Paul Steinbok Visiting Professorship, University of British Vancouver, 2024
Joan Venes Lectureship, University of Michigan, 2019
Albert Nelson Marquis Lifetime Achievement Award, Marquis Who's Who, 2018
Who's Who in America, Marquis, 2005-21
Who's Who in the World, Marquis, 2008-21
Castle Connolly's America's Top Cancer Doctors, 2005-21
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

News Media Appearances: 2024-25

"Classifying childhood brain cancers by immune response may improve diagnostics and treatments," *Science Daily*, March 19, 2025.

Publications: 2024-25

• Book Chapters:

McDowell MM, Pollack IF, Bykowski MR, Goldstein GA. Sagittal suture synostosis: Key points for Surgeons and Management Principles (Diagnosis, Surgical Considerations and Timing). In: *Neurosurgical Aspects of Craniosynostosis*, DiRocco F, Kestle J (eds), Chapter 7, Springer Nature, 2024.

Bykowski MR, McDowell MM, Smetona JT, Goldstein JA, Pollack IF. Spring-mediated cranioplasty for treatment of sagittal synostosis. In: *Neurosurgical Aspects of Craniosynostosis*, DiRocco F, Kestle J (eds), Chapter 41, Springer Nature, 2024.

Filbin M, Haberler C, Haas-Kogan DA, Pollack IF, Reardon DA, Alexandrescu S. Pediatric-type diffuse low-grade gliomas. In: *Oxford Textbook of Neuro-Oncology, 2nd Edition*, Batchelor T, Weller M (eds) Chapter 2.2, Oxford University Press, 2025.

Filbin M, Alexandrescu S, Haas-Kogan DA, Pollack IF, Reardon DA, Haberler C. Circumscribed astrocytic gliomas. In: *Oxford Textbook of Neuro-Oncology, 2nd Edition*, Batchelor T, Weller M (eds) Chapter 2.4, Oxford University Press, 2025.

• Refereed Articles:

Nisboym M, Sneiderman CT, Jaswal AP, Xiong Z, Vincze SR, Sever RAE, Zou H, Frederico SC, Agnihotri S, Hu B, Drappatz J, Pollack IF, Kohanbash G, Raphael I. Assessment of anti-CD69 antibody alone and in combination with anti-PD-1 in murine GBM. *Expert Rev Clin Immunol* 21(2):239-247, 2025.

Lee JJY, Tao R, You Z, Haldipur P, Farooq H, Hendriske LD, Abeysundara N, Richman CM, Want EY, Wu X, Rasnitsyn A, Bailey S, Cavalli FMG, Morrissy S, Garzia L, Michealraj KA, Visvanathan A, Fong V, Palotta J, Suarez R, Livingston BG, Luu B, Daniels C, Loukides M, Pfister SM, Ponce de Leon FC, Perezpena-Diazconti M, Lach B, Singh SK, Joyner A, Nunes S, Leary S, Cho B-Y, Kim S-K, Wang K-C, Lee J-Y, Tominaga T, Weiss WA, Phillips JJ, Shizhong D, Zadeh G, Saad AG, Laszlo B, Klekner A, Pollack IF, Hamilton RL, Ra Y, Grajkowska WA, Perek-Polnik M, Thompson RC, Kenney AM, Cooper MK, Mack SC, Jabado J, Lupien M, Gallo M, Suzuki H, Millen K, Huang F, Northcott PA, Taylor MD. ZIC1 is context dependent cancer driver in the rhombic lip. *Nat Genet* 57(1):88-102, 2025.

Ian F. Pollack, MD

Isaacs A, Shannon C, Browd S, Hauptman J, Holubhov R, Jensen H, Kulkarni A, McDonald PMC, McDowell M, Naftel RP, Nunn N, Pindrik J, Pollack IF, Reeder R, Riva-Cambrin J, Rozzelle D, Rocque B, Strahle J, Tamber MS, Whitehead WE, Kestle JR, Limbrick D, Wellons J. Neurodevelopmental outcomes of permanent and temporary CSF diversion in post-hemorrhagic hydrocephalus: A Hydrocephalus Clinical Research Network Study. *J Neurosurg Pediatr* 35(4):315-326 2025.

Bonfield CM, Alexander AL, Birgfield CB, Couture DE, David LR, French B, Gociman B, F JA, Golinko MS, Kestle JRW, Lee A, Magge SN, Pollack IF, Rottgers SA, Runyan CM, Smyth MD, Vyas R, Wilkinson CC, Skolnick GB, Strahle JM, Patel KB. Sports after single-suture synostosis surgery: A survey of the Synostosis Research Group (SynRG) members. *Neurosurg Focus* 58(1):E3, 2025.

Yengo-Kahn A, Wellons J, Jensen H, Kulkarni A, Chu JA, Hauptman J, Isaacs A, Jackson E, McDonald P, McDowell M, Pollack IF, Reeder R, Riva-Cambrin J, Rocque B, Strahle J, Tamber MS, Kestle J. Reimagining durability of hydrocephalus treatment using conditional survival. *J Neurosurg Pediatr* 35(4):327-337 2025.

Raphael I, Xiong Z, Sneiderman CT,Raphael RA, Jackson SA, Mash M, Schwegman L, O'Brien C, Anderson KJ, Sever RAE, Hendrickse LD, Vincze SR, Diaz A, Felker J, Nechemia-Arbely Y, Hu B, Agnihotri S, Kamulla US, Uttam S, Hwang EI, Drappatz J, Rich JN, Broniscer A, Pierce TM, Taylor MD, Nisboym M, Forsthuber TG, Pollack IF, Chikina M, Rajasundaram R, Kohanbash G. T cell receptor landscape of childhood brain tumors. *Sci Transl Med* 19;17(790):eadp0675, 2025.

Rocque BG, Jensen H, Reeder RW, Rozzelle CJ, Kulkarni AV, Pollack IF, McDowell M, Naftel RP, Jackson EM, Whitehead WE, Pindrik JA, Isaacs A, Strahle JM, McDonald PJ, Tamber MS, Hankinson TC, Browd SR, Hauptman JS, Krieger MD, Chu J, Limbrick DD Jr, Holubkov R, Kestle JRW, Wellons JC III. Racial disparities in hydrocephalus mortality and shunt revision: A study from the Hydrocephalus Clinical Research Network. *J Neurosurg Pediatr* 35(6):554-5625, 2025.

Mochizuki AY, Hummel TR, Cripe T, Fouladi M, Pollack IF, Mitchell D, Young Poussaint, T, Onar-Thomas A, Pillay-Smiley N, DeWire-Schottmiller M, Stevenson CB. Intratumoral/peritumoral herpes simplex virus-1 mutant HSV1716 in pediatric patients with refractory or recurrent high-grade gliomas: A report of the Pediatric Brain Tumor Consortium. *Onco*, 5, 1. https://doi.org/10.3390/onco5010001, 2025.

Xiong Z, Walsh KM, Sneiderman CT, Nisnboym M, Hadjipaniyas CG, Agnihotri S, Eagar TN, Wang TN, Pollack IF, Forsthuber TG, Li X, Raphael I, Kohanbash G. Immuno-epidemiological mapping of HLA diversity across glioma patient cohorts. *Neuro Oncol* [Online ahead of print], 2025.

Fangusaro J, Onar-Thomas A, Poussaint TY, Lensing S, Ligon AH, Lindeman N, Banerjee A, Kilburn LB, Lenzen A, Pillay-Smiley N, Pollack IF, Robison NJ, Partap S, Qaddoumi I, Landi D, Jones DTW, Stewart CF, Fouladi M, Dunkel IJ. Report on Pediatric Brain Tumor Consortium (PBTC)-029, A phase 2 study of Selumetinib for recurrent/progressive pediatric low-grade glioma: Strata 2, 5, and 6 with long-term survival outcomes on strata 1, 3, and 4. *Neuro Oncol* [Online ahead of print], 2025.

Jackson EM, Jensen H, Reeder RW, Chiarelli PA, Chu JK, Hankinson TC, Hauptman JS, Isaacs A, Kulkarni AV, Limbrick DD Jr, McDonald PJ, Pindrik J, Pollack IF, Rocque BG, Rozelle C, Strahle J, Tamber MS, Wellons JC III, Kestle JRW, Whitehead WE, Riva-Cambrin J. Complex shunt system comparison: An observational study by the Hydrocephalus Clinical Research Network. *J Neurosurg Pediatr* [Online ahead of print], 2025.

Ian F. Pollack, MD

Xiong Z, Sneiderman CT, Kuminkoski C, Reinheimer J, Schwegman L, Sever RA, Habib A, Hu B, Agnihotri S, Rajasundaram D, Zinn PO, Forssthuber TG, Pollack IF, Li X, Raphael I, Kohanbash G. Transcript-targeted antigen mapping reveals the potential of POSTN splicing junction epitopes in glioblastoma immunotherapy. *Genes Immun* [Online ahead of print], 2025.

Mazewski C, Leary SES, Kang G, Li BK, Kellie S, Hayes L, Shaw D, Ho B, Reddy A, Gossett J, Burger PC, Judkins AR, Aridgides P, Geyer JR, Gajjar A, Pollack IF, Fouladi M, Huang A. Phase 3 randomized trial of high-dose methotrexate for young children with high-risk embryonal brain tumors: A report from the Children's Oncology Group. *Neuro Oncol* [Online ahead of print], 2025.

Frederico SC, Raphael I, Nisnboyn M, Huq S, Shlegel BT, Sneiderman CT, Jackson SA, Jain A, Olin MR, Rood BR, Pollack IF, Hwang EI, Rajasundaram R, Kohanbash G. Transcriptomic observations of intra and extracellular immunotherapy targets for pediatric brain tumors. *Expert Rev Clin Immunol* 20(11):1411-1420, 2024.

Pollack IF, Raphael I, Felker J, Kohanbash G. Immunotherapy for pediatric low-grade gliomas. *Childs Nerv Syst* 40(10):3263-3275, 2024.

Malholtra AK, Kulkarni AV, Verhey LH, Reeder RW, Riva-Cambrin J, Jensen H, Pollack IF, Rocque BG, Tamber MS, McDonald PJ, Krieger MD, Pindrik JA, Hauptman JS, Browd SR, Whitehead WE, Jackson EM, Wellons JC III, Hankinson TC, Chu J, Limbrick DD, Strahle JM, Kestle JRW. Does machine learning improve prediction accuracy of the endoscopic third ventriculostomy score? A contemporary Hydrocephalus Clinic Research Network Study. *Childs Nerv Syst* 10;41(1):42 2024.

Research Activities

Dr. Pollack's group has extended their studies that define the mechanisms underlying resistance in childhood and adult malignant gliomas. They have expanded the repertoire of "drug-resistance" tumor model systems, paired with treatment naïve counterparts. The group has leveraged this unique resource to identify the glycolytic and pentose phosphate metabolic pathways as a key mediator through which multiple cell lines achieve treatment resistance. Using RNA sequencing studies and pathway analysis, Dr. Pollack and his group have identified several common molecular drivers of this process. Gene set enrichment analysis has demonstrated that these mediators hijack glycolytic signaling and produce as a pseudo-hypoxic phenotype. Metabolomic analysis of downstream signaling pathway components have shown an involvement of both glycolytic intermediates and mitochondrial energy metabolites that are amenable to therapeutic intervention. These observations have provided a basis for pharmacological studies that incorporate 2-deoxyglucose for reversing resistance as well as potentiating the efficacy of cytotoxic chemotherapy agents by virtue of their inhibition of DNA synthesis. Metabolic manipulations that may provide novel approaches for promoting tumor cell killing are being tested in animal models. Dr. Pollack's group has demonstrated dramatic enhancement in survival with treatment in one orthotopic xenograft model and are planning studies using other models and dietary modulation, which may open up several novel strategies for clinical therapies. The group has also demonstrated that mechanisms of resistance in childhood malignant gliomas overlap between treatment agents, suggesting that tumors follow common mechanisms to rapidly achieve a resistant phenotype, regardless of treatment modality, which provides common strategies for counteracting this development. An ancillary observation is that tumor cells exhibit cell-to-cell transfer, both between live and dying cells that are treated with therapeutic agents, which may provide a way in which a population of cells acquires resistance capabilities from neighboring cells. This has provided a basis for examining whether resistance is a clonal or epigenetic phenomenon, as assessed by RNA sequencing profiles.

Ian F. Pollack, MD

Dr. Pollack and his group have also continued their NIH- and foundation-funded activities that focus on immunotherapy for pediatric brain tumors. Accrual continues on ongoing clinical trials for recurrent low-grade gliomas and ependymoma. He also continues to serve as institutional principal investigator as NIH- and foundation-funded studies of the Pediatric Brain Tumor Consortium, Hydrocephalus Clinical Research Network, and Children's Brain Tumor Network.

Ava Puccio, RN, PhD

Associate Professor
Co-Director, Neurotrauma Clinical Trials Center

Ava M. Puccio, RN, PhD, is an associate professor with tenure 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 in neuroscience and nursing as well as her doctoral degree from the University of Pittsburgh. Her dissertation examined focusing on brain oxygenation and oxidative stress biomarkers. She has continued this translational work in the severe traumatic brain injury (TBI) population having an instrumental role in the current Phase 3 clinical trial, 'Brain Oxygenation Optimization in Severe TBI Phase 3 (BOOST3)' study, comparing intracranial pressure (ICP) monitoring only to ICP and brain oxygenation therapies. She was the recipient of a K99/R00 award from the National Institutes of Health exploring the genetic underpinnings of secondary injury. She has over 25+ years of clinical trial design, involvement and management, with several completed and ongoing traumatic brain and spine injury research studies.

As an early adopter of team science, Dr. Puccio has been involved in the Transforming Research and Clinical Knowledge in TBI (TRACK-TBI) network since its inception and is the principal investigator of the National TBI Biospecimens Repository. She is also instrumental in multiple collaborative initiatives in biomarker exploration and validation within TRACK-TBI, BioBOOST, BioHOBIT and others.

Dr. Puccio's specialized areas of interest are focused on improving outcomes in traumatic brain injury and spinal cord injury patients, with clinical venues of controlled normothermia, mechanisms of brain oxygenation and exploring biomarker and genetic expression.

Dr. Puccio values training the next generation of scientists. Her previous mentees include undergraduates, medical students, residents, clinical fellow and academic postdoctoral students.

In June of 2025, Dr. Puccio received the Mary Ann Liebert Award for Science from the National Neurotrauma Society. This career achievement award recognizes a female researcher who has made notable scientific contributions in the field of neurotrauma and who has made recent impactful contributions to education, mentoring or advocacy.

Dr. Puccio has leadership positions in TRACK-TBI, Neurocritical Care Society and is a reviewer for the NIH, Department of Defense and several foundations. She is involved in many working groups including the NINDS Common Data Element (CDE) Working Group TBI.

Specialized Areas of Interest
Traumatic brain injury research; biomarkers.

Board Certifications
RN License: Pennsylvania

Ava Puccio, RN, PhD

Hospital Privileges
UPMC Mercy
UPMC Presbyterian

Professional Activities
Guest Lecturer, Pathophysiology Across the Lifespan, University of Pittsburgh
Copeland Foundation Grant Committee, 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)
Executive and Steering Committee, TRACK-TBI, University of California, San Francisco

Professional Organization Membership
International Initiative for Traumatic Brain Injury Research
National Neurotrauma Society
Neurocritical Care Society
Sigma Theta Tau International Nursing Honor Society
Society of Critical Care Medicine
Women in Neurotrauma Research

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

Honors & Awards
Mary Ann Liebert, Inc. (formerly known as Rosand Franklin award), for Neurotrauma Research Excellence, 2025
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: 2024-25
• Refereed Articles:
Manley GT, Dams-O'Connor K, Alosco ML, Awwad HO, Bazarian JJ, Bragge P, Corrigan JD, Doperalski A, Ferguson AR, Mac Donald CL, Menon DK, McNett MM, van der Naalt J, Nelson LD, Pisică D, Silverberg ND, Umoh N, Wilson L, Yuh EL, Zetterberg H, Maas AIR, McCrea MA; NIH-NINDS TBI Classification and Nomenclature Initiative. A new characterisation of acute traumatic brain injury: the NIH-NINDS TBI Classification and Nomenclature Initiative. *Lancet Neurol* 24(6):512-523, 2025.

Bazarian JJ, Zetterberg H, Buki A, Dengler BA, Diaz-Arrastia R, Korley FK, Lazarus R, Meier TB, Mondello S, Moritz K, Okonkwo DO, Papa L, Phillips JB, Posti JP, Puccio AM, Sloley S, Steyerberg E, Wang KK, Awwad HO, Dams-O'Connor K, Doperalski A, Maas AIR, McCrea MA, Umoh N, Manley GT. Blood-Based Biomarkers for Improved Characterization of Traumatic Brain Injury: Recommendations from the 2024 National Institute for Neurological Disorders and Stroke Traumatic Brain Injury Classification and Nomenclature Initiative Blood-Based Biomarkers Working Group. *J Neurotrauma* 42(13-14):1065-1085, 2025.

Ava Puccio, RN, PhD

Alsaadi N, Younes R, Killinger JR, Hoteit L, Puccio AM, McIntyre P, Raymond O, Filicky A, Hahner T, Agnone AG, Vincent LE, Srinivasan A, Zarisfi M, Dishong DM, Abdullah A, Arivudainambi A, Kar R, Mihalko EP, Loughran P, Wisniewski SR, Luther JF, Spinella PC, Okonkwo D, Guyette FX, Sperry JL, Shea SM, Neal MD. Predictive value of platelet function assays in traumatic brain injury patients on antiplatelet therapy. *J Trauma Acute Care Surg* 98(4):550-556, 2025

Neal MD, Okonkwo DO, Guyette FX, Luther JF, Vincent LE, Puccio AM, Harner AM, Agnone AG, Brubaker DP, Love ET, Leeper CM, Brown JB, Forsythe R, Spinella PC, Yazer MH, Wisniewski SR, Sperry JL; and the Cold Stored Platelet for Traumatic Brain Injury (CRISP-TBI) study group. Early Cold-stored Platelet Transfusion following Traumatic Brain Injury: A Randomized Clinical Trial *Ann Surg* 281(5):796-805 2025.

Serlin Y, Imtiaz H, Maclean MA, Pease MW, Okonkwo DO, Puccio AM, Eagle S, Castellano JF, Inati SK, Friedman A. Paroxysmal Cortical Slowing Predicts Posttraumatic Epilepsy After Severe Traumatic Brain Injury. *Neurocrit Care* [Online ahead of print], 2025.

Harris M, Yue JK, Jain S, Sun X, Puccio AM, Gardner RC, Wang KKW, Okonkwo DO, Yuh EL, Mukherjee P, Nelson LD, Taylor SR, Markowitz AJ, Diaz-Arrastia R, Manley GT, Korley FK; TRACK-TBI Investigators. Effect of blood alcohol on the diagnostic accuracy of glial fibrillary acidic protein and ubiquitin carboxy-terminal hydrolase L1 for traumatic intracranial hemorrhage: A TRACK-TBI study. *Acad Emerg Med* [Online ahead of print], 2025.

Eagle SR, Svirsky SE, Puccio AM, Borrasso A, Edelman K, Beers S, Agoston D, Soose R, Collins M, Kontos A, Schneider W, Okonkwo DO. Predictive Blood Biomarkers of Targeted Intervention for Chronic Mental Health Symptoms following Traumatic Brain Injury. *J Neurotrauma* 42(5-6):e454-e460, 2025.

Snider SB, Deng H, Hammond FM, Kowalski RG, Walker WC, Zafonte RD, Okonkwo DO, Giacino JT, Puccio AM, Bodien YG. Time to Command-Following and Outcomes After Traumatic Brain Injury *JAMA Netw Open* 7(12):e2449928, 2024.

Yue JK, Kanter JH, Barber JK, Huang MC, van Essen TA, Elguindy MM, Foreman B, Korley FK, Belton PJ, Pisică D, Lee YM, Kitagawa RS, Vassar MJ, Sun X, Satris GG, Wong JC, Ferguson AR, Huie JR, Wang KKW, Deng H, Wang VY, Bodien YG, Taylor SR, Madhok DY, McCrea MA, Ngwenya LB, DiGiorgio AM, Tarapore PE, Stein MB, Puccio AM, Giacino JT, Diaz-Arrastia R, Lingsma HF, Mukherjee P, Yuh EL, Robertson CS, Menon DK, Maas AIR, Markowitz AJ, Jain S, Okonkwo DO, Temkin NR, Manley GT; TRACK-TBI Investigators. Clinical profile of patients with acute traumatic brain injury undergoing cranial surgery in the United States: report from the 18-centre TRACK-TBI cohort study. *Lancet Reg Health Am* 39:100915, 2024

Yue JK, Etemad LL, Elguindy MM, van Essen TA, Belton PJ, Nelson LD, McCrea MA, Vreeburg RJG, Gotthardt CJ, Tracey JX, Coskun BC, Krishnan N, Halabi C, Eagle SR, Korley FK, Robertson CS, Duhaime AC, Satris GG, Tarapore PE, Huang MC, Madhok DY, Giacino JT, Mukherjee P, Yuh EL, Valadka AB, Puccio AM, Okonkwo DO, Sun X, Jain S, Manley GT, DiGiorgio AM; TRACK-TBI Investigators; Badjatia N, Barber J, Bodien YG, Fabian B, Ferguson AR, Foreman B, Gardner RC, Gopinath S, Grandhi R, Russell Huie J, Dirk Keene C, Lingsma HF, MacDonald CL, Markowitz AJ, Merchant R, Ngwenya LB, Rodgers RB, Schneider ALC, Schnyer DM, Taylor SR, Temkin NR, Torres-Espin A, Vassar MJ, Wang KKW, Wong JC, Zafonte RD. Prior traumatic brain injury is a risk factor for in-hospital mortality in moderate to severe traumatic brain injury: a TRACK-TBI cohort study *Trauma Surg Acute Care Open* 9(1):e001501, 2024.

Ava Puccio, RN, PhD

O'Meara K, Puccio AM, Ren D, Deslouches S, Jha R, Okonkwo DO, Conley YP. The Influence of CYP2B6 Variants and Administration of Propofol on Patient Outcomes after Traumatic Brain Injury. *Neurotrauma Rep* 5(1):680-685, 2024.

Sperry JL, Luther JF, Okonkwo DO, Vincent LE, Agarwal V, Cotton BA, Cannon JW, Schreiber MA, Moore EE, Namias N, Minei JP, Urbanek KL, Yazer MH, Puccio AM, Fox EE, Brown JB, Neal MD, Guyette FX, Wisniewski SR; on behalf of the SWAT Study Group; MACRO Research Specialists; MACRO Clinical Trials Research Associates. Early GFAP and UCH-L1 point-of-care biomarker measurements for the prediction of traumatic brain injury and progression in patients with polytrauma and hemorrhagic shock. *J Neurosurg* [Online ahead of print], 2024.

Research Activities

Dr. Puccio is conducting many cutting-edge biomarker and high definition fiber tracking imaging and observational research studies. She is very involved in the Transforming Research and Clinical Knowledge in TBI (TRACK-TBI) consortium and was awarded a Department of Defense grant as principal investigator of the National TBI Biospecimens 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.

Her expertise in the blood-based biomarker field has led to her recognition as a world-renowned expert in the field and she recently served on the National Institute of Neurological Disorders and Stroke TBI Classification and Nomenclature Workshop. She also is the contact principal investigator for a NIH-funded U01 study, 'INFORM-TBI: Analytical Validation Study to Promote Clinical Implementation of Emerging TBI Biomarkers', which aims to overcome reproducibility challenges of biomarkers across platforms, including understanding the effect of pre-analytical and analytical factors.

Analyses from repository 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 24 hours of a suspected TBI in determining the need for a brain CT scan, and is the central PI of the biorepository for a FDA-pivotal trial with Abbott Laboratories which results are pending. The success of this biorepository has also spring-boarded opportunities to acquire additional ongoing grant support through the DoD, as the biorepository for the biomarkers in the Brain Oxygenation Optimization Study Trial (Bio- BOOST), as well as TRACK-TBI Geriatric Initiative (NIH funded) to further define the elderly TBI cohort and TRACK Precision Medicine an initiative for personalized care in TBI.

Charles E. Romero, MD

Clinical Assistant Professor
Medical Director, UPMC Hamot Comprehensive Stroke Program

Charles E. Romero, MD, joined the University of Pittsburgh Department of Neurological Surgery in 2023 as a vascular and CAST-accredited neuroendovascular surgeon-neurologist specializing in the treatment of vessel diseases of the brain, including aneurysms, stroke, carotid artery stenosis, arteriovenous malformations and fistulas, cavernomas, and intracerebral hemorrhage using minimally invasive techniques. As director of UPMC Hamot's comprehensive stroke program, Dr. Romero is responsible for leading a team that provides stroke care, develops policies and procedures, and ensures the highest quality of care. His team is also working vigorously to improve patient outcomes and educate patients and their families about cerebrovascular disease.

Charles E. Romero, MD

Dr. Romero completed his undergraduate work at Rutgers University. He received his medical degree from the Universidad Autonoma de Guadalajara School of Medicine. He then completed an academic year of supervised clinical education and fifth pathway certification at New York Medical College. Dr. Romero completed the neurology residency program at Tufts Medical Center in Boston followed by fellowships in both stroke and interventional neuroradiology at Lahey Clinic Hospital & Medical Center in Burlington, Massachusetts.

Dr. Romero has published numerous papers and book chapters, participated in clinical trials, and he has lectured at national conferences, medical institutions, and academic gatherings covering endovascular stroke care, groundbreaking research, and preventive health care. His research interests include clinical outcomes in the treatment of cerebrovascular disease and stroke prevention.

Specialized Areas of Interest
Ischemic stroke, intracranial aneurysms, arteriovenous malformations, arteriovenous fistulas, carotid stenosis, intracranial arterial stenosis, epistaxis, tumor embolization and minimally invasive treatment of spine fractures.

Board Certifications
American Board of Psychiatry and Neurology

Hospital Privileges
UPMC Hamot

Professional Organization Membership
American Academy of Neurology
American Association of Neurological Surgeons
Society of Neurointervention
Society of Vascular and Interventional Neurology
World Federation of Interventional and Therapeutic Neuroradiology

Education & Training
BS, Biology, Rutgers University, 1992
Postbaccalaureate Premedical Certification, Columbia University, 1994
MD, Universidad Autonoma de Guadalajara School of Medicine, 1999
Fifth Pathway Certification, New York Medical College, 2000
Residency, Neurology, Tufts Medical Center, 2005
Fellowship, Stroke, Lahey Clinic Hospital & Medical Center, 2006

Honors & Awards
Patient Awards, *U.S. News & World Report*, 2011

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, Pennsylvania 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.

Michael J. Rutigliano, MD

His clinical interests include a wide range of neurosurgical diseases, focusing mostly in the areas of spinal and peripheral nerve disorders, and concussion 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

Education & Training
BS, Chemistry, University of Pittsburgh, 1985
MD, University of Pittsburgh, 1989
MBA, Joseph Katz School of Business, University of Pittsburgh, 1994
Residency, Neurosurgery, University of Pittsburgh, 1996

Natalie Sherry, PsyD, ABPP-CN

Assistant Professor

Natalie Sherry, PsyD, ABPP-CN, is a board-certified clinical neuropsychologist and assistant professor in the Department of Neurological Surgery at the University of Pittsburgh. She provides clinical services across the Departments of Neurological Surgery, Neurology, and Hematology/Oncology at UPMC. She serves as chief of clinical psychology at UPMC Shadyside and is a lead member of the steering committee for the UPMC/Pitt Psychology Consortium.

Natalie Sherry, PsyD, ABPP-CN

Dr. Sherry specializes in the assessment of cognitive function in neurosurgical and neurological patients with particular expertise in brain tumor. She co-developed the perioperative cognitive mapping protocol for UPMC's Adult Neurosurgical Oncology Program and conducts intraoperative cognitive mapping for awake brain surgeries. Her academic interests focus on cognitive outcomes in patients with cancer and neurological conditions.

Dr. Sherry earned her undergraduate degree in neuroscience from the University of Pittsburgh, graduating summa cum laude. She holds a joint degree from Widener University including a doctorate in clinical psychology and a master's degree in business administration. She completed her internship in the Department of Neurology at the Hospital of the University of Pennsylvania and in the Department of Physical Medicine and Rehabilitation at Temple University Hospital. Her postdoctoral fellowship in clinical neuropsychology was completed at the UPMC Sports Concussion Program in the Department of Orthopaedic Surgery.

Specialized Areas of Interest
Neuropsychology

Board Certifications
American Board of Clinical Neuropsychology

Professional Organization Membership
American Academy of Clinical Neuropsychology
American Psychological Association
International Neuropsychological Society
National Academy of Neuropsychology
Pennsylvania Psychological Association
Sport Neuropsychology Society

Professional Activities
Medical Advisory Board, Parkinson's Foundation Western Pennsylvania
Steering Committee, UPMC/Pitt Psychology Consortium
Finance Committee, Sports Neuropsychology Society

Education & Training
BS, Neuroscience, University of Pittsburgh, 2011
MA, Clinical Psychology, 2014
MBA, Widener University, 2016
PsyD, Widener University, 2016
Clinical Neuropsychology Fellowship, UPMC, 2018

Honors & Awards
Senior Researcher Award, American Academy of Child & Adolescent Psychiatry, 2019

Jeremy G. Stone, MD

Clinical Assistant Professor
Director Cerebrovascular Surgery, UPMC Hamot

Jeremy G. Stone, MD, is a board-certified neurosurgeon with CAST-accredited subspecialty fellowship training in neuroendovascular surgery, completing both residency and fellowship at the University of Pittsburgh. He currently practices with UPMC Hamot Neurosurgery and Neurointervention in Erie, Pennsylvania serving as clinical assistant professor and director of cerebrovascular surgery.

Jeremy G. Stone, MD

Dr. Stone enjoys general neurosurgery with clinical focus on open cerebrovascular, neuro-endovascular, minimally invasive techniques, and spine deformity. He also leads scientific discovery with participation as site principal investigator in several clinical trials.

Specialized Areas of Interest
Cerebrovascular (open and endovascular neurosurgery); degenerative spine disease and spinal deformity with emphasis on minimally invasive 360-degree approaches for deformity correction; stroke.

Board Certifications
American Board of Neurological Surgery

Hospital Privileges
UPMC Hamot

Professional Organization Membership
Alpha Omega Alpha
American Association of Neurological Surgery
AANS/CNS Cerebrovascular Section
Congress of Neurological Surgeons
North American Spine Society
Society of Neurointerventional Surgeons

Professional Activities
UPMC Neurosurgery and Neurology Value Analysis Committee

Education & Training
BS, Biology/Psychology, Case Western Reserve University, 2009
MD, University of Hawaii, 2014
CAST-Accredited Fellowship, Neuroendovascular Surgery, University of Pittsburgh, 2020
Residency, Neurological Surgery, University of Pittsburgh, 2021

Honors & Awards
Best Off-Service Teacher Award, Orthopedic Surgery Residency, UPMC Hamot, 2021
UPMC Medical Education LEAP Award for Patient Safety and Quality Improvement, 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
Top Score, American Board of Neurological Surgery Written Board Exam, 2018
Frank and Mary McDowell Award for Excellence in Surgery, 2014
Windsor and Mary Cutting Excellence in the Basic Sciences Award, 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
Po'okela and Noi'i Award for Outstanding Research, 2014
American College of Physicians Bernard Him Award for Top Performance in Internal Medicine, 2013

Research Activities
• Multicenter, international, randomized, placebo controlled, double-blind, parallel group and event driven Phase 3 study of the oral FXIa inhibitor asundexian (BAY 2433334) for the prevention of ischemic stroke in male and female participants aged 18 years and older after an acute non-cardioembolic ischemic stroke or high-risk TIA (OCEANIC-STROKE).

Jeremy G. Stone, MD

Phase 3 program of the Oral faCtor Eleven A iNhibitor asundexLan as novel anti-thrombotiC STROKE study.

• Comparison of Anti-coagulation and anti-Platelet Therapies for Intracranial Vascular Atherostenosis (CAPTIVA).

Two-stage Phase III trial randomizing subjects with stroke attributed to 70-99% intracranial atherosclerotic stenosis to 1. ticagrelor + aspirin, 2. low dose rivaroxaban + aspirin, 3. clopidogrel + aspirin.

• Protection against Emboli during caRotid artery stenting using a 3-in-1 delivery system comprised oF a pOst-dilation balloon, integRated eMbolic filter, and A Novel Carotid stEnt II (PERFORMANCE II).

Prospective, single-arm, multicenter clinical trial to evaluate the safety and effectiveness of the Neuroguard IEP System for the treatment of carotid artery stenosis.

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, machine learning and artificial intelligence. 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 diagnosis, artificial intelligence.

Professional Organization Membership

American Institute for Medical and Biological Engineering
Institute of Electrical and Electronics Engineers

Education & Training

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

Publications: 2024-25

• Refereed Articles:

Osei PK, McCrory MA, Steiner-Asiedu M, Sazonov E, Sun M, Jia W, Baranowski T, Frost G, Lo B, Anderson AK. Food-related behaviors of rural (Asaase Kooko) and peri-urban (Kaadjanor) households in Ghana. *Front Nutr* 6:12:1523793, 2025.

Li B, Sun M, Mao Z-H, Jia W. Dining bowl modeling and optimization for single-image-based dietary assessment. *Sensors* (Basel) 19;24(18):6058, 2024.

Mingui Sun, PhD

Lo FP, Qiu J, Jobarteh ML, Sun Y, Wang Z, Jiang S, Baranowski T, Anderson AK, McCrory MA, Sazonov E, Jia W, Sun M, Steiner-Asiedu M, Frost G, Lo B. AI-enabled wearable cameras for assisting dietary assessment in African populations. *NPJ Digit Med* 7(1):356, 2024.

Osei PK, Anderson AK, Baranowski T, Domfe CA, Frost G, Gallo S, Gao J, Hall DB, Lo B, McCrory MA, Sazonov E, Steiner-Asiedu M, Sun M. Potential of Automatic Ingestion Monitor (AIM-2) for Dietary Assessment in Rural and Urban Children in Ghana. *Current Developments in Nutrition* 9(Suppl 2):106316, 2025.

Zheng Y, Jia W, Wu B, Li B, Chen K, Zweig S, Sun M. Pilot Study on AI-Based Automatic Carbohydrate Counting for Chinese Americans with Type 2 Diabetes *Diabetes* 74(Suppl 1):585-P, 2025.

Research Activities

• Automatic Carbohydrate Counting Using AI and Large Language Models

Accurate carbohydrate counting (CC) is one of the core dietary management skills for effective glycemic control in individuals with diabetes. However, the traditional approach largely relies on the patients' estimation of food portion sizes and carbohydrate amounts. Thus, this approach is subjective and burdensome.

Recently, an image-based approach has been developed in which patients take pictures of their food using a smartphone or a wearable device. The resulting images are processed to identify food items, their portion sizes, and the amounts of carbohydrates consumed. Although the image approach is more objective, it is still burdensome due to the required manual procedures to handle image data and search a food database.

More recently, AI technologies, especially the Large Language Models (LLMs), emerged which shined new lights on CC. LLMs can automatically recognize foods from images, estimate their portions, and then produce CC results without requiring a database lookup. Although the AI approach holds a strong promise for CC, the accuracy of the current LLM results remains unsatisfactory.

Dr. Sun is currently investigating two primary causes of errors, one is a questionable food shape fitting method utilized by LLMs to estimate food portion size, and the other is an over-reliance of LLMs on common object dimensions obtained from training data. Dr. Sun believes that the accuracy of the LLM-based CC system can be improved substantially by mathematical modeling the food shape and supplying case-specific information to LLMs through appropriately designed prompts.

Fadi Sweiss, MD

Clinical Assistant Professor

Fadi Sweiss, MD, joined the University of Pittsburgh Department of Neurological Surgery in August of 2020, practicing at UPMC Williamsport in north central Pennsylvania. He specializes in the diagnosis and treatment of degenerative, traumatic, and oncologic spinal conditions using traditional, open surgical techniques and advanced, minimally invasive techniques.

Dr. Sweiss received his medical degree from Northeast Ohio Medical University, Rootstown, Ohio, and completed his residency in neurosurgery at George Washington University Hospital, Washington, D.C.

"As long as I can remember, I've wanted to be a doctor," said Sweiss. "My brother is a neurosurgeon and the field fascinated me. I enjoy being able to care for and build relationships with

Fadi Sweiss, MD

my patients. It never ceases to amaze me how the proper care can transform and change a patient's life and that's what it is all about for me."

Specialized Areas of Interest
Complex spine disorders; adult spine revision surgery and deformity correction, cervical, thoracic and lumbar surgery; neurotrauma.

Education & Training
BS, Biology, Virginia Tech, 2006
MD, Northeast Ohio Medical University, 2013
Residency, George Washington University, 2020

Honors & Awards
Top 40 Physicians Under 40, Pennsylvania Medical Society, 2023

Bart Thaci, MD

Clinical Assistant Professor

Bart Thaci, MD, joined the University of Pittsburgh Department of Neurological Surgery as a clinical assistant professor in July 2022 specializing in neurovascular disease. His particular clinical interests include the treatment of brain and spinal cord vascular disorders such as aneurysms, arteriovenous malformations, arteriovenous fistulas, and cavernous malformations. He also performs embolization of brain and spinal cord tumors; cervical, intracranial, and venous stenting; and revascularization for acute ischemic stroke.

Dr. Thaci received his medical degree from University of Tirana, Faculty of Medicine, Albania. After relocating in the United States, Dr. Thaci continued post-doctoral studies at the University of Chicago Brain Tumor Center and then a pre-residency neurosurgery fellowship at Boston Medical Center, Boston University. He completed his neurosurgery residency at the University of California-Davis. During his residency, Dr. Thaci completed two endovascular fellowships, the first at the University of Alabama, Birmingham in 2020 and the second at the CAST-approved University of California-Davis in 2022.

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 Carlisle
UPMC Community General
UPMC Hanover
UPMC Harrisburg
UPMC Lititz
UPMC Memorial
UPMC West Shore

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

Bart Thaci, MD

Education & Training
MD, University of Tirana, Faculty of Medicine, Albania, 2004
Fellowship, Pre-residency, Neurosurgery, Boston University Medical Center, 2015
Residency, University of California Davis Medical School, 2022
Fellowship, Endovascular Neurosurgery, University of Alabama, Birmingham, 2020
Fellowship, Endovascular Neurosurgery, University of California Davis Medical School, 2022

Parthasarathy D. Thirumala, MD

Professor
Director, Center of Clinical Neurophysiology
Director, Clinical Neurophysiology Laboratory

Parthasarathy D. Thirumala, MD, joined the Center for Clinical Neurophysiology in June 2008. He specializes in intraoperative neurophysiological monitoring (IONM) for adult and pediatric neurosurgical, orthopedic, ENT, vascular, and interventional neuroradiology procedures.

Dr. Thirumala completed his neurology residency and clinical neurophysiology fellowship at the University of Pittsburgh Medical Center. He received his internal medicine internship training at Brookdale University Hospital in Brooklyn, N.Y. Prior to clinical training, he earned a master's degree in biomedical engineering from the University of Illinois at Chicago and completed his medical degree at Stanley Medical College in Chennai, India.

Dr. Thirumala's clinical and research interests center on the diagnostic accuracy of IONM and the development of therapeutic and risk stratification strategies for perioperative neurological disorders. His work emphasizes IONM applications in cardiac, vascular, and endovascular surgeries, with a focus on conditions such as stroke, delirium, and cognitive impairment. He also studies real-time interventions that mitigate perioperative brain injury using multimodal monitoring techniques.

He has authored over 150 peer-reviewed articles, book chapters, and invited reviews in journals including *JAMA, Neurology, Neurosurgery, Journal of Neurosurgery,* and *Journal of Clinical Neurophysiology*. Dr. Thirumala lectures nationally and internationally on the role of IONM in improving surgical outcomes.

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

Parthasarathy D. Thirumala, MD

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

Professional Activities
Course Co-Director, Principles and Practice of Intraoperative Monitoring, UPMC

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

Honors & Awards
Neurologist of the Year, Pennsylvania Neurology Society, 2021

Subrahmanya Vallabhapurapu, PhD

Research Assistant Professor

Subrahmanya Vallabhapurapu, PhD, joined the University of Pittsburgh Department of Neurological Surgery in September of 2024. His research is focused on the understanding of the biological complexity and delineating how misregulation of biological phenomena leads to disease states like cancer and autoimmunity. Dr. Vallabhapurapu obtained his PhD in immunology from the University of Wuerzburg, Germany, where he focused on transcriptional regulation of immune cell development. Later, his research focused in the fields of cancer biology, stem cells, epigenetic regulation of stem cells, signal transduction and cell death.

Specialized Areas of Interest
Brain tumor biology; cancer evolution; treatment resistance mechanisms in cancer; communicative mechanisms between tumor cells, stromal cells and immune cells that regulate tumor initiation and progression of tumors; therapeutic strategies to treat cancer.

Education & Training
PhD, Immunology, University of Wuerzburg, Germany, 2005
Postdoctoral Fellow, University of Wuezburg, Germany, 2007
Postdoctoral Fellow, University of Basel, Switzerland, 2008
Postdoctoral Fellow, University of Bern, Switzerland, 2010
Postdoctoral Fellow, University of Cincinnati, 2015.

Subrahmanya Vallabhapurapu, PhD

Professional Activities
Scientific reviewer for *Cell Death and Disease*; *Cellular Physiology and Biochemistry*; *Medicine*; *Cell Biology International*; and *Breast Cancer: Basic and Clinical Research*.

Research Activities
Chemoresistance mechanisms in brain tumors. Identification of cell intrinsic and extrinsic signals in the initiation and maintenance of chemo/treatmentresistance. Identification of brain tumor cellular pools involved in chemo/treatment resistance, to target and reverse chemo/treatment resistance.

Sheela Vivekanandan, MD

Clinical Assistant Professor

Sheela Vivekanandan, MD, is a neurosurgeon specializing in spine care, currently serving as a clinical assistant professor in the Department of Neurological Surgery at the University of Pittsburgh. She joined the department in September 2023 and primarily treats patients in the Harrisburg, Pa. area. Dr. Vivekanandan has contributed to research in her field, with publications focusing on mechanical thrombectomy techniques and the impact of anticoagulant medications on subdural hematomas.

Specialized Areas of Interest
Spine care, sacroiliac joint fusion, lumbar fusion, meningioma, and subdural hematomas.

Professional Organization Membership
American Association of Neurological Surgeons
Congress of Neurological Surgeons
Women in Neurosurgery

Education & Training
MD, University of Missouri, Kansas City
Residency, Geisinger Medical Center
Fellowship, University of Utah

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 two-year neurovascular surgery fellowship at Yale University School of Medicine.

Dr. Wecht was board-certified with the American Board of Neurological Surgery in 2000 and was recertified in 2010. He specializes in the treatment of brain tumors and general neurosurgery including an active spine 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.

Dr. Wecht is a team neurosurgeon for the Pittsburgh Penguins and has been named among the top doctors in the field of neurological surgery in a national survey conducted by Castle Connolly.

Specialized Areas of Interest
General neurosurgery; brain tumors; spinal and peripheral nerve microsurgery; chiari malformation.

Board Certifications
American Board of Neurological Surgery

Hospital Privileges
UPMC McKeesport
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

Professional Activities
Team Neurosurgeon, Pittsburgh Penguins

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

Honors & Awards
Castle Connolly Top Doctors in America, 2022-25

Fang-Cheng Yeh, MD, PhD

Associate Professor
Director, Fiber Tractography Lab

Fang-Cheng (Frank) Yeh, MD, PhD, joined the Department of Neurological Surgery in 2016 after receiving his MD from National Taiwan University and completing his PhD in biomedical engineering at Carnegie Mellon University. His research focuses on diffusion MRI and tractography-based connectomics, with contributions that have shaped the study of brain connectivity in both research and clinical contexts.

Dr. Yeh is the developer of *DSI Studio*, an open-source software widely used in the neuroscience community for diffusion MRI analysis. The software provides tools for image preprocessing, tensor estimation, and fiber tracking, along with features such as quality control, ROI editing, and

Fang-Cheng Yeh, MD, PhD

clustering analysis. Its support for various diffusion MRI data types has made it compatible with a broad range of studies. *DSI Studio* has been cited in over 2,000 peer-reviewed publications and continues to evolve with regular updates, including GPU acceleration and cloud-based processing to handle larger datasets.

Dr. Yeh also introduced two analytic frameworks: correlational tractography and differential tractography. Correlational tractography enables the identification of white matter pathways associated with specific clinical or cognitive variables, offering insights into how brain connectivity relates to behavior and disease. Differential tractography, on the other hand, detects longitudinal changes in neural pathways, facilitating the study of disease progression and neuroplasticity.

Together, these tools and methods support a growing number of studies in connectomics and provide the research community with practical resources to investigate brain structure and function across a variety of neurological conditions.

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

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

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

Publications: 2024-25
• Refereed Articles:
Mansour H, Azrak R, Cook JJ, Hornburg KJ, Qi Y, Tian Y, Williams RW, Yeh FC, White LE, Johnson GA. The Duke Mouse Brain Atlas: MRI and light sheet microscopy stereotaxic atlas of the mouse brain. *Sci Adv* 11(18):eadq8089, 2025.

Skandalakis G, Viganò L, Neudorfer C, Rossi M, Fornia L, Cerri G, Kinsman K, Bajouri Z, Tavakkoli A, Koutsarnakis C, Lani E, Komaitis S, Stranjalis G, Zadeh G, Barrios-Martinez J, Yeh FC, Serletis D, Kogan M, Hadjipanayis C, Hong J, Simmons N, Gordon E, Dosenbach N, Horn A, Bello L, Kalyvas A, Evans L. White matter connections within the central sulcus subserving the somato-cognitive action network. *Brain* 148(5):1789-1800, 2025.

Barrios-Martinez JV, Almast A, Lin I, Youssef A, Aung T, Fernandes-Cabral D, Yeh FC, Chang YF, Mettenburg J, Modo M, Henry L. Structural connectivity changes in focal epilepsy: Beyond the epileptogenic zone. *Epilepsia* 66(1):226-39, 2025.

Cheng Y, Wang D, Zhang X, Jin G, Wu D, Wang Q, Du J, Qi L, Xu C, Qiao Z, Wang X, Zhang H, Yu T, Wang Y, Yeh FC, Zhao G, Ren L. Structural network-specific effect of extreme capsule stimulation for drug-resistant focal epilepsy. *Brain* [Online ahead of print], 2025.

Cabral DTF, Zenonos GA, Barrios-Martinez J, Bonhomme GR, Yeh FC, Fernandez-Miranda JC, Friedlander RM. Implementation of high-definition fiber tractography for preoperative evaluation and surgical planning of brainstem cavernous malformation: long-term outcomes. *J Neurosurg* 142(4):968-976 2024.

Fang-Cheng Yeh, MD, PhD

Yang ZC, Xue BW, Song XY, Yin CD, Yeh FC, Li G, Deng ZH, Sun SJ, Hou ZG, Xie J. Connectomic insights into the impact of 1p/19q co-deletion in dominant hemisphere insular glioma patients. *Front Neurosci* 18:1283518, 2024.

Research Activities

Dr. Yeh's research activity in 2024–25 centered on the development and application of advanced diffusion MRI techniques to study brain connectivity (connectomics), with an emphasis on understanding and diagnosing brain disorders.

In 2024, he co-authored studies using advanced tractography and connectomic analysis to investigate the impact of genetic mutations (e.g., 1p/19q co-deletion) on brain connectivity in glioma patients. These studies employ sophisticated statistical and graph-theoretical analyses to compare structural networks across patient groups, leveraging the lab's state-of-the-art imaging pipelines and software.

Dr. Yeh's lab maintains and updates *DSI Studio*, a widely used open-source software for diffusion MRI analysis, supporting both research and clinical communities in connectomics.

Overall, Dr. Yeh's 2024–25 research is distinguished by its multidisciplinary collaborations, technical advancements in diffusion MRI, and translational focus on brain disorders, aiming to improve both scientific understanding and clinical outcomes.

Georgios A. Zenonos, MD

Associate Professor
Neurosurgical Co-Director, Center for Cranial Base Surgery
Neurosurgical Co-Director, Pituitary Center for Excellence
Director, Cranial Nerve Program
Director, Clinical Operations, UPMC Presbyterian
Co-Director, Neurosurgery Skull Base Fellowship

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.

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, 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.

Georgios A. Zenonos, MD

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 Surgery

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
AANS/CNS Tumor Section
AANS/CNS Cerebrovascular Section
Congress of Neurological Surgeons
North American Skull Base Society
Alexander S. Onassis Scholars Society
SWOG Cancer Research Network

Professional Activities
Director, Neurosurgery Preceptorship Program, University of Pittsburgh
Director, Integrated Life Sciences Neurosurgery ENT Course, University of Pittsburgh
Grant Reviewer, University of Pittsburgh
Designated Physician, Pituitary Center of Excellence

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

Honors & Awards
Best Basic Science Abstract, NASBS meeting, 2021
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
3rd Best Abstract: Stereotactic and Functional Section, American Association of Neurological Surgery Annual Scientific Meeting, 2014

Georgios A. Zenonos, MD

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: 2024-25

• Refereed Articles:

Hoz SS, Ma L, Agarwal P, Jacobs RC, Al-Bayati AR, Nogueira RG, Zenonos GA, Gardner PA, Friedlander RM, Lang MJ, Gross BA. Clinical comparison of flow diversion and microsurgery for retreatment of intracranial aneurysms. *J Clin Neurosci* 136:111296, 2025.

Phoominaonin IS, Vargas Rosales AF, Choby GW, Wang EW, Zenonos GA, Snyderman CH, Gardner PA. Carotid Plexus Sympathetic Nerves as a Landmark for the Abducens Nerve Within the Cavernous Sinus During Endoscopic Endonasal Surgery: Cadaveric Anatomic Study and Surgical Consideration. *Oper Neurosurg* (Hagerstown) 28(5):697-704, 2025.

Tang A, Taori S, Fung N, Almeida JP, Champagne PO, Fernandez-Miranda JC, Gardner P, Hwang PH, Nayak JV, Patel C, Patel ZM, Celda MP, Pinheiro-Neto C, Sanusi O, Snyderman C, Thorp BD, Van Gompel JJ, Zenonos GA, Zwagerman NT, Wang EW, Geltzeiler M, Choby G. Pathologic dural invasion is associated with regional recurrence in olfactory neuroblastoma: A multi-institutional study. *Int Forum Allergy Rhinol* 15(4):373-383, 2025.

Abou-Al-Shaar H, Zenonos GA, Fernandez-Miranda JC, Gardner PA. Commentary: Is It Justified to Sacrifice the Pituitary Stalk During Craniopharyngioma Surgery? A Systematic Review and Meta-Analysis. *Neurosurgery* 96(4):e81-e82, 2025

Pichugin A, Formentin C, Chan YK, Trondin A, Wang EW, Snyderman CH, Gardner PA, Zenonos GA. The Connective Tissue Architecture of the Cavernous Sinus: An Anatomical Study and Unifying Conceptualization. *World Neurosurg* 194:123573, 2025.

Karampouga M, Varga GJ, Affolter K, Bonhomme GR, Stefko TS, Choby GW, Wang E, Snyderman CH, Gardner PA, Zenonos GA. Two-Module Endoscopic Endonasal Optic Canal Decompression: A Cadaveric Study & Illustrative Case Presentation. *J Neurol Surg B Skull Base* 86(S 01): S1-S576, 2025.

Daniels KE, Mocharnuk J, Balogun Z, Zenonos GA, Gardner PA, Snyderman CH, Wang EW. Long-term complications of extracranial pericranial flaps in skull base reconstruction. *Curr Opin Otolaryngol Head Neck Surg* 33(1):43-49, 2025.

Muthiah N, Gersey ZC, Le L, Abdallah H, Abou-Al-Shaar H, Stefko ST, Bonhomme GR, Kocasarac C, Wang EW, Snyderman CH, Gardner PA, Zenonos GA. Skull base chordomas presenting with abducens nerve deficits: clinical characteristics and predictive factors for deficit improvement or resolution. *J Neurosurg* 142(6):1682-1690, 2025.

Gersey ZC, Vargas AF, Leung JH, Fazeli PK, Zenonos GA, Gardner PA. Prolactinoma Resection in a Transgender Woman on Gender-affirming Hormone Therapy. *JCEM Case Rep* 3(8):luaf120, 2025.

Tang A, Abdallah HM, Gardner PA, Zenonos GA, Chang YF, Choby G, Wang EW, Snyderman CH. Factors Associated With a Higher 30-Day Hospitalization Period for Pituitary Adenoma Patients: Introducing a Novel Outcome Metric. *Neurosurgery* [Online ahead of print], 2025.

Georgios A. Zenonos, MD

Jimenez MA, Horowitz MA, Gendreau JL, Yamini B, Ahmed AK, Geltzeiler M, Sanusi O, Wang EW, Snyderman CH, Choby GW, Zenonos GA, Gardner PA, Rowan NR, Mukherjee D. Characterizing Disparities in Access to Surgery for Pituitary Adenomas: A National Cancer Database Analysis. *J Clin Endocrinol Metab* [Online ahead of print], 2025.

Gersey ZC, Zenkin S, Mamindla P, Amjadzadeh M, Ak M, Plute T, Peddagangireddy V, Abdallah H, Muthiah N, Wang EW, Snyderman C, Gardner PA, Colen RR, Zenonos GA. Radiogenomics and Radiomics of Skull Base Chordoma: Classification of Novel Radiomic Subgroups and Prediction of Genetic Signatures and Clinical Outcomes. *Neuro Oncol* [Online ahead of print], 2025.

Tang A, Abdallah HM, Chang YF, Zenonos GA, Gardner PA, Choby GW, Wang EW, Snyderman CH. Changes in pituitary adenoma patient presentation and outcomes during the COVID pandemic at a Pituitary Center of Excellence. *Pituitary* 27(6):986-991, 2024.

Abdallah HM, Fernandes Cabral DT, Gersey ZC, Abou-Al-Shaar H, O'keefe S, Mysels S, John I, Gardner PA, Solari MG, Zenonos GA. Reduction of giant parietooccipital fibrous dysplasia using dynamic mirror image guidance: a case report and review of the literature. *Br J Neurosurg* 38(6):1440-1446, 2024.

Fernandes Cabral DT, Zenonos GA, Barrios-Martinez J, Bonhomme GR, Yeh FC, Fernandez-Miranda JC, Friedlander RM. Implementation of high-definition fiber tractography for preoperative evaluation and surgical planning of brainstem cavernous malformation: long-term outcomes. *J Neurosurg* 142(4):968-976], 2024.

Pascal O. Zinn, MD, PhD

Associate Professor
Director, Adult Neurosurgical Oncology
Director, Molecular Tumor Biology and Personalized Precision Therapy Lab
Director, Neurosurgical Oncology Tissue Bank
Director, UPMC Hillman Cancer Center and Shadyside Hospital Residency Program
Co-Chief, Surgical Service Line

Pascal O. Zinn, MD, PhD, joined the University of Pittsburgh Department of Neurological Surgery in 2019. He is an associate professor and director of the adult neurosurgical oncology program. 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 cancer molecular biology and neuroscience laboratory, studying approaches in personalized tumor treatments and patient care. Towards this, Dr. Zinn is creating innovative novel brain models using organoid technology and conducts funded research on brain computer interface and artificial intelligence.

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 likes 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—treatment plan.

Pascal O. Zinn, MD, PhD

Specialized Areas of Interest
Neurosurgical oncology; awake brain surgery for brain, skull base, and spinal cord tumors; personalized precision care for brain and spinal tumor patients; stereotactic radiosurgery for brain and spine tumors, laser ablation treatment for brain tumors.

Board Certifications
American Board of Neurological Surgeons

Hospital Privileges
UPMC Hamot
UPMC Hillman Cancer Center
UPMC Magee-Womens Hospital
UPMC Mercy
UPMC Presbyterian
UPMC Shadyside

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

Professional Activities
NRG Oncology IDH Wildtype Glioma Expert Group
Executive Committee, AANS and CNS Tumor Section
BK Medical Ultrasound for spinal application working group
Spineart for spine oncology applications
Fellow, American Association of Neurological Surgeons

Education & Training
MD, University of Zurich, Switzerland, 2007
Research Fellowship, Dana-Farber Cancer Institute, Harvard Medical School, 2012
PhD, University of Lausanne, Switzerland, 2012
Research Fellowship, MD Anderson Cancer Center, University of Texas, 2015
Neurosurgery Residency, Baylor College of Medicine and MD Anderson Cancer Center, 2019

Honors & Awards
Castle Connolly Top Doctors in America, 2024-25
Joseph M. Katz Executive MBA Merit Award, University of Pittsburgh, 2024
Stryker AANS Tumor Award, 2023
Natus Award, Congress of Neurological Surgeons, 2022
Faculty Teaching Award, University of Pittsburgh Department of Neurosurgery, 2022
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

Pascal O. Zinn, MD, PhD

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, 2012, 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
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

Publications: 2024-25

• Refereed Articles:

Adida S, Taori S, Bhatia S, Kann MR, Burton SA, Flickinger JC, Olson AC, Sefcik RK, Zinn PO, Gerszten PC. A case series and review of stereotactic body radiation therapy for contiguous multilevel spine metastases. *J Neurooncol* 171(2):299-309, 2025.

Taori S, Habib A, Adida S, Gecici NN, Sharma N, Calcaterra M, Tang A, Pandya S, Mehra A, Deng H, Elidrissy H, Idrissi YA, Amjadzadeh M, Zinn PO. Circulating biomarkers in high-grade gliomas: current insights and future perspectives. *J Neurooncol* 172(1):41-49, 2025.

Gecici NN, Habib A, Niranjan A, Balzer J, Sherry N, Zinn PO. Optimizing brain mapping: integrating real-time neuropsychological assessment in awake craniotomy. *Neurosurg Focus Video* 12(1):V6, 2025.

Adida S, Taori S, Tirmizi Z, Bayley JC, Zinn PO, Flickinger JC, Burton SA, Choi S, Sefcik RK, Gerszten PC. J Stereotactic body radiation therapy for spinal metastases from gastrointestinal primary cancers. *Neurooncol* 173(3):683-694, 2025.

Xiong Z, Sneiderman CT, Kuminkoski CR, Reinheimer J, Schwegman L, Sever RE, Habib A, Hu B, Agnihotri S, Rajasundaram D, Zinn PO, Forsthuber TG, Pollack IF, Li X, Raphael I, Kohanbash G. Transcript-targeted antigen mapping reveals the potential of POSTN splicing junction epitopes in glioblastoma immunotherapy. *Genes Immun* 26(3):190-199, 2025.

Gecici NN, Hameed NUF, Habib A, Deng H, Lunsford LD, Zinn PO.Comparative Analysis of Efficacy and Safety of Frame-Based, Frameless, and Robot-Assisted Stereotactic Brain Biopsies: A Systematic Review and Meta-Analysis. Oper *Neurosurg* (Hagerstown) 28(6):749-761, 2025.

Taori S, Adida S, Bayley JC, Zinn PO, Burton SA, Flickinger JC, Sefcik RK, Gerszten PC. Long term outcomes following upfront stereotactic body radiotherapy alone for spinal metastases. *J Neurooncol* [Online ahead of print], 2025.

Habib A, Deng H, Hameed NUF, Kulich S, Zinn PO. Microsurgery resection of giant cervicothoracic spinal ependymoma: Two-dimensional operative video. *Surg Neurol Int* 15:237, 2024.

Pascal O. Zinn, MD, PhD

Duan T, Taori S, Bhargava S, Lai S, Zhong C, Yomtoubian S, Yuan H, Wu X, Zhang P, Huang T, Wang D, Yuan F, Li D, Li H, Mi H, Wu W, Wang R, Habib A, Hammed F, Vendetti FP, Zinn PO, Bakkenist CJ, Meisel M, Wu Q, Rich JN. Nuclear cholesterol regulates nuclear size and DNA damage responses in cancer stem cells. *Neuro Oncol* [Online ahead of print], 2025

Gecici NN, Habib A, Mallela AN, Rich JN, Drappatz J, Mantica M, Abdullah KG, Zinn PO. Ventricular Entry During Glioblastoma Resection is Associated With Reduced Survival and Increased Risk of Distant Recurrence. *Neurosurgery* [Online ahead of print], 2025.

Zinn PO, Habib A, Deng H, Gecici NN, Elidrissy H, Alami Idrissi Y, Amjadzadeh M, Sherry NS.Uncovering Interoceptive Human Insular Lobe Function through Intraoperative Cortical Stimulation-A Review. *Brain Sci* 14(7):646, 2024.

Gersey ZC, Plute T, Jaman E, Zhang X, Mitha R, Zinn PO, Pearce TM, Amankulor NM. Cerebrospinal Fluid Seeding Versus Inflammation in Setting of Ventriculoperitoneal Shunt as a Potential Cause for Distant Recurrence of Glioblastoma. *Brain Tumor Res Treat* 12(3):181-185, 2024.

Taori S, Adida S, Kann MR, Bhatia S, Sefcik RK, Burton SA, Flickinger JC, Zinn PO, Gerszten PC. Spine Stereotactic Radiosurgery Provides Long-Term Local Control and Overall Survival for Benign Intradural Tumors. *Neurosurgery* [Online ahead of print], 2024.

Sherry N, Eagle SR, Henry LC, Appleton H, González Martínez JA, Friedlander RM, Okonkwo DO, Zinn PO. Perceived Cognitive Function in Neurosurgical Patients. *Neurosurgery* [Online ahead of print], 2024.

David S. Zorub, MD

Clinical Professor

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, Arkansas, 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 with research in electromyography of the thalamus. Postgraduate 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 in electromyography of the spinal cord.

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 December 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

David S. Zorub, MD

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.

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 Hillman 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, 1970
Residency, Duke University, 1970-76
Fellowship, University of Pisa, 1974
Fellowship, Duke University, 1974

Lunsford Honored with Prestgious CNS Laurel Award

L Dade Lunsford, MD, Lars Leksell Professor & Distinguished Professor at the University of Pittsburgh, was honored with the Congress of Neurological Surgeon's Founder's Laurel Award, September 30, 2024, at the CNS Annual Meeting in Houston, Texas. The award recognizes individuals who have made exceptional career contributions to neurosurgery education.

Dr. Lunsford has been instrumental in developing the careers of countless neurosurgeons through his leadership position in the department's residency and fellowship programs and during his tenure as chair of the University of Pittsburgh Department of Neurological Surgery. He also leads the highly successful training course *Principles and Practice of Gamma Knife Radiosurgery* that has trained almost 3,000 surgeons, oncologists, and physicists from around the world in the field of radiosurgery, establishing the University of Pittsburgh as a major international radiosurgery training site.

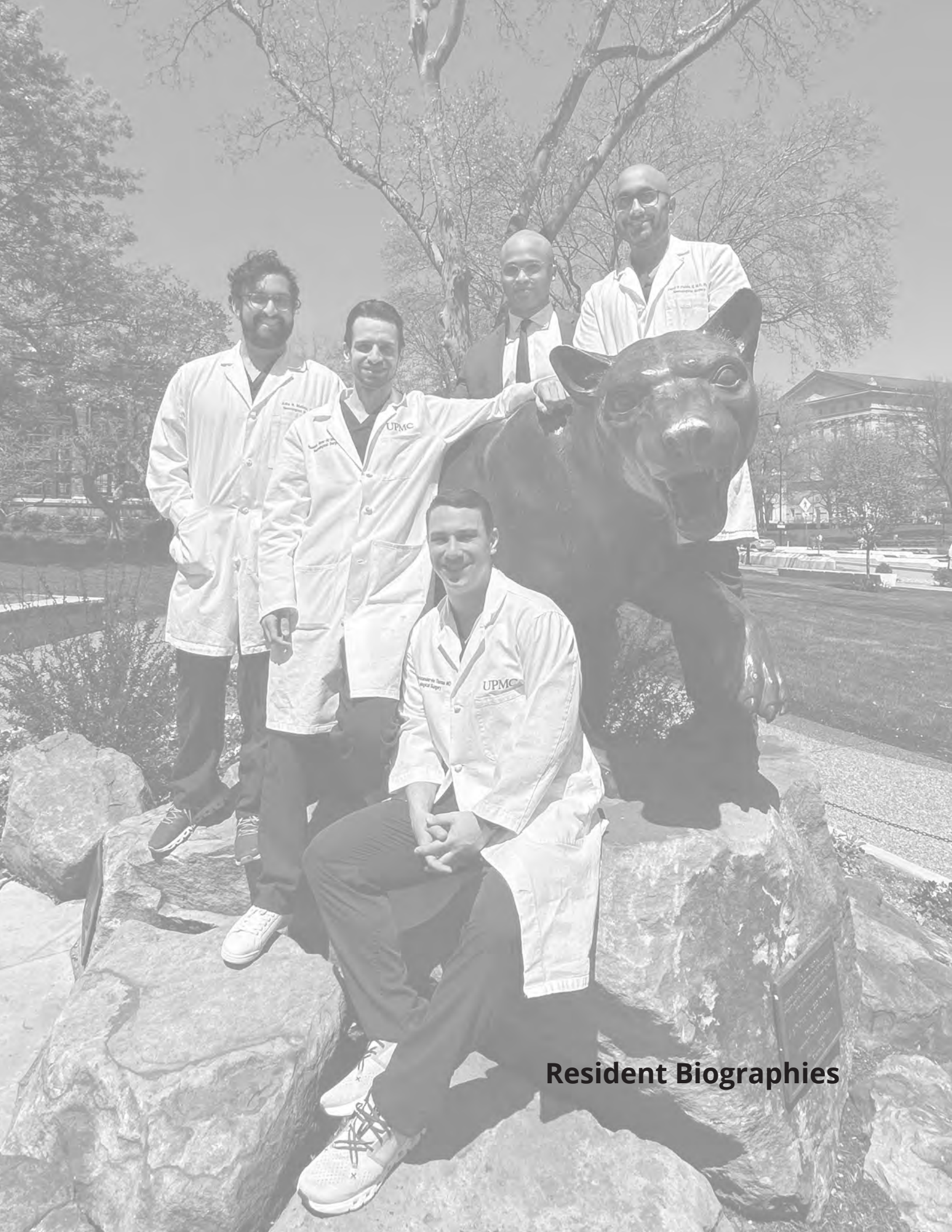
Dr. Lunsford also played a major role in the founding of the International Radiosurgery Research Foundation, a multi-center, international group of academic and clinical centers of excellence performing retrospective and prospective outcomes research, cooperative clinical investigations, and prospective clinical trials conducted at participating institutions to evaluate a variety of clinical indications.

An internationally recognized authority and pioneer in the field of stereotactic radiosurgery, Dr. Lunsford was responsible for installing the Gamma Knife at the University of Pittsburgh Medical Center in 1987, the fifth unit ever built. This medical center was the first in North America to offer this state-of-the-art, minimally invasive form of brain surgery. Since that time, more than 19,000 patients have undergone brain stereotactic radiosurgery using the Gamma Knife at UPMC Presbyterian.

In 2007, Dr. Lunsford was named a Distinguished Professor at the University of Pittsburgh, the highest honor the institution can bestow on an academic professor and reserved for faculty who have achieved scholarly eminence in their discipline. In 2023, the university established the L. Dade Lunsford Endowed Chair at the University of Pittsburgh, conferring Costas G. Hadjipanayis, MD, PhD—the current director of the UPMC Center for Image-Guided Neurosurgery—as the inaugural chair holder. ■

Photos courtesy of CNS

(Left) L. Dade Lunsford, MD, receives Congress of Neurological Surgeon's Founder's Laurel Award from CNS president Elad Levy, MD; (Right) Dr. Lunsford provides special talk during CNS 2024 Annual Meeting.



Resident Biographies

Hussein Abdallah, MD

PGY-3 Resident

Hussein Abdallah, MD, MEng, joined the University of Pittsburgh Department of Neurological Surgery residency program in July 2023 after earning his medical degree from the University of Pittsburgh School of Medicine. Prior to medical school, Dr. Abdallah received bachelor of science and master of engineering degrees in electrical science and engineering with a concentration in control theory from the Massachusetts Institute of Technology. As a graduate student at MIT, Dr. Abdallah applied the engineering principles of control theory to the mathematical design of induced pluripotent stem cell reprogramming circuits. Following his studies at MIT, Dr. Abdallah was a senior research scientist in the Quantitative Sciences division at Takeda Pharmaceuticals, where he developed models for oncological immunotherapy metabolism.

As a medical student at the University of Pittsburgh, Dr. Abdallah worked on multiple projects in the Center for Cranial Base Surgery under the mentorship of Paul Gardner, MD, and Georgios Zenonos, MD. His work on a next-generation prognostication panel for skull base chordoma was recognized by the North American Skull Base Society with an award for the best basic science abstract. Dr. Abdallah continues his research work on multiple clinical databases for skull base tumors, including pituitary adenomas and chordomas. He remains interested in all clinical aspects of neurosurgery, and other research interests include the application of data science for more efficient patient care and technology development in neurosurgery. Dr. Abdallah grew up in Dearborn, Mich. Outside of neurosurgery, he enjoys the great outdoors, and his hobbies include biking, running, weightlifting and swimming.

Specialized Areas of Interest

Skull base surgery; minimally invasive neurosurgery; database outcomes research.

Education & Training

SB, Electrical Science and Engineering, Massachusetts Institute of Technology, 2016
MEng, Electrical Science and Engineering, Massachusetts Institute of Technology, 2018
MD, University of Pittsburgh School of Medicine, 2023

Honors & Awards

Theodore Kurze Senior Prize for Excellence in Neurological Surgery and Clinical Neuroscience, University of Pittsburgh, 2023
Best Basic Science Abstract, North American Skull Base Society Annual Meeting, 2021
T35 Training Grant for Student Research in Hematology/Oncology, NIH, 2020.
Best Poster and Presentation, 6th Annual Synthetic Biology Symposium, 2017.

Prateek Agarwal, MD

Chief Resident

Prateek Agarwal, MD, MBA, joined the University of Pittsburgh Department of Neurological Surgery residency program in July 2020 after earning a dual MD/MBA degree from the Perelman School of Medicine and Wharton School at the University of Pennsylvania. At the Perelman School of Medicine, he was elected into the Alpha Omega Alpha Honor Medical Society and received the Spencer Morris Prize, the School of Medicine's highest academic honor. Prior to medical and business school, he graduated summa cum laude and Phi Beta Kappa from Harvard University in 2015 with an AB in molecular and cellular biology and secondary field in economics.

Dr. Agarwal is currently pursuing an enfolded endovascular neurosurgery fellowship at UPMC, under the mentorship of Bradley Gross, MD, with plans to complete a post-residency open cerebrovascular fellowship.

Prateek Agarwal, MD

Dr. Agarwal's neurosurgical research focuses on optimizing clinical outcomes, with an emphasis on employing system-level interventions to improve patient outcomes while reducing costs. His investigation on using behavioral economics principles to reduce neurosurgical postoperative infections and implant costs was awarded the 2018 Neurosurgery Paper of the Year in Socioeconomics, Health Policy, and Law. He has also performed translational research on injectable hydrogels for intervertebral disc regeneration, supported by the Neurosurgery Research and Education Foundation (NREF) Medical Student Summer Fellowship. His undergraduate basic neuroscience research in olfaction resulted in publications in Nature Neuroscience and Nature Communications.

Dr. Agarwal is active in organized neurosurgery. He was selected as a Council of State Neurological Societies (CSNS) Socioeconomic Fellow for 2023-24 and appointed as an early career member on the AANS Education Committee in May 2022. Previously he was elected to serve on the Young Neurosurgeons Committee (YNC) in 2021 and served as the 2018 YNC MISSION fellow. He is also passionate about entrepreneurship and co-founded the medical device startup Sanguis, which won 1st place at the 2018 Penn Wharton Entrepreneurship Startup Challenge.

Dr. Agarwal was born and raised in New Jersey. Outside of neurosurgery, he enjoys aviation, water polo, swimming, tennis and spending time with his family and friends.

Specialized Areas of Interest
Endovascular neurosurgery; open cerebrovascular neurosurgery; complex spine surgery; minimally invasive spine surgery; clinical outcomes research; socioeconomics in neurosurgery; organized neurosurgery; health policy and innovation.

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

Education & Training
AB, Molecular and Cellular Biology, Harvard University, 2015
MD, Perelman School of Medicine at the University of Pennsylvania, 2020
MBA, Health Care Management, The Wharton School at the University of Pennsylvania, 2020

Honors & Awards
CSNS Socioeconomic Fellowship, 2023-24
Spencer Morris Prize, Perelman School of Medicine, 2020
Palmer Scholar, The Wharton School, 2020
Alpha Omega Alpha, Perelman School of Medicine, 2019
Neurosurgery Paper of the Year in Socioeconomics, Health Policy, and Law, 2018
MISSION Fellowship, Young Neurosurgeons Committee, 2018
Department of Neurosurgery Research Prize, Perelman School of Medicine, 2017
NREF Medical Student Summer Fellowship, 2016
Guggenheim Family Neurosurgery Scholarship, Perelman School of Medicine, 2016
Summa Cum Laude, Harvard University, 2015
Phi Beta Kappa, Harvard University, 2015

Ali Alattar, MD

PGY-7 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 of advanced studies in clinical research. Dr. Alattar studied biochemistry at Portland State University and graduated summa cum laude with a bachelor of science degree.

Dr. Alattar cultivated an interest in neuro-oncology outcomes, especially regarding the impact of extent of surgical resection on survival and developed a novel biomarker platform for diagnosis of glioblastoma, during medical school. In residency, Dr. Alattar has continued to develop his interest in neuro-oncology and is also building his clinical expertise in spine surgery, skull base, and open and endovascular neurosurgery.

Dr. Alattar's research interests include big data, cost-effectiveness, artificial intelligence, and machine learning as well as the application of augmented reality to image-guidance and development of unique biomarkers and molecular therapeutics in the diagnosis and treatment of intracranial aneurysms. 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 weight lifting.

Specialized Areas of Interest

Neuro-oncology, skull base neurosurgery, open and endovascular neurosurgery, and spine surgery and correction of deformity.

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

Honors & 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, 2011-13
Building Our Future Scholarship Award, 2010-11

Ali Alattar, MD

Publications: 2024-25

• Refereed Articles:

Fields DP, Varga G, Alattar A, Shanahan R, Das A, Hamilton DK, Okonkwo DO, Kanter AS, Forsythe RM, Weiner DK. Preinjury Frailty Predicts 1-Year Mortality in Older Adults with Traumatic Spine Fractures. *Neurosurgery* 95(3):676-681, 2024.

Hudson JS, Nowicki KW, Lucke-Wold B, Gersey ZC, Dodd WS, Alattar A, McCarthy DJ, Agarwal P, Mehdi Z, Lang MJ, Hasan DM, Hoh BL, Gross BA. Clopidogrel Is Associated with Reduced Likelihood of Aneurysmal Subarachnoid Hemorrhage: A Multi-Center Matched Retrospective Analysis. *Transl Stroke Res* 15(5):936-940, 2024.

Anand SK, Shanahan RM, Alattar AA, Phillips HW, Okonkwo DO, McDowell MM. Atlantoaxial facet fixation using cervical facet cage: technical case report and review of the literature. *Childs Nerv Syst* 40(7):2193-2197, 2024.

Sharath Anand, MD

PGY-5 Resident

Sharath Kumar Anand, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July 2021 after earning an MD degree from Wayne State University School of Medicine. At Wayne State, he was elected into the Alpha Omega Alpha Honor Medical Society and was awarded the Karl G. Pinckard Scholarship. Prior to medical school, he graduated from the University of Michigan in 2017 with a bachelor of science degree in cellular and molecular biology as well as a minor in electrical engineering and computer science.

During medical school, Dr. Anand conducted clinical neurosurgical research on topics including subarachnoid hemorrhage surgery outcomes, spine surgery and epilepsy care. He has a special interest in socioeconomic disparity research and institutional factors that affect neurosurgical outcomes.

Dr. Anand was born in Chennai, India and raised in Ann Arbor, Mich. Outside of neurosurgery he enjoys sports as well as spending time with his family and friends.

Specialized Areas of Interest

Cerebrovascular neurosurgery; spine surgery; skull base neurosurgery; general neurosurgery.

Professional Organization Membership

Alpha Omega Alpha Honor Society
American Association of Neurological Surgeons
Congress of Neurological Surgeons

Education & Training

BS, Cellular & Molecular Biology, University of Michigan, 2017
MD, Wayne State University School of Medicine, 2021

Honors & Awards

Karl G. Pinckard Scholarship, Wayne State University, 2021
Alpha Omega Alpha Honor Society, Wayne State University, 2020
Best Clinical Research Award – Tumor, Congress of Neurological Surgeons, 2020
Year III Comprehensive Honors, Wayne State University, 2020
Year II Comprehensive Honors, WSU, 2019

Stephanie Casillo, MD

PGY-3 Resident

Stephanie Casillo, MD, joined the University of Pittsburgh Department of Neurological Surgery as a PGY-1 resident July 1, 2023 after earning her MD degree from the University of Pittsburgh School of Medicine. As a medical student, she was president of the AANS Medical Student Chapter, led the preclinical medical student neurosurgery elective course, and was awarded the Theodore Kurze, MD Senior Prize for Excellence in Neurological Surgery and Clinical Neurosciences. Prior to medical school, she graduated magna cum laude from Rochester Institute of Technology with a degree in biomedical engineering.

Dr. Casillo's clinical and academic interests include neuro-oncology, pediatric neurosurgery, surgeon-scientist education, and women in neurosurgery. As a research fellow in the Physician-Scientist Training Program (PSTP), Dr. Casillo conducted longitudinal translational research on metabolic dependences in pediatric diffuse midline glioma (DMG). Specifically, she identified a novel mechanism by which the hallmark histone mutation H3K27M impacts tumor cell glycolysis through an ERK5-PFKFB3 axis involving both a critical kinase and a metabolic effector. Small molecule inhibitors targeting this axis prolong survival in mouse models. She was awarded the Neurosurgery Research and Education Foundation (NREF) Medical Student Summer Research Fellowship (MSSRF) for this work, which has resulted in publications in Molecular Oncology and Nature Cancer.

Dr. Casillo is an advocate for the advancement of women in neurosurgery and was the lead investigator on a project narrating the life and accomplishments of Dorothy Klenke Nash, MD, the first female neurosurgeon in the United States. Her work has resulted in publications in *Neurosurgery* and *Journal of Neurosurgery*.

Dr. Casillo has also sought clinical research opportunities in traumatic brain injury, vascular neurosurgery, spine surgery, and neurosurgical education.

Dr. Casillo was born and raised in Buffalo, N.Y. Outside of work, she enjoys cooking, live music, and spending time with her family, friends, and partner Patrick.

Specialized Areas of Interest

Neuro-oncology; pediatric neurosurgery; surgeon-scientist education; women in neurosurgery.

Professional Organization Membership

American Association of Neurological Surgeons
Congress of Neurological Surgeons
Society of Neuro-Oncology

Education & Training

MD, Physician-Scientist Training Program, University of Pittsburgh School of Medicine, 2023
BS, Biomedical Engineering, Rochester Institute of Technology, 2018

Honors & Awards

Runner-Up Presentation Award, Stuart Niles Rowe Research Day, University of Pittsburgh Department of Neurological Surgery, 2024
Theodore Kurze Senior Prize for Excellence in Neurological Surgery and Clinical Neuroscience, University of Pittsburgh, 2023
Sell Family Physician Scientist Award, Physician-Scientist Training Program, University of Pittsburgh School of Medicine, 2023

Stephanie Casillo, MD

Medical Student Summer Research Fellowship (MSSRF), Neurosurgery Research and Education Foundation, 2021
Physician-Scientist Training Program Scholarship, Physician-Scientist Training Program, University of Pittsburgh School of Medicine, 2018
Honors Program Research Grant, Rochester Institute of Technology, 2013
Presidential Scholarship, Rochester Institute of Technology, 2013

Hansen Deng, MD

PGY-7 Resident

Hansen Deng, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July 2019. He graduated with distinction from the University of California, San Francisco School of Medicine, where he was elected to the Alpha Omega Alpha Honor Medical Society. He earned dual undergraduate degrees in oil painting and biology from the University of California, Berkeley, and was inducted into the Phi Beta Kappa Society. He was elected to the Sigma Xi Scientific Honor Society for his research at the University of Pittsburgh.

Dr. Deng's surgical fellowships include advanced training in minimally invasive and deformity spine surgery, as well as neuro- and spinal oncology. His research with TRACK-TBI focuses on the use of biomarkers to improve diagnostic precision and prognostication following traumatic brain injury. At the Brain Trauma Research Center, his work centers on the secondary pathophysiology of neurotrauma and spinal cord injury, with the aim of advancing evidence-based clinical practices.

He is an active mentor to undergraduate and graduate students interested in medicine and neurosurgery. Outside of work, he enjoys painting, playing basketball, and cooking.

Specialized Areas of Interest
Spinal oncology; spinal deformity; neurotrauma.

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

Education & Training
BA, Biology and Art (Oil-Painting), University of California Berkeley, 2014
MD (with Distinction in Clinical and Translational Research), University of California San Francisco, 2019

Honors & Awards
Walter L. Copeland Fund in Research, 2023, 2024
Stuart Rowe Society Lectureship Runner-Up Award for Best Resident Research, 2023
Neurotrauma and Critical Care Paper of the Year, Congress of Neurological Surgeons, 2023
Tumor Paper of the Year, Congress of Neurological Surgeons, 2021
Best Clinical Research Award, Neurotrauma and Critical Care, Congress of Neurological Surgeons, 2020

Hansen Deng, MD

ThinkFirst Injury Prevention Award, American Association of Neurological Surgeons, 2020
Best Clinical Research Abstract, Pediatric Section, Congress of Neurological Surgeons, 2019
Ronald R. Tasker Young Investigator Award, Congress of Neurological Surgeons, 2019
Steinhart Scholarship Award, UCSF School of Medicine, 2019
Distinction in Clinical and Translational Research, University of California, San Francisco, 2019
Storytelling Prize, UCSF Synapse Student Voices, 2019
Journal of Neuro-Oncology Award, American Association of Neurological Surgeons, 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: 2024-25

• Refereed Articles:

Lavadi RS, Anand SK, Culver LG, Deng H, Ozpinar A, Puccio LM, Agarwal N, Alan N. Surgical Management of Hip-Spine Syndrome: A Systematic Review of the Literature. *World Neurosurg* 189:10-16 2024.

Tripathi M, Sheehan JP, Niranjan A, Ren L, Pikis S, Lunsford LD, Peker S, Samanci Y, Langlois AM, Mathieu D, Lee CC, Yang HC, Deng H, Rai A, Kumar N, Sahu JK, Sankhyan N, Deora H. Gamma Knife Radiosurgery for Hypothalamic Hamartoma: A Multi-Institutional Retrospective Study on Safety, Efficacy, and Complication Profile. *Neurosurgery* 96(2):426-437.

Hudson JS, Legarreta A, Fields DP, Deng H, McCarthy DJ, Sefcik R, Agarwal N, Hamilton DK. Intradiscal Osteotomy and Bilateral Expandable Transforaminal Interbody Fusion Cages for Iatrogenic Kyphotic Deformity: A Technical Report. *Asian J Neurosurg* 19(2):317-320, 2024.

Yue JK, Kanter JH, Barber JK, Huang MC, van Essen TA, Elguindy MM, Foreman B, Korley FK, Belton PJ, Pisică D, Lee YM, Kitagawa RS, Vassar MJ, Sun X, Satris GG, Wong JC, Ferguson AR, Huie JR, Wang KKW, Deng H, Wang VY, Bodien YG, Taylor SR, Madhok DY, McCrea MA, Ngwenya LB, DiGiorgio AM, Tarapore PE, Stein MB, Puccio AM, Giacino JT, Diaz-Arrastia R, Lingsma HF, Mukherjee P, Yuh EL, Robertson CS, Menon DK, Maas AIR, Markowitz AJ, Jain S, Okonkwo DO, Temkin NR, Manley GT; TRACK-TBI Investigators. Clinical profile of patients with acute traumatic brain injury undergoing cranial surgery in the United States: report from the 18-centre TRACK-TBI cohort study. *Lancet Reg Health Am* 39:100915 2024.

Snider SB, Deng H, Hammond FM, Kowalski RG, Walker WC, Zafonte RD, Okonkwo DO, Giacino JT, Puccio AM, Bodien YG. Time to Command-Following and Outcomes After Traumatic Brain Injury. *JAMA Netw Open* 7(12):e2449928, 2024.

Taori S, Habib A, Adida S, Gecici NN, Sharma N, Calcaterra M, Tang A, Pandya S, Mehra A, Deng H, Elidrissy H, Idrissi YA, Amjadzadeh M, Zinn PO. Circulating biomarkers in high-grade gliomas: current insights and future perspectives. *J Neurooncol* 172(1):41-49, 2025.

Gecici NN, Hameed NUF, Habib A, Deng H, Lunsford LD, Zinn PO. Comparative Analysis of Efficacy and Safety of Frame-Based, Frameless, and Robot-Assisted Stereotactic Brain Biopsies: A Systematic Review and Meta-Analysis. *Oper Neurosurg* (Hagerstown) 28(6):749-761, 2025.

Wei Z, Jose S, Abou-Al-Shaar H, Deng H, Luy D, Kondziolka D, Niranjan A, Lunsford LD. Intracerebral and pituitary metastatic eccrine carcinoma: prolonged survival using stereotactic radiosurgery. *Br J Neurosurg* 39(2):240-245, 2025.

Hansen Deng, MD

Donohue JK, Wei Z, Deng H, Niranjan A, Lunsford LD. Management of sarcomatoid Malignant pleural mesothelioma brain metastases with stereotactic radiosurgery: an Illustrative case. *Br J Neurosurg* 39(3):372-374, 2025.

Andrew Faramand, MD

PGY-5 Resident

Andrew Faramand, MD, MSc, received his medical degree from Jordan University of Science and Technology in Irbid, Jordan. After graduating from medical school, Dr. Faramand pursued his master's degree with distinction in clinical neuroscience at University College London-Queen Square Institute of Neurology. His research at Great Ormond St. Hospital focused on the outcomes of epilepsy surgery in children.

Dr. Faramand is a dedicated researcher in the field of Gamma Knife stereotactic radiosurgery. He completed three years of post-doctoral research fellowship at the UPMC Center of Image-Guided Neurosurgery at the University of Pittsburgh Department of Neurological Surgery under the mentorship of L. Dade Lunsford, MD. He specifically worked on clinical studies regarding stereotactic radiosurgery for brain tumors, arteriovenous malformations, and trigeminal neuralgia.

He enjoys playing soccer, swimming, and spending time with family and friends.

Specialized Areas of Interest
Neuro-oncology; stereotactic radiosurgery; cerebrovascular neurosurgery; skull-base neurosurgery.

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

Education & Training
MD, Jordan University of Science and Technology
MSc, Clinical Neuroscience, University College London-Queen Square Institute of Neurology
Fellowship, University of Pittsburgh

Honors & Awards
JANE Oral Presentation Award, AANS/CNS Spine Summit, 2019
High Distinction Graduate, University College London, 2015
Dean's Honors List, Jordan University of Science and Technology, 2004-20

Joseph Garcia, MD

PGY-4 Resident

Joseph H. Garcia, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July 2022 after graduating from the University of California, San Francisco School of Medicine, earning his MD with distinction in molecular medicine. He received his undergraduate degree from the University of California, Davis.

Prior to residency, Dr. Garcia performed basic science research focused on understanding the role of cellular metabolism in neurodegeneration and in brain tumor biology. He also conducted clinical neurosurgical research on topics ranging from cerebrovascular disease to surgical treatments for epilepsy.

Joseph Garcia, MD

Dr. Garcia was born and raised in San Francisco, California. Outside of neurosurgery, he enjoys sports, getting outside, and spending time with his family and friends.

Specialized Areas of Interest
Cerebrovascular neurosurgery; epilepsy surgery; neuro-oncology; skull base neurosurgery.

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

Education & Training
BS, Plant Biology, University of California Davis, 2014
MD, University of California San Francisco, 2022

Honors & Awards
Best Basic Scientific Paper Abstract Award, AANS Cerebrovascular Section, 2023
MD with Distinction in Molecular Medicine, UCSF, 2022
Steinhart Award for students matching into surgical subspecialties, UCSF, 2022
Dean's Prize for Long-Term Research, UCSF, 2021
Research Diversity Supplement, NIH-National Cancer Institute (NCI), 2020
Dean's Prize for Short-Term Research, UCSF, 2018

Jeffery Head, MD

Chief Resident

Jeffery Head, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July of 2020. He graduated from Colgate University in 2012 with honors in cellular neuroscience and earned his medical degree from Sidney Kimmel Medical College at Thomas Jefferson University in 2020, where he graduated cum laude and was elected into the Alpha Omega Alpha Honor Society.

Prior to medical school, Dr. Head spent two years as a post-baccalaureate research fellow at the National Institutes of Health studying developmental neurobiology in zebra fish. His work focused on understanding the molecular signaling pathways that regulate collective cell migration in the peripheral nervous system during embryogenesis and creating digital reconstructions of the relationships between these cells during their embryonic migration.

During his medical school career, Dr. Head was involved in research on spinal cord stimulation waveforms in treating chronic low-back pain, surgical approaches to the spine in treating OPLL, mechanical thrombectomy in distal circulation strokes, and the risk-factors for infection in external ventricular drains. During residency, Dr. Head is completing enfolded-fellowships in adult spinal deformity, minimally invasive spine surgery, and spine oncology. He has developed a focus in his research on applying the principles of deformity spine surgery correction to adult degenerative spine pathologies.

Dr. Head was born and raised in Fairfield, Connecticut. Outside of neurosurgery Dr. Head is an avid skier and enjoys wood working, cooking, hiking, running, softball, and spending time with his wife and his new puppy.

Specialized Areas of Interest
Adult spinal deformity, minimally invasive spine surgery, spine oncology.

Jeffery Head, MD

Professional Organization Membership
Alpha Omega Alpha Honor Society
American Association of Neurological Surgeons
Congress of Neurological Surgeons

Education & Training
BA, Cellular Neuroscience, Colgate University, 2012
MD, Sidney Kimmel Medical College at Thomas Jefferson University, 2020

Honors & Awards
Cum Laude, Sidney Kimmel Medical College (SKMC), Thomas Jefferson University 2020
Alpha Omega Alpha Honor Society, SKMC 2019
Top Performer, AANS Top Gun Neurosurgical Skills Competition, AANS Meeting 2019
Dr. George McClellan Surgical Honor Society, SKMC 2018
Hobart Amory Hare Medical Honor Society, SKMC 2018
Best Poster Award, Sigma-Xi Student Research Day, SKMC 2018
Best Poster Award, Post-Baccalaureate Poster Day, NIH 2014
Honors, Neuroscience Concentration, Colgate University 2012

Joseph Scott Hudson, MD

PGY-7 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 is currently an enfolded CAST and AO spine accredited complex and minimally invasive spine fellow. He is founder and CEO of BioForce Spine LLC, a University of Pittsburgh based start-up company currently developing a nanoscale osteo-inductive coating for titanium spine implants.

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
Minimally invasive and complex spine surgery, spinal deformity, general neurosurgery, cerebrovascular neurosurgery.

Joseph Scott Hudson, MD

Professional Organization Membership
Alpha Omega Alpha
American Association of Neurological Surgeons
AO Spine
Congress of Neurological Surgeons
North American Spine Society
Society of Minimally Invasive Spine Surgery

Education & Training
BA, Biology, Minor in Chemistry, University of Iowa, 2015
MD, University of Iowa Carver College of Medicine, 2019

Honors & Awards
Travel Grant, Society of Minimally Invasive Spine Surgery, 2023
Educational Scholarship, Lumbar Spine Research Society, 2023
Travel Grant, Medtronic, 2023
Travel Grant, International Society for the Advancement of Spine Young Surgeons, 2023
Richard Kessel Scholarship in Medicine, University of Iowa Carver College of Medicine, 2018
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
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
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

News Media Appearances
"Usefulness and Accuracy of Artificial Intelligence Chatbot Responses to Patient Questions for Neurosurgical Procedures," Congress of Neurological Surgeons *Journal Club Podcast*, July 2024.

Publications: 2024-25
• Book Chapters:
Hudson JS, Buell TJ, Okonkwo DO. Deformity Prevention and Correction: Complex Clinical Strategies. In: *Biomechanics of Spine Stabilization: Self-Assessment and Review*, Boakye M, Benzel EC, Ghogawala Z, Brodke DS, Chapman JR (eds), Chapter 27, Thieme, 2025.

• Refereed Articles:
Adida S, Hudson JS, Legarreta AD, Taori S, Shanahan RM, Jawad-Makki MH, Colan JA, Mitha R, Agarwal N, Okonkwo DO, Hamilton DK, Buell TJ. Revision surgery for proximal junctional failure: A single-center analysis. *Clin Neurol Neurosurg* 253:108880, 2025.

Bhatia S, Nouduri ST, Sankar A, Kann MR, Hardi A, Hudson JS, Al-Bayati AR, Nogueira RG, Lang MJ, Gross BA. Endovascular thrombectomy for acute ischemic stroke with primary occlusion of the anterior cerebral artery: A meta-analysis. *J Stroke Cerebrovasc Dis* 34(2):108208, 2025.

Ali A, Kumar RP, Polavarapu H, Lavadi RS, Mahavadi A, Legarreta AD, Hudson JS, Shah M, Paul D, Mooney J, Dietz N, Fields DP, Hamilton DK, Agarwal N. Bridging the Gap: Can Large Language Models Match Human Expertise in Writing Neurosurgical Operative Notes? *World Neurosurg* 192:e34-e41, 2024.

Joseph Scott Hudson, MD

Shanahan RM, Hudson JS, Piazza MG, Kehinde F, Anand SK, Ortiz D, Madan-Khetarpal S, Greene S. Neurosurgical Management of Rubinstein-Taybi Syndrome: An Institutional Experience. *Pediatr Neurosurg* 59(5-6):181-192, 2024.

Hoz SS, Hudson JS, Ma L, Lang MJ, Gross BA. Medications and "Risk" of Aneurysm Rupture Based on Presentation: Setting the Record Straight. *World Neurosurg* 188:e573-e577, 2024.

Nowicki KW, Mittal A, Hudson JS, D'Angelo MP, McDowell MM, Cao C, Mantena R, Jauhari A, Friedlander RM. Blockade of the Platelet-Driven CXCL7-CXCR1/2 Inflammatory Axis Prevents Murine Cerebral Aneurysm Formation and Rupture. *Transl Stroke Res* [Online ahead of print], 2024.

Research Activities
Dr. Hudson's research focuses on clinical outcomes in spine surgery, leveraging UPMC's robust volume. Likewise, he is collaborating with Haitao Liu, PhD, in the University of Pittsburgh Department of Chemistry, and George Hussey, PhD, in the McGowan Institute for Regenerative Medicine, to co-develop a coating which will enhance the osseous integration of titanium alloy spine implants by allowing for the implants direct ligand mediated stimulation of bone marrow derived mesenchymal stem cells in the surgical field. This technology will help reduce rates of pseudoarthrosis. This work has led to the creation of a University of Pittsburgh based start-up company BioForce Spine, LLC, and the creation of an intellectual property portfolio.

Sakibul Huq, MD

PGY-5 Resident

Sakibul Huq, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July 2021 after earning his MD from the Johns Hopkins University School of Medicine. He previously graduated from the University of North Carolina at Chapel Hill, where he studied biology and business administration on the fully funded Morehead-Cain Scholarship.

Dr. Huq is pursuing a surgeon-scientist career pathway with a focus on neuro-oncology and skull base surgery. He is currently completing an enfolded fellowship in skull base surgery under the direction of Paul Gardner, MD, and Georgios Zenonos, MD. He is also the recipient of an NIH NINDS UE5 research grant, through which he is completing a postdoctoral fellowship under the mentorship of Constantinos Hadjipanayis, MD, PhD, and Sameer Agnihotri, PhD. Dr. Huq is a member of the Burroughs Wellcome Foundation Physician Scientist Incubator program and a grant recipient of The Beckwith Institute's Clinical Transformation Program. His work has resulted in numerous awards and over 50 peer-reviewed publications.

Dr. Huq also remains interested in neurosurgical organization and leadership. He previously served as the AANS Young Neurosurgeons Committee MISSION fellow. Prior to medical school, he worked in management consulting with Huron Consulting Group, where he developed interests in healthcare quality, value and leadership.

Dr. Huq is a native of Pittsburgh. His hobbies outside neurosurgery include fitness, soccer, basketball, travel and music. His wife is a graduate of the obstetrics and gynecology residency program at UPMC Magee-Womens Hospital and is a current reproductive endocrinology and infertility fellow at UPMC. They enjoy exploring the Pittsburgh food scene and spending time with their Australian shepherd Kobe.

Specialized Areas of Interest
Skull base neurosurgery, neuro-oncology, radiosurgery, genomics, liquid biopsy, quality improvement, high value care, medical education, and socioeconomics.

Sakibul Huq, MD

Professional Organization Membership
American Association of Neurological Surgeons
AANS/CNS Section on Tumors
American Medical Association
Congress of Neurological Surgeons

Education & Training
MD, Johns Hopkins University School of Medicine, 2021
BS, University of North Carolina at Chapel Hill, 2014

Honors & Awards
NIH NINDS UE5 Research Education Grant Recipient, 2025
Clinical Transformation Program Grant Recipient, The Beckwith Institute, 2024
Physician Scientist Incubator Program, Burroughs Wellcome Foundation, 2024
Walter Copeland Grant, Pittsburgh Foundation, 2023, 2024
Brian D. Silber Award, AANS, 2020
James Rutka Pediatric Brain Tumor Award, CNS, 2020
Harvey Cushing Medical Student Research Award, Johns Hopkins Medicine, 2020
Medical Student Summer Research Fellowship, AANS/NREF, 2020
MISSION Fellowship, AANS Young Neurosurgeons Committee, 2019
Medical Student Summer Fellowship, American Brain Tumor Association, 2019
Paul Ehrlich Research Award, Johns Hopkins Young Investigators Day, 2019
Carolyn L. Kuckein Student Research Fellowship, Alpha Omega Alpha, 2018
Henry Strong Denison Outstanding Student Research Award, Johns Hopkins Medicine, 2018
Tylenol Future Care Scholarship, 2016
Morehead-Cain Scholarship, University of North Carolina at Chapel Hill, 2014
Phi Beta Kappa, University of North Carolina at Chapel Hill, 2014
Highest Distinction, University of North Carolina at Chapel Hill, 2014

Rachel C. Jacobs, MD

Chief Resident

Rachel C. Jacobs, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July of 2020 after receiving her medical degree from the University of Pittsburgh School of Medicine. She obtained her undergraduate degree in neuroscience and behavioral biology from Emory University as a liberal arts scholarship recipient.

During her undergraduate education, she spent four years at Yerkes National Primate Research Center studying selective MRI-guided neurotoxic lesions and neuroanatomical procedures in rhesus macaques to assess brain reorganization following neonatal brain lesions. During medical school, she became heavily involved in the UPMC Center for Image-Guided Neurosurgery under the mentorship of L. Dade Lunsford, MD. Specifically, she worked on clinical studies regarding stereotactic radiosurgery outcomes for benign and malignant brain tumors, arteriovenous malformations and cavernous malformations. Her peer-reviewed work has been presented at regional and national neurosurgical conferences in oral and abstract form.

Dr. Jacobs enjoys boxing, spinning, and international travel in her free time. She is a native of Atlanta, Georgia.

Specialized Areas of Interest
Open vascular and endovascular neurosurgery.

Rachel C. Jacobs, MD

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

Education & Training
BS, Neuroscience/Behavioral Biology, Emory University, 2016
MD, University of Pittsburgh School of Medicine, 2020

Honors & Awards
Excellence in Neurosurgery Award, University of Pittsburgh Department of Neurological Surgery, 2022
Morris H. and Gertrude M. Harris Foundation Scholar for Jewish Medical Students, 2016-20
Liberal Arts Scholarship Recipient, Emory University, 2012-16

Publications: 2024-25
• Refereed Articles:
Crane A, Shanahan R, Hudson J, Nowicki KW, Gersey ZC, Agarwal P, Jacobs RC, Lang MJ, Gross B. Pharmaceutical Modulation of Intracranial Aneurysm Development and Rupture. *J Clin Med* 13(11):3324, 2024.

Jacobs RC, Chilukuri A, Abou-Al-Shaar H, Garcia J, Agarwal P, McDowell MM, Al-Bayati AR, Greene S. Arteriovenous Malformation-Associated Aneurysms in the Pediatric Population: the UPMC Experience. *J Neurosurg Pediatr* 35(1):79-84, 2024.

Hoz SS, Ma L, Muthana A, Al-Zaidy MF, Ahmed FO, Ismail M, Jacobs RC, Agarwal P, Al-Bayati AR, Nogueira RG, Lang MJ, Gross BA. Cranial Nerve Palsies and Intracranial Aneurysms: A Narrative Review of Patterns and Outcome. *Surg Neurol Int* 15:277, 2024.

Hoz SS, Ma L, Agarwal P, Jacobs RC, Al-Bayati AR, Nogueira RG, Zenonos GA, Gardner PA, Friedlander RM, Lang MJ, Gross BA. Clinical Comparison of Flow Diversion and Microsurgery for Retreatment of Intracranial Aneurysms. *J Clin Neurosci* 136:111296 2025.

Research Activities
Endovascular treatment of intracranial aneurysms, arteriovenous malformations, and arteriovenous fistulas.

Albin John, MD

PGY-3 Resident

Albin A. John, MD MBA, joined the University of Pittsburgh Department of Neurological Surgery residency program in July 2023 after graduating from Texas Tech University Health Sciences Center. He received his undergraduate degree from Duke University.

Prior to residency, Dr. John performed clinical and translational research in various fields including neurology, orthopedics, plastic surgery, burn and neurosurgery. He has conducted clinical neurosurgical research on topics ranging from optogenetics to spinal hardware, operative techniques and advanced imaging for Chiari patients.

Dr. John was born and raised in Singapore. After immigrating to the United States, he spent his formative years in Houston, Texas. Outside of neurosurgery, he enjoys sports, cooking, salsa dancing, and spending time with family and friends.

Albin John, MD

Specialized Areas of Interest
Complex spine; spine oncology; hardware and medical devices; entrepreneurship.

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

Education & Training
BA, Neuroscience, Duke University, 2018
MBA, Rawls College of Business, 2020
MD, Texas Tech University Health Sciences Center, 2023

Honors & Awards
Alpha Omega Alpha, Zeta Texas Chapter, 2022
Phi Kappa Phi, Rawls College of Business, 2019
Distinction in Neuroscience, Duke University, 2018

Ritesh Karsalia, MD

PGY-1 Resident

Ritesh Karsalia, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July 2025 after earning his medical degree from the Perelman School of Medicine at the University of Pennsylvania. At the University of Pennsylvania, Dr. Karsalia also earned a master of science in translational research (MSTR) degree alongside his medical education. He received his undergraduate degree in biology and Latin American studies from Villanova University.

Dr. Karsalia's clinical and academic interests have spanned the breadth of neurosurgery, including minimally invasive and complex spine as well as translational neuro-oncology. At the University of Pennsylvania, Dr. Karsalia received a NIH TL1 grant to support his work developing novel intraoperative molecular imaging agents for gliomas. Additionally, he served as the Frazier Clinical Research Scholar in Penn's Department of Neurosurgery, where he conducted research centered around neurosurgical outcomes, perioperative risk factors, risk-mitigation strategies, and social determinants of health.

Dr. Karsalia was born and raised in central New Jersey. Outside of neurosurgery, he enjoys watching Philly sports, attending music festivals, learning about personal finance, and working out (running, cycling, and weightlifting).

Specialized Areas of Interest
Spine, neuro-oncology, intraoperative molecular imaging, clinical outcomes, social determinants of health.

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

Education & Training
BS, Biology and Latin American Studies, Villanova University, 2019
MD, Perelman School of Medicine at the University of Pennsylvania, 2025
MSTR, Perelman School of Medicine at the University of Pennsylvania, 2025

Ritesh Karsalia, MD

Honors & Awards
Penn Medicine Institute for Translational Medicine and Therapeutics grant, 2024
National Institutes of Health TL1 grant, 2023
Oral Abstract Presentation Award, Pennsylvania Neurosurgical Society, 2023
Phi Beta Kappa Honor Society, 2019
John M. McClain Medallion for Excellence, Villanova University, 2019
Thomas J. Mentzer Award, Villanova University, 2019
Falvey Research Scholar, Villanova University, 2019

Rohit Prem Kumar, MD

PGY-1 Resident

Rohit Prem Kumar, MD, matched into the University of Pittsburgh Department of Neurological Surgery residency program in March of 2025 and will join the department on July 1, 2025. He earned his medical degree from Hackensack Meridian School of Medicine, where he was awarded the Dean Bonita Stanton Scholarship and was the president of his class. Prior to medical school, Dr. Kumar graduated summa cum laude with a bachelor of arts in biology from the New Jersey Institute of Technology's Albert Dorman Honors College.

During medical school, Dr. Kumar developed a strong academic and clinical interest in complex spine surgery, spinal trauma, and the application of artificial intelligence and computational methodologies to enhance neurosurgical outcomes. Between his third and fourth years of medical school, he served as a research fellow at the Spine Computational Outcomes Learning Institute (SCOLI), working extensively with advanced computational analyses under the mentorship of Nitin Agarwal, MD, and D. Kojo Hamilton, MD.

His research includes investigating the efficacy of novel therapeutic agents like romosozumab for improving spine surgery outcomes and engineering marvels such as metamaterials to develop better spinal implants. Dr. Kumar's dedication to advancing spine surgery has resulted in numerous peer-reviewed publications in prestigious journals, including *Neurosurgery, Journal of Neurosurgery* and *JAMA Surgery*. Additionally, he is committed to patient advocacy and helped form the Spine and Scoliosis Patient Support Group to provide a community for individuals with spinal disorders.

Dr. Kumar was born in Hyderabad, India, and raised in Plainsboro, New Jersey. Outside of neurosurgery, he enjoys gaming, writing, photography, cooking, weightlifting, and spending quality time with his family and friends.

Specialized Areas of Interest
Complex spine surgery; spinal trauma; neurosurgical outcomes research; computational methodologies and artificial intelligence in neurosurgery; medical education.

Professional Organization Membership
American Association of Neurological Surgeons
AANS/CNS Section on Disorders of the Spine and Peripheral Nerves
American Medical Association
Congress of Neurological Surgeons

Education & Training
BA, Biology, New Jersey Institute of Technology, Albert Dorman Honors College, 2018
MD, Hackensack Meridian School of Medicine, 2025

Rohit Prem Kumar, MD

Honors & Awards
Dean Bonita Stanton Scholarship, Hackensack Meridian School of Medicine, 2020-25
Clinical Transformation Program Grant, Beckwith Institute, 2024
Young Investigator Research Grant Award, AO Spine, 2024
Young Surgeon Grant, International Society for the Advancement of Spine Surgery, 2024
Education Scholarship, Lumbar Spine Research Society, 2024
TechQuest Award, NJIT, 2017
i-Corps Grant, National Science Foundation, 2017
Undergraduate Research & Innovation Grant, NJIT, 2016 & 2017

Andrew Legarreta, MD

PGY-7 Resident

Andrew D. Legarreta, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July 2019, after earning his medical degree from Vanderbilt University School of Medicine. He completed his undergraduate studies at Duke University, where he earned a bachelor of arts in history.

During his time in medical school, Dr. Legarreta focused on the effects of sports-related concussions among high school athletes. His research specifically explored predictors of post-concussion syndrome and, separately, analyzed structural and functional neuroimaging findings in football players. His peer-reviewed studies have been presented in both oral and poster formats at regional and national neurosurgical conferences.

In his residency, Dr. Legarreta has concentrated on minimally invasive spine surgery, particularly in the context of deformity correction. His current research involves the application of machine learning techniques to various aspects of spine surgery.

In his leisure time, Dr. Legarreta enjoys playing guitar, traveling internationally and playing golf. He is originally from Buffalo, New York.

Specialized Areas of Interest
Minimally invasive spine surgery; machine-learning; 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 & Awards
Cornelius Vanderbilt Scholarship, Vanderbilt University School of Medicine, 2015-19

Publications: 2024-25
• Refereed Articles:
Adida S, Hudson JS, Legarreta AD, Taori S, Shanahan RM, Jawad-Makki MH, Colan JA, Mitha R, Agarwal N, Okonkwo DO, Hamilton DK, Buell TJ. Revision surgery for proximal junctional failure: A single-center analysis. *Clin Neurol Neurosurg* 253:108880, 2025.

Andrew Legarreta, MD

Research Activities
Dr. Legarreta's 2024–25 research focused on spine biomechanics, imaging analytics, and perioperative risk. He co-authored studies identifying predictors of subsidence after lateral lumbar interbody fusion, showing that increased fusion length was protective, while lateral plating was not. He contributed to machine learning analyses using CT-derived Hounsfield units as a surrogate for DEXA in assessing bone quality and fracture risk. Additional projects explored revision strategies for proximal junctional failure, the use of AI for radiology summarization, and evaluation of digital neurosurgical education platforms.

David J. McCarthy, MD

Chief Resident

David McCarthy, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July of 2020 after graduating from the University of Miami Miller School of Medicine. He earned a master's degree in clinical and translational research with a focus in statistics from the University of Miami and a bachelor of science degree in biochemistry from the University of Florida.

During medical school, Dr. McCarthy cultivated an interest in ischemic and hemorrhagic stroke treatment modalities and outcomes. In the laboratory, he investigated endothelial dysfunction in aneurysms and pharmaceutical stroke recovery enhancement. For aneurysms, he researched molecular inhibition of pathologic endothelial cell expression and enhanced endothelization following endovascular treatment modalities. In ischemic stroke, he utilized a murine photochemical cortical stroke model to assess the efficacy of various neuroprotective pharmaceutical agents. In clinical research, Dr. McCarthy authored and co-authored manuscripts that focused on optimizing neuroendovascular access, and post stroke thrombectomy critical care.

Dr. McCarthy's research interests include neurosurgical epidemiology and treatment trends, neuroendovascular devices, and the molecular physiology of cerebral aneurysms. He hopes to apply artificial intelligence and machine learning for computation flow dynamic assessment of cerebral aneurysms, comparing physiologic cell stress to genomic expression. Additionally, he hopes to contribute to neurosurgical literature with the improvement of current statistical methods.

Dr. McCarthy was raised in Tampa, Fla. In his free time, he enjoys creating art (resin, graphite), winter mountaineering, skiing, hiking, running, and weight lifting.

Specialized Areas of Interest
Cerebrovascular neurosurgery, neuro-oncology, pediatric neurosurgery, functional neurosurgery, and neurotrauma.

Professional Organization Membership
American Association of Neurological Surgeons
American Heart Association: Stroke Council
Congress of Neurological Surgeons

Education & Training
BS, Biochemistry, University of Florida, 2014
MS, University of Miami, 2018
MD, University of Miami Miller School of Medicine, 2020

David J. McCarthy, MD

Honors & Awards
Judson Scholarship Recipient, University of Miami Miller School of Medicine, 2014-2020
ISC Junior Investigator Travel Award, American Heart Association, 2019
Second Place Clinical Poster Award, Eastern Atlantic Student Research Forum, 2018
Cerebrovascular Disease and Stroke Fellowship Recipient, American Heart Association, 2017
Best Clinical Poster Presentation Winner, Eugene J. Sayfie Research Day, 2017
Medical Student Research Fellow, Neurosurgery Research and Education Foundation, 2017
Clinical and Translational Investigation Scholarship, University of Miami, 2017

Najib Muhammad, MD

PGY-1 Resident

Najib Muhammad, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program July 1, 2025. He earned his medical degree from the University of Pennsylvania Perelman School of Medicine. Prior to medical school, he graduated summa cum laude from the University of Pennsylvania in 2021 with a BA in chemistry and a MS in biological chemistry.

During medical school, Dr. Muhammad developed academic and clinical interests in neuro-oncology, skull base, and vascular neurosurgery. His translational research aimed to develop novel fluorescent dyes for intraoperative molecular imaging of brain tumors, and his clinical research analyzed new techniques and patient outcomes in vascular neurosurgery and spine surgery. His research on these topics and others resulted in numerous presentations and publications in leading journals including the *Journal of Neurosurgery* and the *Journal of Neurointerventional Surgery*. He is also passionate about medical device innovation and helped develop new devices used in pediatric neurosurgery and neurocritical care.

Dr. Muhammad was born in Singapore and raised in the suburbs of Atlanta. Outside of neurosurgery, he enjoys playing basketball, snowboarding, watching sports, and spending time with friends and family.

Specialized Areas of Interest
Skull base surgery; neurosurgical oncology; cerebrovascular surgery; spine surgery; clinical outcomes research; medical device innovation.

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

Education & Training
BA, University of Pennsylvania, 2021
MS, University of Pennsylvania, 2021
MD, University of Pennsylvania Perelman School of Medicine, 2025

Honors & Awards
Agnew Society Scholarship, University of Pennsylvania Perelman School of Medicine, 2022
Summa Cum Laude, University of Pennsylvania, 2021
Phi Beta Kappa, University of Pennsylvania, 2021

Abhinav Pandey, MD

PGY-1 Resident

Abhinav (Abhi) Pandey, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program July 1, 2025. He earned his medical degree from Weill Cornell Medicine, where he was inducted into the Gold Humanism Honor Society. He previously earned a bachelor of arts in economics with general honors from the University of Chicago.

Dr. Pandey's clinical interests include neurosurgical-oncology, pediatric neurosurgery and complex cranial and skull base surgery. His academic work centers on cancer immunogenomics and the role of cell-to-cell communication between tumor cells and the surrounding stroma. His computational research applies transcriptomic techniques to investigate tumor biology, drug resistance and signaling networks, while his clinical research focuses on minimally invasive approaches to skull base tumors. During his research year, Dr. Pandey was supported by the Burroughs Wellcome Physician-Scientist Institutional Award to study mechanisms of leptomeningeal dissemination in medulloblastoma. He has authored over 30 peer-reviewed publications, with work published in *Cancer Cell, Nature Medicine,* and *Neuro-Oncology*.

Raised in Westford, Mass., Dr. Pandey enjoys reading contemporary fiction, cooking, and weightlifting in his free time.

Specialized Areas of Interest
Neurosurgical oncology; pediatric neurosurgery; skull base surgery; precision medicine.

Professional Organization Membership
American Association of Neurological Surgeons
Arnold P. Gold Humanism Honor Society
Congress of Neurological Surgery

Education & Training
BA, Economics, University of Chicago, 2017
MD, Weill Cornell Medicine, 2025

Honors & Awards
Burroughs Wellcome Fund Physician-Scientist Institutional Award, 2023

News Media Appearances: 2024-25
"Medical Students Celebrate Their Future with Match Day Successes, *Weill Cornell Medicine Newsroom*, March 21, 2025.

Publications: 2024-25
• Refereed Articles:
Yoo SK, Fitzgerald CW, Cho BA, Fitzgerald BG, Han C, Koh ES, Pandey A, Sfreddo H, Crowley F, Korostin MR, Debnath N, Leyfman Y, Valero C, Lee M, Vos JL, Lee AS, Zhao K, Lam S, Olumuyide E, Kuo F, Wilson EA, Hamon P, Hennequin C, Saffern M, Vuong L, Hakimi AA, Brown B, Merad M, Gnjatic S, Bhardwaj N, Galsky MD, Schadt EE, Samstein RM, Marron TU, Gönen M, Morris LGT, Chowell D. Prediction of checkpoint inhibitor immunotherapy efficacy for cancer using routine blood tests and clinical data. *Nat Med* 31(3):869-880, 2025.

Bander ED, Pandey A, Gundlach C, Li Y, Tusa Lavieri M, Christos PJ, Dobri G, Schwartz TH. Hormone outcomes following endoscopic endonasal resection of nonfunctional pituitary adenomas. *J Neurosurg* [Online ahead of print], 2025.

Abhinav Pandey, MD

Giantini-Larsen AM, Pandey A, Garton ALA, Rampichini M, Winston G, Goldberg JL, Magge R, Stieg PE, Souweidane MM, Ramakrishna R. Therapeutic manipulation and bypass of the blood-brain barrier: powerful tools in glioma treatment. *Neurooncol Adv* 7(1):vdae201, 2025.

Martin B, Guadix SW, Sathian R, Laramee M, Pandey A, Ray I, Wang A, Davuluri R, Thomas CJ, Dahmane N, Souweidane M. Designing a time-dependent therapeutic strategy using CDK4/6 inhibitors in an intracranial ATRT model. *Neuro Oncol* 27(4):1076-1091, 2025.

Research Activities
Between 2024 and 2025, Dr. Pandey co-authored more than 15 publications, primarily in neurosurgery-focused journals such as *Journal of Neurosurgery, Neurosurgery,* and *World Neurosurgery* and additionally in oncology-focused journals such as *Neuro-oncology* and *Neuro-oncological Advances*. These projects encompassed diverse topics—from comparing surgical approaches to olfactory groove meningiomas and pituitary adenomas to exploring machine learning tools for tumor prognostication to price transparency in neurosurgical care. Dr. Pandey was first author on several of these manuscripts, and also contributed to a high-impact study published in Nature Medicine on using routine clinical and laboratory data to predict response to immune checkpoint inhibitors.

Jordan Petitt, MD

PGY-2 Resident

Jordan Petitt, MD, joined the University of Pittsburgh Department of Neurological Surgery in October of 2024.

Sangami Pugazenthi, MD

PGY-1 Resident

Sangami Pugazenthi, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program July 1, 2025. She earned her medical degree from Washington University School of Medicine in St. Louis where she received the Distinguished Student Scholarship. She previously completed her undergraduate education in biochemistry and public health at Vanderbilt University in Nashville where she graduated with highest honors.

During medical school, Dr. Pugazenthi developed an interest in leveraging neurosurgical interventions in skull base surgery and neuro-oncology to investigate brain and skull base tumors using computational and in vitro molecular analysis techniques. The goal of these studies was to further our ability to prognosticate and develop targeted therapy for these tumors. She has received numerous grants and awards for this work resulting in first author publications in *Science Advances, Neuro-Oncology* and *JNCI*. She has also published many manuscripts in topics such as detailing barriers to neurosurgery for medical students, the impact of organized neurosurgery research funding, and mapping the geographic movement of neurosurgeons across their training. Dr. Pugazenthi has interests in medical education and organized neurosurgery resulting in her co-founding and leading the Women in Neurosurgery Medical Student Committee and the Congress of Neurological Surgeons Medical Student Subcommittee.

Dr. Pugazenthi was born in Trichy, India and raised in the suburbs of Chicago. Outside of neurosurgery, she enjoys running, hiking, visiting national parks, international travel, and spending time with family and friends.

Sangami Pugazenthi, MD

Specialized Areas of Interest
Skull base surgery, neuro-oncology, cerebrovascular neurosurgery, radiosurgery, general neurosurgery, medical education, organized neurosurgery.

Professional Organization Membership
American Association of Neurological Surgeons
American Medical Association
AANS/CNS Section on Tumors
AANS/CNS Section on Women in Neurosurgery
Congress of Neurological Surgeons

Education & Training
BA, Vanderbilt University, 2020
MD, Washington University School of Medicine, St. Louis, 2025

Honors & Awards
Richard S. Brookings Medical School Prize, Washington University, 2025
Antoinette Frances Dames Award, Washington University, 2025
Dr. Brookings Medical School Research Award, Washington University, 2025
Future Physicians of Tomorrow Scholarship, American Medical Association, 2024
Neurosurgery Department Research Symposium Medical Student Research Award, Washington University, 2022, 2024
Muraszko Mentorship Award, NREF/WINS, 2024
Medical Student Summer Research Fellowship Best Abstract Award, NREF, 2023
Lucien Rubenstein Award for Top Fellowship Performance, ABTA, 2024
Medical Student Summer Research Fellowship Grant Award, NREF, 2023
Jack & Fay Netchin Medical Student Summer Fellowship Grant, ABTA, 2023
Year-Long Research Program Fellowship Award, Washington University, 2022-2023
Socioeconomic Medical Student Summer Fellowship Grant Award, CSNS/CNS, 2023
Best Oral Presentation at Annual Research Symposium, Washington University, 2023
Scholars in Medicine Award, Washington University, 2023
Mizuho Minimally Invasive Brain Tumor Surgery Abstract Award, AANS/CNS Section on Tumors, 2023
Center for the Study of Race, Ethnicity & Equity Grant Award, Washington University, 2022
Stephen Euless Kelly Scholarship, Washington University School of Medicine, 2020-2025
Distinguished Student Scholar, Washington University School of Medicine, 2020-2025
Highest Honors for Biochemistry and Chemical Biology Thesis Defense, Vanderbilt University, 2020
Biochemistry Department Aida Nureddin Outstanding Research Award, Vanderbilt University, 2020
Vanderbilt Awards for Leadership Excellence, Ripple in the Pond Award, Vanderbilt University, 2020

Publications: 2024-25
• Book Chapters:
Balasubramanian S, Pugazenthi S. Cohen JA, Jung JK. Health Literacy: How the Internet Has Changed the Way People Receive Health Information. In: *The Evolution of Health Literacy: Empowering Patients Through Improved Education (2nd Edition)*, Agarwal N, Hansberry DR, Prabhu AV (eds), pp 37-50, Nova Science Publishers, 2025.

• Refereed Articles:
Paliwoda ED, Gajjar AA, Patel S, Bhupathiraju S, Barpujari A, Lavadi RS, Mitha R, Pugazenthi S, Mooney J. Ranking United States' Medical Residency Programs: A Systematic Review and Critical Analysis of Doximity's Residency Navigator Tool. *Cureus* 17(2):e79579, 2025.

Sangami Pugazenthi, MD

Kann MR, Estes E, Pugazenthi S, Barpujari A, Mohan V, Rogers JL, Hardi A, Graffeo C. The Impact of Surgical Prehabilitation on Postoperative Patient Outcomes: A Systematic Review. *J Surg Res* 306:165-181, 2025.

Patel B, Pugazenthi S, English CW, Nitturi V, Pari SS, Mahlokozera T, Leidig WA, Lu HC, Yang A, Roberts K, DeSouza P, McGeehan KP, Mao DD, Sinha N, Ippolito JE, Dahiya S, Petti A, Yano H, Klisch TJ, Harmanci AS, Patel AJ, Kim AH. NF2 loss-of-function and hypoxia drive radiation resistance in grade 2 meningiomas. *J Natl Cancer Inst* [Online ahead of print], 2025.

Pugazenthi S, Patel B, English CW, Leidig WA, McGeehan KP, McCornack CR, Mok S, Anzaldua-Campos M, Nouri SH, Roberts K, Chatrath A, Khan A, Gadot R, Yano H, Klisch TJ, Harmanci AS, Patel AJ, Kim AH. Multiomic and clinical analysis of multiply recurrent meningiomas reveals risk factors, underlying biology, and insights into evolution. *Sci Adv* 10(43):eadn4419, 2024.

Kann MR, Chen D, Huang G, Pugazenthi S, Zehnder N. Qualitative Analysis of Reddit Posts Following the Switch to USMLE Step 1 Pass-Fail Score Reporting. *Med Sci Educ* 35(1):425-436, 2024.

Muzyka L, Pugazenthi S, Kann MR, Strahle JM. Mapping the landscape of pediatric neurosurgery: geography, gender, and trends over time. *J Neurosurg Pediatr* 34(6):649-658, 2024.

Kann MR, Huang G, Pugazenthi S, Kann R, Chen D, Zehnder N. Unlocking Medical Student Success: A Systematic Review and Meta-Analysis of Third-Party Resources Used as Supplements for Medical Education and USMLE Board Preparation. *Med Sci Educ* 34(6):1603-1622, 2024.

Research Activities
Dr. Pugazenthi's research focuses on the molecular characterization of aggressive meningiomas, pituitary lesions, and vestibular schwannomas using bioinformatic and traditional laboratory validation methods. She is also studying outcomes from patients with brain and skull base tumors who underwent neurosurgical procedures.

Madi Remick, MD

PGY-2 Resident

Madison (Madi) Remick, MD, joined the University of Pittsburgh Department of Neurological Surgery as a PGY-1 resident on July 1, 2024 after earning her medical degree from the University of Pittsburgh. She received her bachelor of science degree in neuroscience from the University of Michigan after which she went on to receive a master of science in biomedical science from the University of Pittsburgh.

Dr. Remick's clinical and academic interests include functional neurosurgery, pediatric neurosurgery, and clinical outcomes research. Prior to medical school, Dr. Remick worked as the clinical research coordinator and lab manager of the Pediatric Brain Electrophysiology Laboratory at UPMC Children's Hospital of Pittsburgh. Prior to residency, she performed various clinical and translational research projects across various topics in neurosurgery with a specific focus on drug-resistant epilepsy under the mentorship of Taylor J. Abel, MD.

Born in Albany, New York, Dr. Remick spent her childhood in Cleveland, Ohio, and Morgantown, West Virginia. Outside of work, she enjoys hiking, skiing, watching college football, and spending time with her friends, family, and partner Jim.

Madi Remick, MD

Specialized Areas of Interest
Functional neurosurgery; pediatric neurosurgery; skull base surgery; clinical outcomes research; medical education; women in surgery.

Professional Organization Membership
Allegheny County Medical Society
American Association of Neurological Surgeons
Congress of Neurological Surgery
Pennsylvania Medical Society

Education & Training
MD, University of Pittsburgh, 2024
MS, Biomedical Science, University of Pittsburgh, 2019
BS, Neuroscience, University of Michigan, 2018

Honors & Awards
Theodore Kurze Senior Prize for Excellence in Neurological Surgery and Clinical Neuroscience, University of Pittsburgh, 2024
Bert & Sally O'Malley Awards for Outstanding Medical Student Research, University of Pittsburgh, 2024
Roth Research Fellowship Award, University of Pittsburgh, 2024

Jessica Ryvlin, MD

PGY-2 Resident

Jessica Ryvlin, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July 2024 after graduating from Albert Einstein College of Medicine with Distinction in Research. Prior to medical school, she graduated with honors in research from Cornell University with a degree in human biology, health, and society and a minor in health policy. For her undergraduate laboratory research focusing on congenital vascular development and hemodynamics, she received the American Heart Association Founders Affiliate Research Fellowship in 2016 and was a winner of the Federation of American Societies for Experimental Biology (FASEB) BioArt Competition.

As a medical student, Dr. Ryvlin spent several years as a clinical investigator in the Montefiore Medical Center Department of Neurosurgery Spine Research Group, going on to complete a year-long research fellowship dedicated to establishing and validating predictive tools for patients undergoing operative interventions for spinal metastases. She also consistently participated in global neurosurgery efforts in collaboration with the Virtue Foundation, traveling to Ulaanbaatar, Mongolia to provide clinical and operative support for education in complex spine and spinal oncology in resource-poor settings.

Dr. Ryvlin was born and raised in Minneapolis, Minn. where she was a competitive tennis player in the United States Tennis Association (USTA) until moving to New York for her undergraduate and graduate degrees. Outside of neurosurgery, she enjoys alpine and back country skiing, climbing and bouldering, ultralight backpacking, board games, and traveling.

Specialized Areas of Interest
Spine; spinal oncology; complex spine; global neurosurgery; predictive analytics; machine learning & artificial intelligence; health disparities; medical education.

Jessica Ryvlin, MD

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

Education & Training
MD, Albert Einstein College of Medicine, 2024
BS, Cornell University, 2017

Honors & Awards
Distinction in Research Graduate, Albert Einstein College of Medicine, 2024
Alpha Omega Alpha Honor Society, 2023
Student Research Fellowship, Albert Einstein College of Medicine, 2020-22
Honors Research Program, Cornell University Division of Nutritional Sciences, 2017
Affiliate Research Fellowship, American Heart Association Founders, 2016
BioArt Competition Winner, Federation of American Societies for Experimental Biology, 2015

Anthony Schulien, MD

PGY-5 Resident

Anthony J. Schulien, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July 2021 after earning an MD degree from the University of Pittsburgh School of Medicine. Here, he completed the five-year Physician Scientist Training Program (PSTP), and was awarded The Theodore Kurze, MD, award for Excellence in Neurological Surgery and Clinical Neurosciences. Prior to medical school, he graduated magna cum laude from the University of Pittsburgh with a degree in neuroscience as well as a minor in chemistry.

During his training, Dr. Schulien has conducted longitudinal research on ischemic neuroprotective strategies at the Pittsburgh Institute for Neurodegenerative Diseases (PIND). His translational research has resulted in the development of a novel, blood brain barrier-permeable neuroprotective peptide that mitigates Kv2.1 potassium channel-mediated apoptotic neuronal death and improves neurologic functional outcomes following cerebral ischemia in a murine model. His work has resulted in publications in *Science Advances, Brain,* and the *Journal of Neuroscience*, among others. Dr. Schulien has presented this work broadly in both national and international forums. He has also performed clinical research in outcomes following skull base surgery with the department.

Before matriculation to medical school, Dr. Schulien found his passion for medicine as a volunteer EMT with the Loudoun County Volunteer Rescue Squad. Dr. Schulien was born and raised in Potomac Falls, Va. His hobbies include back country backpacking, snowboarding, and spending time with his family, friends, and dog.

Specialized Areas of Interest
Cerebrovascular neurosurgery; endovascular neurosurgery; skull base neurosurgery; neurotrauma; spine surgery; general neurosurgery.

Professional Organization Membership
American Association of Neurological Surgeons
American Medical Association
Congress of Neurological Surgeons
Society for Neuroscience

Professional Activities
Pitt Neurosurgery Residency Advisory Council (PNRAC)

Anthony Schulien, MD

Education & Training

BS, Neuroscience, University of Pittsburgh, 2015
MD, Physician Scientist Training Program, University of Pittsburgh, 2021

Honors & Awards

Top Presentation Award, Stuart Niles Rowe Research Day, University of Pittsburgh Department of Neurological Surgery, 2023
Theodore Kurze, MD, Senior Prize for Excellence in Neurological Surgery, UPMC Neurosurgery, 2021
Certificate of Merit for Excellence in the Longitudinal Research Project, University of Pittsburgh School of Medicine, 2021
Top Research Poster Award, Brain Day, University of Pittsburgh Brain Institute, 2018
Physician Scientist Training Program (PSTP) Trainee Scholarship, University of Pittsburgh School of Medicine, 2016
Neuroscience Research Excellence Award, University of Pittsburgh Department of Neuroscience, 2015
Summer Undergraduate Research Program (SURP) in Molecular Pharmacology Fellowship, Center for Neuroscience at the University of Pittsburgh (CNUP), 2014
Chancellor's Undergraduate Research Fellowship, University of Pittsburgh Honors College, 2014
President's Volunteer Service Award, Loudoun County Volunteer Rescue Squad, 2013-2014

Nikhil Sharma, MD

PGY-2 Resident

Nikhil Sharma, MD, MS, joined the University of Pittsburgh Department of Neurological Surgery residency program in July 2024 after earning his MD from the University of Pittsburgh. He received his master's degree in biomedical science from Geisinger Commonwealth School of Medicine in 2019, and his bachelor's degree in business from Fairleigh Dickinson University in 2013.

Prior to medical school, Dr. Sharma was the inaugural recipient of the Charles Harrison Frazier Scholar Program at the University of Pennsylvania Department of Neurosurgery, where he worked on multiple projects ranging from multi-centered clinical trials to new device studies in the NICU and large database reviews. His work resulted in numerous publications and several awards at national conferences and continued the development of the scholar program.

As a medical student, Dr. Sharma was the neurosurgery mixed reality (MR) research fellow in the University of Pittsburgh Surreality Lab, under the mentorship of Edward G. Andrews, MD. His work on implementing mixed reality into the neurosurgical operating room led to numerous publications and more than $500,000 in grant awards, as well as partnerships with large medical device companies including Medivis.

Throughout his medical school journey, Dr. Sharma was awarded the Loren Roth Research Fellowship Award, the Pre-Doctoral Surreality Innovations and Research Fellowship Award, the Neurosurgery Charles Harrison Frazier Scholar Award, and the Dean's Summer Research Program Award. Dr. Sharma's other clinical research interests include skull base tumors and functional neurosurgery.

Dr. Sharma was born in Jaipur, India but spent most of his childhood in Bryn Mawr, Pa. Outside of neurosurgery, he enjoys playing golf, working out, traveling, playing chess, and spending time with family and friends.

Nikhil Sharma, MD

Specialized Areas of Interest
Functional neurosurgery; neuro-oncology; artificial intelligence (AI) and mixed-reality (MR) in neurosurgery; medical education.

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

Education & Training
BS, Business, Marketing, Fairleigh Dickinson University, 2013
MS, Biomedical Sciences, Geisinger Commonwealth School of Medicine, 2019
MD, University of Pittsburgh, 2024

Honors & Awards
Loren Roth Research Fellowship Award, University of Pittsburgh, 2022
Dean's Summer Research Program Award, University of Pittsburgh, 2021
Top Operative Technique Abstract, Functional Section, CNS Annual Meeting, 2021
Charles Harrison Frazier Neurosurgery Scholar, University of Pennsylvania Department of Neurosurgery, 2016-18

Publications: 2024-25
• Refereed Articles:
Taori S, Habib A, Adida S, Gecici NN, Sharma N, Calcaterra M, Tang A, Pandya S, Mehra A, Deng H, Elidrissy H, Idrissi YA, Amjadzadeh M, Zinn PO. Circulating biomarkers in high-grade gliomas: current insights and future perspectives. *J Neurooncol* 172(1):41-49, 2025.

William Shuman, MD

PGY-4 Resident

William H. Shuman, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July 2022 after graduating from the Icahn School of Medicine at Mount Sinai, earning his MD with distinction in research. He received his undergraduate degree from The Johns Hopkins University in 2016, completing a BA in biophysics and receiving the Detlev Bronk Award for Outstanding Scholarship in Biophysics.

During medical school, Dr. Shuman conducted clinical neurosurgical research focusing on patient outcomes primarily in spine surgery and skull base surgery, and he has presented his work at multiple national research conferences. He is interested in using his research experience to optimize postoperative outcomes for neurosurgical patients.

Dr. Shuman was born and raised in Detroit, Michigan. In his free time, he enjoys playing guitar, listening to blues rock and folk music, weight lifting and running, hiking, playing golf, pick-up basketball, bowling, cooking, and spending time with his family and friends.

Specialized Areas of Interest
Skull base surgery; spine surgery.

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

William Shuman, MD

Education & Training
BA, Biophysics, The Johns Hopkins University, 2016
MD, Icahn School of Medicine at Mount Sinai, 2022

Honors & Awards
Distinction in Research, Icahn School of Medicine at Mount Sinai, 2022
Healthcare Delivery and Outcomes Presentation Award, AANS/CNS Spine Summit, 2019
Detlev Bronk Award in Biophysics, The Johns Hopkins University, 2016
Phi Beta Kappa, 2016

Oliver Y. Tang, MD

PGY-3 Resident

Oliver Y. Tang, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July 2023 after earning his MD degree from the Warren Alpert Medical School of Brown University. Prior to medical school, he graduated magna cum laude from Brown University in 2019 with a BS in Neuroscience with Honors, studied in the selective Program in Liberal Medical Education, and was one of four students in his undergraduate class to receive the Harvey A. Baker Fellowship.

Dr. Tang's clinical and academic interests include translational neuro-oncology, image-guided neurosurgery, health policy and social determinants of health, artificial intelligence (AI) and big data in clinical medicine, medical education and global neurosurgery. He has published over 85 peer-reviewed publications in these fields and is excited to work with students interested in similar domains. He is presently serving as a Council of State Neurosurgical Societies (CSNS) Socioeconomic Fellow for the 2025-26 academic year. He has previously received funding from the Neurosurgery Research & Education Foundation and the National Institutes of Health to study topics ranging from CAR T therapy for glioblastoma to traumatic brain injury outcomes in Rwanda. During medical school, he was inducted into the Alpha Omega Alpha honor society and was also recognized with the Stanley Aronson Prize for excellence in the clinical neurosciences.

Dr. Tang was born in New York, N.Y., but spent most of his childhood in New Jersey. His partner is a resident in the University of Pittsburgh Department of Dermatology. Outside of neurosurgery, he enjoys swimming, musical theater, movie going, mystery and science fiction, video and board games, and spending time with family and friends.

Specialized Areas of Interest
Neuro-oncology; image-guided neurosurgery; pediatric neurosurgery; health policy; big data and artificial intelligence; medical education; global neurosurgery.

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

Education & Training
MD, The Warren Alpert Medical School of Brown University, 2023
BS, Program in Liberal Medical Education, Brown University, 2019

Honors & Awards
Socioeconomic Fellowship, Council of State Neurosurgical Societies, 2025
Pediatric Neurosurgery Paper of the Year, Co-Authorship, CNS, 2024

Oliver Y. Tang, MD

CNS Foundation DEI Abstract Award, Congress of Neurological Surgeons, 2022, 2023
Neurosurgery "Editor's Choice" Article, Congress of Neurological Surgeons, 2021, 2023
The Stanley Aronson Prize, The Warren Alpert Medical School of Brown University, 2023
Alpha Omega Alpha, The Warren Alpert Medical School of Brown University, 2022
Framework in Global Health Program Scholarship, Brown University, 2021
Neurosurgery Research and Education Fund Medical Student Summer Research Fellowship, Neurosurgery Research and Education Fund, 2020
Best Clinical Research Award for Socioeconomic/CSNS Podium Presentation, Congress of Neurological Surgeons, 2019
Best Computational Health Systems Abstract Award at Computational Neuroscience Outcomes Center Symposium, Brigham & Women's Hospital, 2019
Third Place Socioeconomic E-Poster Award, American Association of Neurological Surgeons, 2019
Harvey A. Baker Fellowship, Brown University, 2019
The Milton Hamolsky Prize, Brown University, 2019

Gina Watanabe, MD

PGY-2 Resident

Gina Watanabe, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July 2024 after earning her medical degree from the University of Hawaii John A. Burns School of Medicine, where she was elected into the Alpha Omega Alpha Honor Society. She attended the University of Hawaii on a prestigious Regents scholarship and completed a Bachelor of Science degree in Molecular Cell Biology in 2020.

Dr. Watanabe's clinical and academic interests span many areas of neurosurgery including neuro-oncology, neurotrauma, minimally invasive and complex spine, cerebrovascular, patient outcomes, technology in neurosurgery, and neurosurgery education.

Dr. Watanabe was born and raised on the island of Oahu. Outside of neurosurgery, she enjoys playing the guitar, tennis, and spending time with family and friends.

Specialized Areas of Interest

Spine, neuro-oncology, cerebrovascular, clinical outcomes, patient education, technology and innovation.

Professional Organization Membership

American Association of Neurological Surgeons
Congress of Neurological Surgeons

Education & Training

BS, Molecular Cell Biology, University of Hawaii at Manoa, 2020
MD, University of Hawaii John A. Burns School of Medicine, 2024

Honors & Awards

Dr. Frank and Mary McDowell Award for Excellence in Surgery, John A. Burns School of Medicine, University of Hawaii, 2024
Dr. Albert C.K. Chun-Hoon Service Award, John A. Burns School of Medicine, 2024
Po'okela Noi'i Research Award, John A. Burns School of Medicine, 2024
Alpha Omega Alpha, Hawaii Chapter, 2024
Matsumoto Scholarship in Honor of Dr. Windsor Cutting, John A. Burns School of Medicine, University of Hawaii, 2020
Honors Thesis Prize, University of Hawaii at Manoa, 2020

Gina Watanabe, MD

Associated Students of the University of Hawaii Research Award, University of Hawaii at Manoa, 2019
Regents Scholar, University of Hawaii at Manoa, 2016

Publications: 2024-25

• Refereed Articles:

Khan MF, Bow-Keola J, Gensler R, Patel S, Gendreau J, Putzler D, Paulo F, Suzuki R, Watanabe G, Hoshide R, Inouye D. Occipitocervical fusion and serious airway adverse events: A systematic review. *J Clin Neurosci* [Epub ahead of print], 2025.

Putzler DH, Khan MF, Paulo FO, Nguyen LA, Galang C, Rauber E, Gensler R, Gendreau J, Watanabe G, Palmisciano P. Intracranial meningioma with intratumoral hemorrhage: A systematic review of associated features and outcomes. *J Clin Neurosci* [Epub ahead of print], 2025.

Department Honors 2025 Graduating Residents

A special black-tie graduation reception and dinner was held June 21, 2025, at the Pittsburgh Golf Club honoring Hussam Abou-Al-Shaar, MD; Ricardo Fernández-de Thomas, MD; Daryl P. Fields II, MD, PhD; Arka N. Mallela, MD; and Gautam Nayar, MD, on their successful completion of the UPMC/University of Pittsburgh's seven-year neurological surgery residency program. The event was attended by more than 150 faculty members, colleagues, family and friends.

Following graduation, Dr. Abou-Al-Shaar will serve a fellowship at McGovern Medical School at UTHealth in Houston, Texas; Dr. Fernandez-de Thomas will be an assistant professor at the University of Puerto Rico; Dr. Fields will be an assistant professor at the University of Florida; Dr. Mallela will be an assistant professor at Rush University Medical Center in Chicago; and Dr. Nayar will enter private practice with Oregon Neurosurgery in Eugene, Oregon at PeaceHealth Riverbend Hospital.

The department also recognized graduating residents for the following completed fellowships: Dr. Abou-Al-Shaar (open and endoscopic cranial base surgery, stereotactic radiosurgery, sports neurosurgery). Dr. Fernández-de Thomas (spine, sports neurosurgery); Dr. Nayar (spine, endovascular); and Dr. Mallela (neuro-oncology, functional epilepsy).

Other physicians honored for completing fellowships included Mark Maclean, MD, (spine, neurotrauma spine); James Mooney, MD (spine, sports neurosurgery); Timoteo Almeida, MD, (stereotactic radiosurgery, functional epilepsy surgery), and Ivo Petoe, MD, (external open and endoscopic skull base).

Annual teaching awards were also announced at the dinner. Dr. Abou-Al-Shaar was selected as the best resident teacher as chosen by department faculty and David Fernandes Cabral, MD—a graduate of last year's Pitt neurosurgery residency class and winner of the 2024 best resident teacher award—was chosen as the best faculty teacher by the residents.

Special awards were also presented to PGY-5 resident Prateek Agarwal, MD—High American Board of Neurological Surgery (ABNS) Score Award—and Dr. Abou-Al-Shaar—Joseph Maroon Aequanimitas Award for humility, compassion and excellent care of patients, and the Nitin Agarwal Courage Award for graduating with more than 200 papers published during residency.

As the department honored its graduating residents, it also welcomed five new residents: Ritesh Karsalia, MD; Najib Muhammad, MD; Abhinav Pandey, MD; Rohit Prem Kumar MD; and Sangami Pugazenthi, MD. ■

Department chair Robert Friedlander (left) and department residency director D. Kojo Hamilton (right) with 2025 neurosurgery residency graduates Gautam Nayar, Ricardo Fernández-de Thomas, Hussam Abou-Al-Shaar, Arka Mallela and Daryl P. Fields II.

Research

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 though the implementation and administration of state-of-the-art basic and translational research. Our department—with more than 60 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. In the 2025 fiscal year, our faculty and residents were involved in almost 200 research projects totaling more than $10.5 million in expenditures. Additional charitable donations to the department totaled more than $875,000.

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 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. The fund has provided substantial seed money, often leading to millions of dollars in federal grants for the Department of Neurological Surgery. In fy 2025, researchers from our department were awarded $121,000 from the Copeland Fund.

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 which provide resources for a wide range of neurosurgery faculty, residents, visiting fellows and students. Neurotrauma, 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 Neurotrauma Clinical Trials Center (NCTC)—under the direction of David O. Okonkwo, MD, PhD and co-director, Ava M. Puccio, RN, PhD—is located within the Copeland Laboratory. The NCTC team conducts innovative clinical research with a focus on biomarkers as well as the evaluation of neurotherapeutics for traumatic brain and spinal cord injury. In addition, annual resident training is performed every July for hands-on cadaver training of multi-modality intracranial monitoring insertions (i.e. external ventricular drain placement, and intracranial pressure and brain oxygenation/temperature monitoring). Instruction of lumbar puncture and Mayfield positioning for operating room stabilization is performed with simulation.

The Surgical Neuroanatomy Laboratory—under the direction of Paul Gardner, MD— specializes in training residents and fellows on advanced anatomy and neurosurgical skull-base approaches. The lab places a specific focus on the development, and subsequent training, of new methods of intraoperative cranial navigation and endoscopic techniques. The lab also hosts yearly

international visiting research fellows, where neurosurgeons from around the world participate in ground-breaking research regarding innovative neurosurgical methodology. Kyle Affolter is the coordinator for these efforts.

The Fiber Tractography Lab, under the 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. 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.

Neurotrauma Research

Neurotrauma research at the University of Pittsburgh Department of Neurological Surgery is a multidisciplinary, internationally renowned program focused on the understanding of traumatic brain injury (TBI) and spinal cord injury (SCI) and developing therapies effective in treating them.

C. Edward Dixon, PhD, leads the Department of Neurological Surgery's efforts in preclinical traumatic brain injury research. The research focuses on basic and translational efforts to study mechanisms of cognitive deficits after TBI and to evaluate novel interventions. Shaun Carlson, PhD, leads efforts on synaptic dysfunction mechanisms of TBI. The Department of Neurological Surgery has pioneered efforts in the study of presynaptic mechanisms of cognitive deficits after TBI. Preclinical TBI research is supported by the National Institutes of Health, Veterans Administration, and the Department of Defense.

David O. Okonkwo, MD, PhD, leads the department's clinical research efforts as director of the Neurotrauma Clinical Trials Center (NCTC). The NCTC performs wide-ranging studies, including clinical trials funded by federal agencies and industry to study new therapies, novel brain monitoring devices, 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 NCTC and the National TBI Biospecimens Repository have pioneered efforts in basic and clinical science which have substantially influenced clinical practice, including:

1. Evaluating the clinical utility of point-of-care assessment platforms for blood biomarkers of TBI;
2. Applying machine learning techniques to computed tomography scans to predict outcomes for severe TBI patients;
3. Establish the sensitivity and clinical utility of magnetoencephalography to image brain injury; and
4. Assess the viability of hypothermia as a treatment of severe head injury.

The NCTC continues to play a pivotal role in large collaborative efforts, such as Transforming Research and Clinical Knowledge in TBI (TRACK-TBI), a multi-center study funded by the National Institute of Neurological Disorders at the NIH. The department is a key contributor to the next generation of TRACK-TBI studies, which seeks to improve the treatment and long-term outcomes of patients with TBI.

The NCTC is also actively enrolling research participants to examine the potential effects of repeated head impacts on long-term neurological health.

Brain Tumor Research

The University of Pittsburgh Medical Center (UPMC) Brain Tumor Program is involved with innovative and cutting-edge across multiple campuses at the University of Pittsburgh including the John Rangos Research Center at UPMC Children's Hospital of Pittsburgh, the University of Pittsburgh School of Medicine, and the UPMC Hillman Cancer Center.

Brain tumor research at the University of Pittsburgh is one of the largest clinical and most productive basic/translational brain tumor programs in the country, encompassing research across the adult and pediatric brain tumor science spectrum and supported by funding from the National Institutes of Health (NIH), competitive foundation awards, and generous donor contributions. University brain tumor research is collaborative with researchers and clinicians from diverse fields, including neurosurgery, radiation oncology, neuro-oncology, neuropathology, and neuroradiology, working together to tackle the complex challenges associated with brain tumors. This multidisciplinary collaboration fosters a comprehensive understanding of brain tumor biology, enables faster translation of discoveries into clinical practice, and ultimately improves patient care with clinical trials.

The University of Pittsburgh Brain Tumor Program is one of the founding members of the National Cancer Institute (NCI)-supported Pediatric Brain Tumor Consortium, currently in its 26th year of continuous funding largely through the efforts of Ian Pollack, MD. In addition, the Brain Tumor Program is also a founding member of the Children's Brain Tumor Network, a multi-institutional repository for pediatric brain tumors and paired normal tissues that comprises the world's largest collection of genomic, proteomic, and immunophenotypic samples for many types of childhood brain cancer.

• Brain Tumor Research Advances

Significant contributions to brain tumor research have occurred at the University of Pittsburgh, with numerous groundbreaking discoveries and innovations. Researchers have pioneered novel techniques for intraoperative brain tumor visualization for fluorescence-guided surgery (FGS). In addition, brain tumor imaging has been developed at the University of Pittsburgh, such as advanced MRI and PET imaging, which allow for better visualization and characterization of tumors. These imaging tools aid in precise tumor diagnosis, treatment planning, and monitoring of treatment response.

Brain tumors are inherently immunosuppressive. 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. 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.

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 Brain Tumor Biology and Therapy Laboratory, led by Sameer Agnihotri, PhD, has identified novel and clinically actionable pathways in diffuse midline gliomas (DMG), pediatric gliomas, and glioblastoma multiforme (GBM) with publications in *JCI Insight, Molecular Oncology,* and *Developmental Cell.* Dr. Agnihotri was one of a handful of international researchers awarded a Distinguished Scientist Award and Grant from the Sontag Foundation for study of pediatric brain tumors. He also received an Idea Development Award from the Department of Defense and a V-Foundation grant to support brain tumor research.

The Brain Tumor Evolution Therapy Lab, led by Baoli Hu, PhD, has focused on developing a new class of drugs for targeting the immune-suppressive microenvironment in glioblastoma and understanding molecular mechanisms of medulloblastoma metastatic dissemination. An important publication in *Nature Cell Biology* was published last year. This work has been supported by NIH/National Cancer Institute (NCI) R01 and NINDS R21 grants. In 2024, another R01 was awarded for medulloblastoma research and Dr. Hu's lab was also awarded an RK Mellon Institute grant.

The Brain Tumor Metabolism and Functional Genomics lab, led by Antony MichaelRaj, PhD, was involved in multiple high impact journal publications in *Science* and *Nature Communications*. Dr. MichaelRaj was the recipient of a research grant by the Matthew Larson Foundation for studying pediatric ependymomas, and has had multiple high impact publications including *Cell*, *Nature Communications* and *Cell Reports*.

The Pediatric Neurosurgery ImmunoOncology (PNIO) lab, led by Gary Kohanbash, PhD, advanced research across multiple focus areas including preclinical testing of immunotherapies, big data generation and analysis, AI, and radiochemistry. The lab published 16 peer reviewed research articles this past year including manuscripts in *Science Translational Medicine* and *Neuro-Oncology* and was featured in multiple media appearances including on WTAE-TV in Pittsburgh and in *Science Daily*. The lab has ongoing funding from the National Institutes of Health. The PNIO lab together with collaborators across UPMC and Pitt recently received approval to lead a highly novel clinical trial for patients with recurrent glioblastoma which is expected to begin in 2025.

The Laboratory of Applied Epigenomics (LAE) is led by Cody Nesvick, MD, a newly recruited neurosurgeon-scientist at the Rangos Research Center at UPMC Children's Hospital of Pittsburgh. The LAE is focused on identifying epigenetic mechanisms of disease in atypical teratoid rhabdoid tumor (ATRT) and translating findings into novel therapies for patients with this deadly disease. Dr. Nesvick recently published seminal findings on how lineage-specific transcription factor function is impacted by SWI/SNF chromatin remodeling complex composition in *Neuro Oncology* and was recently awarded a AANS/CNS Joint Section of Pediatric Neurosurgery grant.

• Brain Tumor Translational Advances

The Department of Neurological Surgery brain research efforts have been at the forefront of developing innovative treatment strategies for brain tumors. Researchers have conducted extensive investigations into targeted therapies, immunotherapies, and gene therapies that hold great promise for improving patient outcomes. Their work has led to the development of clinical trials testing novel treatments, providing hope for patients who have limited options.

An important new clinical trial initiated at the University of Pittsburgh is the use intraoperative photodynamic therapy (PDT). This is a first in the U.S. for newly diagnosed GBM patients. Patients undergo a maximal resection of their GBM tumor with the use of 5-ALA fluorescence-guided surgery (FGS). After completion of tumor removal during surgery, intraoperative 5-ALA PDT is then performed. Patients will then go onto their standard of care treatment options after their tumor removal and PDT. Enrollment of the first GBM patients began in 2024, with Jan Drappatz, MD, director of neuro-oncology at UPMC, serving as the principal investigator.

In 2022, the University of Pittsburgh Department of Neurological Surgery became an integral part of the Glioblastoma Therapeutics Network, a collaborative effort by the National Cancer Institute (NCI). This program, led at UPMC by Kalil Abdullah, MD, and his Translational Neuro-Oncology Lab is designed to stimulate scientific and clinical teams from select institutions across the country to develop promising drugs in the laboratory and then design clinical trials that can be performed at multiple sites. As a component of this NIH-funded effort, researchers are currently evaluating new drugs that may be used to treat the most difficult brain cancer, glioblastoma. One of these drugs targets IDH-mutant gliomas, which are more common in younger adults. In addition to laboratory work, clinical trials are being planned for both new drugs.

A new form of treatment—magnetic hyperthermia therapy (MHT)—for GBM is now under development at the UPMC Hillman Cancer Center in the Brain Tumor Nanotechnology Laboratory, directed by Costas Hadjipanayis, MD, PhD. MHT relies on the intratumoral delivery of magnetic iron-oxide nanoparticles (MIONPs) for the generation of local hyperthermia after application of an alternating magnetic field (AMF). MHT is currently being studied in preclinical brain tumor models in combination with adjuvant therapies (chemoradiation). Treatment planning is also under development with Penn State University. Other novel treatments currently being studied preclinically in the Brain Tumor Nanotechnology Laboratory include photodynamic therapy (PDT) and sonodynamic therapy of both adult and pediatric high-grade gliomas.

A new collaboration with Blue Pearl Pet Hospital in Pittsburgh has been established for a preclinical study of novel therapeutics addressing new brain tumors in spontaneous canine glioma patients. Canine glioma tumors are very similar in biology and clinical behavior as human gliomas including glioblastoma.

• Clinical Care Advances

As one of the highest volume tumor centers in the country, care of our neurooncology patients is facilitated by an emphasis on cutting-edge technology and clinical 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 42 years, the UPMC Center for Image-Guided Neurosurgery has provided care to more than 20,000 patients using minimally invasive options to biopsy, resect, or provide adjuvant therapies. 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 18,000 patients have been treated and over 1,400 articles, books, or chapters have been published) and linear accelerator radiation technologies at UPMC Shadyside, methods to enhance the efficacy and safety of radiation delivery have been pioneered.

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. Now updated this facility also serves as a site to explore less invasive strategies for tumor removal such as the endoscopic endonasal approaches, endoport resection using guiding technologies coupled with endoscopic removal, and transorbital approaches. 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. Recently, the UPMC Hillman Cancer Center obtained the AIRO/BrainLab system, allowing for intraoperative CT scanning to allow navigated instrumentation during oncologic spinal reconstruction, and high-fidelity intraoperative frameless registration for patients with brain tumors. This substantial investment is a foundational commitment to advancing state-of-the-art brain neurosurgical oncology care.

Laser Interstitial Thermal Therapy (LITT) has been an area of emphasis at UPMC. Both the UPMC Hillman Cancer Center and UPMC Presbyterian utilize this technology for patients with brain tumors and radiation necrosis across our region and worldwide. One of the primary advantages of LITT is its minimally invasive nature, as it involves the use of a thin laser probe inserted directly into the target tissue. This allows for precise and localized treatment, reducing the risk of damage to surrounding healthy tissues. LITT is particularly beneficial for brain tumors and lesions, as it provides an alternative to open surgery, thereby minimizing the risk of complications, reducing hospital stays, and promoting quicker recovery times. Moreover, LITT is performed under real-time MRI guidance, enabling the neurosurgical team to monitor and adjust the treatment as necessary, ensuring optimal outcomes. Additionally, LITT is associated with lower morbidity rates and improved quality of life for patients, as it preserves neurological function and avoids the need for traditional open craniotomy procedures. As of 2024, UPMC has performed more laser ablations for brain tumors than any center in Pennsylvania.

In 2024, a new academic-industrial partnership was launched by the UPMC Department of Neurological Surgery, the University of Pennsylvania and Synaptive Medical. This initiative entitled "Diffusion MRI-Guided Pre-Operative Planning for Supra-Total Resection of High-Grade Gliomas" will be led by Ragini Varma, PhD, professor of radiology at the University of Pennsylvania, and Dr. Hadjipanayis in partnership with Wes Hodges, founder of Synaptive Medical, to provide an enhanced preoperative planning tool for brain tumor surgery that will facilitate extended safe resection of glioblastoma tumors that are not evident with conventional imaging. The tool will be created by integrating diffusion MRI-based methods to visualize white matter pathways in edematous and infiltrated regions of the brain into a commercial neuro planning and navigational software with Synaptive Medical Inc. that will be used by clinical partners at UPMC, the University of Pennsylvania, the University of Nebraska, and the Ochsner Clinic Foundation for evaluation of clinical utility and patient safety. The extended resection facilitated by the enhanced tool is expected to lead to better patient outcomes.

Focused ultrasound will now be available at UPMC for treatment of patients in 2025. Research efforts are underway to establish important clinical trials utilizing focused ultrasound for treatment of brain tumors by opening of the blood brain barrier and sonodynamic therapy in combination with 5-ALA administration.

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. The department is 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 ability to obtain fiber-tracking preoperatively has now been expanded to the UPMC Hillman Cancer Center at UPMC Shadyside, allowing a multimodal approach to tumor resection. The goal is to facilitate brain function preservation and recovery in patients undergoing complex brain tumor surgery.

For brain tumor patients, presurgical brain mapping is performed using magnetoencephalography (MEG), a cutting-edge technology and the most advanced method of functional brain imaging. MEG recordings provide a direct measurement of brain functions allowing brain surgeons to view critical functional areas of brain to determine the best way for removing brain tumors, while preserving brain function and improving recovery.

Magnetoencephalography (MEG) Research

Research is an important aspect of the UPMC Brain Mapping Center (BMC) which houses the TRIUX neo MEG system. Ajay Niranjan, MD, MBA, is the director of the BMC and Brian Coffman, PhD, assistant professor with the University of Pittsburgh Department of Psychiatry, is the director of research. The aim of magnetoencephalography (MEG) research is to facilitate, develop, and advance clinical and basic neuroscience research using MEG. To this end, Dr. Coffman is helping to develop new research applications for MEG in collaboration with researchers throughout the community and providing guidance to researchers considering the application of MEG to their research program.

MEG is the most powerful functional neuroimaging technique for noninvasively recording magnetic fields generated by electrophysiological brain activity, providing millisecond temporal resolution at a spatial resolution far exceeding other neurophysiological imaging methods.

MEG is currently being used to study the healthy brain—both in adults and during development—to understand the neural basis of cognitive processes, including reading, vision, audition, motor control, semantic memory, executive functioning, emotional processing, and working memory. Furthermore, research groups at the University of Pittsburgh and Carnegie Mellon University are also using MEG to investigate neurophysiological dysfunction in a host of pathologies, including TBI, schizophrenia, spinal cord injury, HIV-AIDS, epilepsy, autism spectrum disorders, Alzheimer's disease and Parkinson's disease. MEG currently supports both presurgical clinical services and several major (R01 or equivalent) NIH grants.

MEG research at the UPMC Brain Mapping Center continues to increase the impact on scientific understanding of the brain, with 7-10 publications and more than 100 citations every year for the last four years.

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 has been revolutionizing 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 have been recruited into the TRACK-TBI study, and a large, high-quality database of clinical, imaging, biomarker, and outcome data has been generated.

In collaboration with the TRACK-TBI coordinating center at the University of California San Francisco—led by Geoff Manley, MD—and 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 (DoD) 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. Collaborative research with industry and the DoD includes an FDA-pivotal trial examining acute blood-based biomarker studies in an effort to diagnosis positive intracranial computed tomography findings.

The TRACK-TBI biorepository is 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.

Additional NIH and DoD studies have recognized the expertise of the biorepository and are utilizing the biorepository efforts for their storage needs.

Spinal Cord Stimulation Helps Restore Motion in Spinal Muscle Atrophy Patients

A new drug-free, minimally invasive intervention targets the root cause of progressive loss of neural function in spinal muscle atrophy (SMA), an inherited neuromuscular disease. An intervention, which involves electrical stimulation of the sensory spinal nerves, can gradually reawaken functionally silent motor neurons in the spinal cord and improve leg muscle strength and walking in adults with SMA. The findings were reported by University of Pittsburgh School of Medicine researchers in a February 2025 issue of *Nature Medicine*.

Early results from a pilot clinical trial in three human volunteers with SMA show that one month of regular neurostimulation sessions improved motoneuron function, reduced fatigue and improved strength and walking in all participants, regardless of the severity of their symptoms. The study is first to show that neurotechnology can be engineered to reverse degeneration of neural circuits and rescue cell function in a human neurodegenerative disease.

"To counteract neurodegeneration, we need two things, stop neuron death and restore function of surviving neurons," said Marco Capogrosso, PhD, director of the Pitt Spinal Cord Stimulation Laboratory and study co-corresponding author. "In this study we proposed an approach to treat the root cause of neural dysfunction, complementing existing neuroprotective treatments with a new approach that reverses nerve cell dysfunction."

SMA is a genetic neurodegenerative disease that manifests in progressive death and functional decline of motor neurons—nerve cells that control movement by transmitting signals from the brain and the spinal cord to the muscles. Over time, the loss of motor neurons causes gradual muscle weakness, and leads to a variety of motor deficits, including for the participants in this trial, difficulty in walking, climbing stairs and standing up from chairs.

While there is no cure for SMA, several promising neuroprotective treatments have become available in the last decade. These include gene replacement therapies and medications, both of which stimulate the production of motoneuron-supporting proteins that prevent neuronal death and that slow down—though do not reverse—disease progression.

Studies show that movement deficits in SMA emerge before widespread motoneuron death, suggesting that underlying dysfunction in spinal nerve circuitry may contribute to disease onset and symptom development. According to earlier research on animal models of SMA by study co-author George Mentis, PhD, at Columbia University, surviving motor neurons receive fewer stimulation inputs from sensory nerves—fibers that return the information from skin and muscles back to the central nervous system. Compensating for this deficit in neural feedback

(continued on next page)

(continued from previous page)

could, therefore, improve communication between the nervous system and the muscles, aid muscle movement and combat muscle wasting.

Pitt researchers hypothesized that a targeted epidural electrical stimulation therapy could be used to rescue lost nerve cell function by amplifying sensory inputs to the motor neurons and engaging the degenerated neural circuits. These cellular changes could, in turn, translate into functional improvements in movement capacity.

The Pitt study was conducted as part of a pilot clinical trial that enrolled three adults with milder forms of SMA (Type 3 or 4 SMA). During a study period of 29 days, participants were implanted with two spinal cord stimulation (SCS) electrodes that were placed in the lower back region on each side of the spinal cord, directing the stimulation exclusively to sensory nerve roots. Testing sessions lasted four hours each and were conducted five times a week for a total of 19 sessions, until the stimulation device was explanted.

After confirming that the stimulation worked as intended and engaged spinal motor neurons, researchers performed a battery of tests to measure muscle strength and fatigue, changes in gait, range of motion and walking distance, as well as motoneuron function.

"Because SMA is a progressive disease, patients do not expect to get better as time goes on. But that is not what we saw in our study. Over the four weeks of treatment, our study participants improved in several clinical outcomes with improvements in activities of daily living. For instance, toward the end of the study, one patient reported being able to walk from their home to the lab without becoming tired," said co-corresponding author Elvira Pirondini, PhD, assistant professor of physical medicine and rehabilitation at Pitt.

All participants increased their 6-Minute Walk Test score—a measure of muscle endurance and fatigue—by at least 20 meters, compared to a mean improvement of 1.4 meters over three months of comparable exercise regimen unaided by SCS and a median increase of 20 meters after 15 months of SMA-specific neuroprotective pharmacologic therapy.

These functional gains were mirrored by improved neural function, including a boost in motoneurons' capacity to generate electrical impulses and transmit them to the muscles.

"Our results suggest that this neurostimulation approach could be broadly applied to treat other neurodegenerative diseases beyond SMA, such as ALS or Huntington's disease, as long as appropriate cell targets are identified in the course of future research," said co-corresponding author Robert Friedlander, MD, chair of neurosurgery at Pitt and co-director of the UPMC Neurological Institute. "We are hoping to continue working with SMA patients and launch another clinical trial to test the long-term efficacy and safety of electrical spinal cord stimulation."

Genis Prat-Ortega, PhD, Scott Ensel, BS, and Serena Donadio, BS, all of Pitt, are co-first authors of the study. Other authors of the study are Amy Boos, MS, Jacqueline Ho, MD, Sarah Frazier-Kim, Daryl Fields, MD, PhD, Lee Fisher, PhD, Paula Clemens, MD, and Peter Gerszten, MD, all of Pitt; Luigi Borda, BS, Prakarsh Yadav, BS, Nikhil Verma, BS, and Douglas Weber, PhD, all of Carnegie Mellon University; Tina Duong, PhD, of Stanford University; Jacqueline Montes, PT, EdD, and George Mentis, PhD, of Columbia University; Steven Weinstein, Mikael Eliasson, of Genentech Roche; and Karen S. Chen, of the Spinal Muscular Atrophy Foundation. ■

Marco Capogrosso, PhD

Giorgio Foundation/Pitt to Advance NF1 Research

On April 16, 2025, the Giorgio Foundation and the University of Pittsburgh announced the establishment of The Giorgio Foundation Endowed Chair in the School of Medicine's Department of Neurosurgery with a total commitment of $2 million. This gift will support groundbreaking research in neurological conditions, with a specific focus on neurofibromatosis type 1 (NF1) in both pediatric and adult patients.

The Giorgio Foundation has pledged $1 million to endow a fund at the University of Pittsburgh with all proceeds from the fund directly supporting the chair's mission.

The School of Medicine will add an additional $500,000 to the fund and has committed to securing another $500,000 to be held in the endowed account, bringing the total endowment to $2 million.

"The chair's primary focus will remain on advancing research and treatment for this condition until we cure neurofibromatosis type 1," said Anantha Shekhar, senior vice chancellor for the health sciences and John and Gertrude Petersen Dean of the School of Medicine at Pitt. "The Giorgio Foundation has long been a champion of this area of medicine. By creating a chair, the foundation ensures that Pitt remains at the forefront of innovation and discovery, helping to bring us closer to new treatments for patients."

Supporting Cutting-Edge Neurological Research
The Giorgio Foundation Endowed Chair will support:

- Recruitment and salary of a distinguished faculty member in the Department of Neurological Surgery
- Professional development, research, and scholarly activities related to NF1 and other neurological conditions
- Critical academic initiatives within the Department of Neurological Surgery to drive innovation in neurosurgical treatments and therapies.

"The Giorgio Foundation's generosity will create a lasting impact on neurological research, especially for NF1," said Sameer Agnihotri, PhD, director of the Brain Tumor Biology and Therapy Lab. "This partnership exemplifies how philanthropy can drive scientific progress and bring us closer to life-changing breakthroughs."

Recognizing Philanthropic Leadership
In recognition of this extraordinary gift, the endowed position will be named The Giorgio Foundation Endowed Chair.

"Since the beginning of this journey, a significant part of our mission has been to create a legacy of truly groundbreaking NF1 research. We believe that Dr. Sameer Agnihotri and his lab at the University of Pittsburgh are on an incredible path toward that goal, and we are excited to create an endowment that will help to continue NF1 research for decades to come," said Erin Borzellino, Co-Founder of The Giorgio Foundation.

About The Giorgio Foundation
The Giorgio Foundation believes every child deserves childhood. A childhood free from the fear of unstoppable tumor growth and disfigurement. Through focused clinical research, The Giorgio Foundation seeks to advance the light of knowledge into a condition defined by darkness, fear, and the unknown. ■

Robert M. Friedlander, MD, MA
Chair and Walter E. Dandy Distinguished Professor of Neurological Surgery
University of Pittsburgh School of Medicine

Department of Neurological Surgery
UPMC Presbyterian • 200 Lothrop Street • Suite B-400 • Pittsburgh, PA 15213
(412) 647-3685
www.neurosurgery.pitt.edu

linkedin.com/company/pitt-neurosurgery
facebook.com/pitt.neurosurgery
youtube.com/user/neuroPitt
X.com/PittNeurosurg
instagram.com/pittneurosurgery