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Faculty, Residents & Staff
Faculty
- Chair and Professor:
  Robert M. Friedlander, MD, MA

- Professors:
  C. Edward Dixon, PhD
  (Vice Chair, Research)
  Paul A. Gardner, MD
  (Executive Vice Chair, Surgical Services)
  Peter C. Gerszten, MD, MPH
  (Vice Chair, Quality Improvement)
  Jorge A. González-Martínez, MD, PhD
  Stephanie Greene, MD
  (Vice Chair, Education)
  Costas G. Hadjipanayis, MD, PhD
  (Executive Vice Chair)
  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
  (Vice Chair, Academic Affairs)
  Mingui Sun, PhD
  Parthasarathy D. Thirumala, MD

- Associate Professors:
  Jeffrey Balzer, PhD
  Diane L. Carlisle, PhD
  Donald J. Crammond, PhD
  Avniel Ghuman, PhD
  Ava Puccio, PhD, RN
  Fang-Cheng (Frank) Yeh, MD, PhD

- Assistant Professors:
  Kalil G. Abdullah, MD
  Taylor Abel, MD
  Sameer Agnihotri, PhD
  Katherine M. Anetakis, MD
  Thomas J. Buell, MD
  Marco Capogrosso, PhD
  Bradley Gross, MD
  Luke C. Henry, PhD
  Baoli Hu, PhD
  Robert Kellogg, MD
  Gary Kohanbash, MD
  Michael J. Lang, MD
  Michael McDowell, MD
  Antony MichealRaj, PhD
  Natalie Sandel Sherry, PsyD
  Georgios Zenonos, MD
  Pascal O. Zinn, MD, PhD
Faculty, Residents and Staff

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

• Clinical Associate Professors:
  Or Cohen-Inbar, MD PhD
  Vincent J. Miele, MD
  Michael J. Rutigliano, MD, MBA

• Clinical Assistant Professors:
  Robert L. Bailey, MD
  J. Brad Bellotte, MD
  Bryan Bolinger, DO
  Salem El-Zuway, MD
  Chikezie I. Esonu, MD
  David L. Kaufmann, MD
  Rodwan K. Rajjoub, MD
  Varun Shandal, MD
  Jeremy G. Stone, MD
  Fadi Sweiss, MD

• Research Associate Professors:
  Yue-Fang Chang, PhD

• Research Assistant Professors:
  Shaun W. Carlson, PhD
  Shawn R. Eagle, PhD
  Esther Jane, PhD
  Daniel Premkumar, PhD

• Research Instructor:
  Daniela Leronni, PhD

Residents
• PGY-7:
  Hanna Algattas, MD
  Kamil Nowicki, MD, PhD

• Chief Residents:
  Edward Andrews, MD
  David T. Fernandes Cabral, MD
  Zachary C. Gersey, MD
  Justiss A. Kallos, MD
  Roberta K. Sefcik, MD
  Xiaoran Zhang, MD

• PGY-5:
  Hussam Abou-Al-Shaar, MD
  Ricardo Fernández-de Thomas, MD
  Daryl Fields II, MD, PhD
  Arka N. Mallela, MD
  Gautam Nayar, MD

• PGY-4:
  Ali Alattar, MD
  Hansen Deng, MD
  Joseph Scott Hudson, MD
  Andrew Legarreta, MD

• PGY-3:
  Prateek Agarwal, MD
  Jeffrey Head, MD
  Rachel Jacobs, MD
  David McCarthy, MD

• PGY-2:
  Sharath Anand, MD
  Andrew Faramand, MD
  Sakibul Huq, MD
  Anthony Schulien, MD

• PGY-1:
  Joe Garcia, MD
  Eric Nturibi, MD
  Will Shuman, MD
  James Yoon, MD

Physician Assistants
Alicia Bergell, PA-C
Lauren Carroll, MPAS, PA-C
Theodora Constantine, PA-C
Alissa Conway PA-C
Anne Cully, MPAS, PA-C
Komal Eubanks, DNP, CRNP
Julia Freyer, PA-C
Amanda Gans, PA-C
Nicole Gray, PA-C
Kayla Grom, PA-C
Samantha Gulick, PA-C
Cheyenne Harris, CRNP
Chrisanne Hennicke, MPAS, PA-C
Danielle Hudak, PA-C
Sarah Kwiatkowski, CRNP
Kathleen Mannion, PA-C
Lawrence Marcello, PA-C
Hope Maromonte, MPAS, PA-C
Kristin Mellon, MPAS, PA-C
Kelsey Michenko, PA-C
Jessica Nguyen, MPAS, PA-C
Hannah Pierre, CRNP
Pam Rosato-Lange, CRNP
Robert Friedlander, MD, (second from right), Walter E. Dandy Professor and chair of the Department of Neurological Surgery, was awarded the special faculty rank of Distinguished Professor at the University of Pittsburgh at a special faculty honors convocation ceremony, April 1, 2022. The award is the highest honor the university can accord a faculty member. With Dr. Friedlander is Anantha Shekhar, MD, PhD, School of Medicine dean; Patrick Gallagher, university chancellor and Ann E. Cudd, university provost and senior vice chancellor.
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 Klinke 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 Bahnsen, 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.
Department Overview

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.

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.

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 of the most extensive neurological research programs in the nation. Dr. Lunsford also established the department as one of the leading stereotactic radiosurgical programs in the world. In 1987, he was responsible for bringing the Gamma Knife to the University of Pittsburgh, the first center in the 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.

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 endoNeurosurgery 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 subsequently left the department.

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**

The main offices of the Department of Neurological Surgery at the University of Pittsburgh are housed on the fourth floor of UPMC Presbyterian. The current full-time faculty includes 15 professors, six associate professors and 17 assistant professors. In addition, there are 18 clinical faculty, 6 research faculty and 29 residents at various levels of training. The support staff includes more than 200 physician assistants, clinical coordinators, administrative assistants, nurses, technicians and other personnel.

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

**Brain and Spine Injury Program**

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

The department’s adult clinical neurotrauma division, led by David Okonkwo, MD, PhD, remains a world leader in the treatment of and research into traumatic brain 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, Moya-Moya, and cavernous malformations. With a group of highly subspecialized physicians, center faculty prospectively assess patients and provide broad state-of-the-art treatment options. Since cerebrovascular disease can often be treated using a spectrum of complementary techniques, experts evaluate cases and provide recommendations with the goal of minimizing risks and maximizing long-term efficacy.

  The center is directed by department chairman Robert M. Friedlander, MD. Other members of our team include Paul A. Gardner, MD; Bradley A. Gross, MD; Michael J. Lang, MD; Daniel A. Wecht, MD; and Georgios Zenonos, MD. As part of the cerebrovascular center, Dr. Gross serves as director of endovascular neurosurgery.

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

  The Cerebrovascular Neurosurgery Center works in close collaboration with the UPMC Stroke Institute—staffed by neurologists with additional training in vascular neurology. Our 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. For patients with complex, elective cerebral ischemic disease, Dr. Lang has a very busy practice in cerebral revascularization, offering cutting-edge cerebral bypass options, among.

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

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

Parthasarathy Thirumala, MD, is director of the CCN and is joined by Jeffrey Balzer, PhD; Donald Crammond, PhD; Katherine Anetakis, MD, Varun Shandal, MD, and James Castellano, 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 stimulation motor evoked potentials (dcscMEP) 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 Andrew McCall, 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. Together with their partners in the Departments of Otolaryngology, Oculoplastics, and Plastic Surgery, they continue to advance the field through improvement of surgical techniques as well as molecular strategies for treating skull base disease. They also work in regular collaboration with L. Dade Lunsford, MD, who established the first Gamma Knife center in North America at UPMC in 1987, and was also the first to introduce radiosurgery for the non-operative treatment of skull base tumors.

Experts at the UPMC Center for Cranial Base Surgery continue to lead the field of minimally invasive brain surgery by developing new techniques, tools and approaches that have made it possible to access many tumors, regardless of size. Since 1997, more than 4,000 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.

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

The concept of team surgery allows the center to select the best surgical approach for each tumor, with a surgical plan designed around the particular needs of the individual patient. Treatment is designed to offer the best surgical outcome with the least side effects and maximal preservation of function. A full array of transcranial approaches, minimally invasive key-hole 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 courses a year at UPMC, featuring live surgery and hands-on laboratory work. They also travel the world teaching these procedures to the next generation of skull base surgeons.

The University of Pittsburgh Medical Center has been designated as a “Multidisciplinary Team of Distinction” by the North American Skull Base Society. This designation is based on meeting NASBS membership criteria and may not be construed as a medical referral. In addition, the Pituitary Center has been named a Center of Excellence by the UPMC Health Plan. This designation is based on high volume practice with regular metrics which uphold a high standard of care for the entire UPMC system.

**Center for Cranial Nerve Disorders**

The Cranial Nerve Program, under the direction of Georgios Zenonos, MD, along with Paul Gardner, MD, joins experts in a variety of medical disciplines, including neurosurgery, neurology, neurophysiology, radiology, anesthesia, neuro-oncology, and neuro-otology with the intent of providing the most advanced care for a variety of brain disorders. The goal of the program is to provide the very best outcomes for patients with a variety of disorders in the most minimally invasive manner.

Building upon the pioneering work accomplished at the University of Pittsburgh by former long-time chairman Peter J. Jannetta, MD, with his ground-breaking development of microvascular decompression (MVD), our Cranial Nerve Program is an international leader in the management of trigeminal neuralgia, hemifacial spasm and glossopharyngeal neuralgia, among other cranial nerve disorders.

The center is driven by outcome-based clinical research and basic science research projects aimed at understanding the biologic mechanisms of diseases within the realm of the center. In recent years, this research has resulted in improved outcomes for patients and new therapies for a variety of disorders.
• Epilepsy, 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 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 in the Epilepsy Monitoring Unit. Data from this study demonstrated that patients could utilize a brain computer interface to control a computer cursor. This grant served as the kick-start for two clinical trials.
In the first, quadriplegic patients are implanted with a custom-designed ECoG grid for up to 30 days. The first subject was able to obtain consistent three-dimensional cursor control using a 3D visual environment. He was also able to successfully control a robotic arm. Additional subjects have also successfully achieved cursor control in a 3D virtual environment and control of a robotic arm. The initial work was funded by the Cortical Control of a Dextrous Prosthetic Hand study funded by National Institute of Neurological Disorders and Stroke (NINDS) and Andrew B. Schwartz, PhD (Department of Neurobiology) was the 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 our research team to include the University of Chicago. We join Sliman Bensmaia, PhD, and Nicholas Hatsopoulos, PhD, to expand our research efforts with the goal of restoring hand function in patients with paralysis. The second new collaboration is funded by a $1.2 million NIH award (Jennifer Collinger, PhD, Physical Medicine and Rehabilitation) to better understand the underlying neural activity of reaching and grasping. We will be collaborating with University of Pittsburgh researchers, Aaron Batista, PhD, and Patrick Loughlin, PhD, from the Swanson School of Engineering, and Carnegie Mellon researchers Steven Chase, PhD, and Byron Yu, PhD, from the College of Engineering.

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

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.

• Center for Image-Guided Neurosurgery
The Center for Image-Guided Neurosurgery (CIGNS) led by Costas G. Hadjipanayis, MD, PhD—as he succeeds CIGNS founder and neurosurgery icon L. Dade Lunsford, MD—incor-
iorates the expertise of individuals in image-guided stereotactic and functional neurosurgery, brain tumor surgery, Gamma Knife radiosurgery, neuro-oncology, radiation oncology and neuro-radiology. Ajay Niranjan, MD, MBA, is associate director of the center. The goal of the center is to provide quality patient care using minimal access or minimally invasive stereotactic and radiosurgical technology, high resolution neuroimaging and advanced computer systems. In 1981, the center was the first U.S. center to install a dedicated computed tomography (CT) scanner in a unique stereotactic operating room suite.

As the first North American center to initiate a clinical program for Gamma Knife stereotactic radiosurgery in 1987, the Center for Image-Guided Neurosurgery 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 the fall of 2007, the Leksell Gamma Knife Perfixion™ was installed. This unit is booked for reloading of the Cobalt 60 sources in 2023, during which we hope to upgrade it to the latest generation Gamma Knife technology. This latest generation Gamma Knife unit incorporates advanced robotics, expands the role of radiosurgery to include cranial vertebral junction targets, provides greater patient access, and enhances patient safety. The ICON® Gamma Knife incorporates a cone beam CT imaging system in order 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, arteriovenous malformations (AVMs), and pain or movement disorders. Over 17,600 patients have undergone Gamma Knife stereotactic radiosurgery at UPMC Presbyterian. 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 2021, UPMC installed the new MEGIN NeuroMeg TRIUX® magnetoencephalography (MEG) unit to perform functional brain mapping in patients with brain tumors, epilepsy, trauma and degenerative brain disorders. Dr. Niranjan is the operations director of the MEG project. 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 new MEG unit includes a helium recycling device that significantly reduces the annual cost of helium replacement needed to supercool the detectors of tiny MEG brain waves.

The Center for Image-Guided Neurosurgery 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, neurootologists, radiation oncologists, medical physicists, and nurses have trained at this center. These courses are among the highest rated post-graduate courses offered at the University of Pittsburgh. In 2015, the center opened a new state-of-the-art education and training facility equipped with the latest generation high-definition display systems. In July of 2020—during the early COVID pandemic—the center switched to 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 temporarily and remotely turn their personal computers in radiosurgery planning work stations. Students can now study radiosurgery effectively, avoiding the local housing and transportation costs involved with national or international travel. 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 700 combined peer reviewed publications and over 1,400 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 Jorge A. González-Martínez, MD, PhD) and one for candidates focusing on neurooncology and radiosurgery (supervised by Drs. 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.

The multidisciplinary Center for Image-Guided Neurosurgery includes the clinical and research efforts of radiation oncologists John Flickinger, MD; Yoshio Arai, MD; Susan Rakfal, MD; and Zaid Siddiqui, MD. The participating medical physics group consists of Jong Oh Kim, PhD; Greg Bednarz, PhD; and Tanvir Baig, PhD. Lana Trofimova, PAC, provides patient care assistance for the Gamma Knife program. Five full time dedicated, and very talented, nurses headed by Jonet Vacsulka, BSN, and assisted by RNs Mark Geminetti, Devi Willaman, Nancy Bastine, and Brenda Unghajer provide pre, intra, and post radiosurgery care to more than 600 patients every year. They are all especially trained in conscious sedation techniques to provide comfort and attentive care to our 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’s Neurosurgical Oncology Program is one of the highest volume adult brain tumor centers in the country and includes leading neurosurgeons, neuro-oncologists, radiation oncologists, neuropathologists, researchers, rehabilitation experts, nurses and support staff. This multidisciplinary team delivers compassionate and sophisticated care and uses the latest technologies to treat patients with tumors of the brain, spine and skull base. Education, support and counseling for family members are important parts of the program.
The program—directed by Pascal O. Zinn, MD, PhD, along with the work of Kalil G. Abdullah, MDx—is dedicated to providing the best treatment available for patients with both benign and malignant tumors of the brain and spine. The center is also dedicated to discovering novel and effective therapies for these diseases and is a leading center for surgically-driven clinical trials and translational bench-to-bedside trials based on scientific breakthroughs developed in our laboratories.

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

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

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

To highlight our skill and breadth of expertise in neuro-oncology, the University of Pittsburgh is a member of the Pediatric Brain Tumor Consortium composed of 15 academic centers and children's hospitals located across the United States and Canada selected based on their scientific excellence and clinical expertise in pediatric brain tumors, and is also the coordinating center for the International Radiosurgery Research Foundation, an international consortium of academic centers of excellence dedicated to furthering stereotactic radiosurgery treatment.

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

The Pediatric Neurosurgery Division at UPMC Children’s Hospital of Pittsburgh (CHP) is led by Ian Pollack, MD, and also includes Stephanie Greene, MD, Taylor Abel, MD, Robert Kellogg, MD, and Michael McDowell, MD. The division provides care for children with tumors, spinal and cranial deformities, vascular malformations, spasticity and epilepsy, and peripheral nerve disorders, and has gained international recognition for the treatment of pediatric brain tumors, intractable epilepsy, neurovascular lesions, cerebral palsy, 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, physical therapy, 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.

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

These clinical advances are coupled with a robust and rapidly growing research enterprise, encompassing a state-of-the-art pediatric brain tumor bank that will soon receive specimens from other regional pediatric neurosurgical sites, as well as a series of eight NIH R01, P01, and R21-funded research projects, and a cadre of rising-star investigators, including Sameer Agnihotri, PhD, Gary Kahanbash, 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.

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

The Pediatric Epilepsy Surgery Program, led by Dr. Abel, is the only center in the region able to provide comprehensive epilepsy surgery evaluation and performs > 120 epilepsy surger-
ies 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. For example, the program is one of the highest volume centers for MR-guided laser ablation in North America. Direct cortical modulation with responsive neural stimulation (RNS) is also available when the seizure focus involves eloquent cortex. For children with drug-resistant multi-focal or generalized epilepsy, all available palliative procedures are available, including MR-guided laser callostomy, traditional callosotomy, vagus nerve stimulation, 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 voice and speech perception. This effort is funded by multiple federal grants, including an R01 and R21. 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.

The program is also involved in cutting edge clinical and basic research focused on developing and applying new and improved treatments for children with movement disorders. Dr. Kellogg manages this aspect of the practice and participates in The Spasticity and Movement Disorders Clinic that is held weekly. This clinic is made up of a team of pediatric medical professionals who specialize in the comprehensive, multidisciplinary evaluation and treatment of children and young adults with spasticity and other movement disorders, such as cerebral palsy, spasticity, dystonia, chorea, athetosis and tremor. The purpose of the clinic is to determine whether a patient would benefit from treatment with oral medications, intrathecal baclofen, selective dorsal rhizotomy, intramuscular botox injection, deep brain stimulation, orthopedic procedures, or other therapies. Additionally, the division offers intraventricular baclofen pumps, which is a therapy pioneered at CHP by A. Leland Albright, MD, that has been revived with the addition of Dr. Kellogg. With the ROSA robot and O-Arm, asleep frameless stereotactic deep brain stimulation is available for children with dystonia and other movement disorders requiring neuromodulation.

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

The division is actively involved in the Brain Trauma Research Program, the Fetal Diagnosis and Treatment Center, the Vascular Anomalies Center and the Brachial Plexus Program. In conjunction with a team of specialists at UPMC Magee-Womens Hospital, Dr. Greene has established a program to treat babies with myelomeningocele, or 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, 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. Dr. Greene collaborates with maternal-fetal medicine 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 by Dr. Greene outside of the Brachial Plexus program.

UPMC Children’s Hospital of Pittsburgh is a member of the Hydrocephalus Clinical Research Network, a group of 11 premier pediatric neurosurgical departments in North America that are dedicated to designing and undertaking field-changing prospective research into pediatric hydrocephalus. In addition, 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.

In recent years, the clinical team has been expanded with the addition of Dr. Kellogg, a former neurosurgical fellow who joined the group in September of 2020. In addition to his management of the Pediatric Neurosurgery Division’s spasticity and movement disorders program noted above, he will be focusing on many clinical research studies conducted within the Hydrocephalus Clinical Research Network and other collaborative initiatives. More recently, the division has added Dr. McDowell to our team, who brings particular expertise in the management of cranial base anomalies, after completing both endoscopic cranial base and pediatric neurosurgical fellowships. With this unique combination of skill sets, he is joined by the other members of the internationally acclaimed UPMC Center for Cranial Base Surgery in proving unmatchable care for disorders of the pituitary gland, skull base, and cranio-cervical junction. Dr. McDowell also brings research expertise in near infrared spectroscopy (NIRS) as a noninvasive way of monitoring brain function and intracranial pressure. He recently received the 2021 Hydrocephalus Association Award for his groundbreaking work that may soon have wide-reaching applications for disorders of intracranial pressure include trauma, Chiari malformation, craniosynostosis, and hydrocephalus. A large-scale clinical trial is underway to validate this technology in children and adults with neurosurgical conditions.

Together, the increased complement of neurosurgeons, supported by five full-time advanced practice providers, has enabled expansion of the division’s outreach program to multiple communities beyond our immediate geographic area, combined with an extensive telemedicine presence. Our research initiatives are also supported by four full-time research coordinators, allowing us to maintain a broad array of clinical studies to place our site on the cutting edge of Pediatric Neurosurgery patient care, while advancing the field in general.
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Finally, our 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. Greene serves on the editorial board of the premier journal in the field, *Journal of Neurosurgery: Pediatrics*, and is the chair of the Traveling Fellowship SubCommittee of the Education Committee of the AANS/CNS Section on Pediatric Neurosurgery. She is a member of the AANS/CNS Joint Section Executive Committee as well. As the fellowship director at CHP, Dr. Greene is on the American Board of Pediatric Neurological Surgeons Fellowship committee and is a regular guest examiner for the American Board of Neurological Surgeons oral board examination. She is the only neurosurgeon member of the North American Fetal Therapy Network (NAFTNet) Steering Committee and is a member of the National Spina Bifida Patient Registry Coordinating Committee. 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. Dr. McDowell is the chair of the Young Neurosurgeons Committee of the AANS/CNS Section on Pediatric Neurosurgery and the course director of the acclaimed “Brain and Blade” course for pre-clinical medical students, for which he was awarded the 2021 University of Pittsburgh Dean’s Distinguished Teaching Award.

• Pituitary Center

Over the last few 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 4,000 endoscopic endonasal skull base procedures. Since the introduction of the endoscopic endonasal approach, more than 1,400 pituitary surgeries have been performed at the UPMC Pituitary Center, and our surgical team, consisting of Paul Gardner, MD, and Georgios Zenonas, MD, from neurosurgery, and Carl Snyderman, MD, MBA, and Eric Wang, MD, from otolaryngology, currently performs around 100 operations for pituitary tumors every year (over 900 since 2009). In addition, the Pituitary Center is led by a dedicated neuro-endocrinology team of Pouneh K. Fazeli, MD, (director) and Hussain Mahmud, 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 our skull base center surgeons. 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 in collaboration with pediatric tumor neurosurgical specialist, Michael McDowell, MD.
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, our 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 in January 2022 with an expertise in complex spine deformity cases and spine oncological 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 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. Dr. Buell, who completed advanced training in complex spine surgery at the University of Virginia and Duke University, is a prolific academician poised to make significant contributions to this subspecialty.

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
Department Overview

cord stimulation and intrathecal opioids) to surgical decompression (with or without spinal fusion) to ablative neurosurgery.

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

Accomplishments and Highlights of Note in Fiscal Year 2021-22

July 2021

- Luke Henry, PhD, was selected as a winner of the UPMC Physician Services’ Extra Mile Award. The award recognizes UPMC staff members and physicians who demonstrate the determination to go above and beyond their job duties, maintain high office morale, and actively display UPMC values.

August 2021

- Zel Zhang, MD, was selected to the University of Pittsburgh Physician Scientist Incubator program, designed to train the highest quality biomedical investigators. Dr. Zhang’s research focus is on the impact of tumor microenvironment on efficacy of immunotherapy in brain metastases.

- Taylor J. Abel, MD, was awarded a National Institutes of Health (NIH) National Institute on Deafness and Other Communication Disorders R21 grant for a study investigating the flexible representation of speech in the supratemporal plane. Dr. Abel was also named one of Pittsburgh Magazine’s ‘40 under 40’—individuals under the age of 40 whose creativity, vision and passion enrich the Pittsburgh region.

September 2021

- L. Dade Lunsford, MD, was selected as the 2021 Andy T. Parsa Mentorship Award winner by the American Association of Neurological Surgeons/Congress of Neurological Surgeons Section on Tumors. The Parsa award is given to individuals in honor of cumulative achievement and mentorship in neurosurgical neuro-oncology and recognizes the contributions of senior brain tumor neurosurgeons to the career development of their mentees and junior colleagues.

- Michael McDowell, MD, was elected as vice chair of the American Association of Neurological Surgeons Young Neurosurgeons Committee (YNC) for 2022-24. Also, Hussam Abou-Al-Shaar, MD; Nima Alan, MD; and Ali Alattar, MD, were elected to the YNC. They join fellow current residents Hanna Algattas, MD, and Prateek Agarwal, MD, and residency program graduates Nitin Agarwal, MD; and Daniel Tonetti, MD, on the YNC, establishing the University of Pittsburgh as the most represented institution on the committee.

- Nima Alan, MD, won the 2021 Cervical Spine Research Society Resident and Fellow Scholarship from the Cervical Spine Research Society.

October 2021

- Joseph Maroon, MD, and Eugene Myers, MD, were honored as founders of skull base surgery at the University of Pittsburgh Medical Center at a special banquet at Pittsburgh’s Carnegie Museum of Natural History.
Michael Lang, MD, was named a recipient of a 2021 UPMC Physician Excellence Award. The award recognizes UPMC physicians who exhibit a passion for medicine and consistently achieve clinical excellence.

November 2021

- The UPMC Center for Cranial Base Surgery hosted a live surgical broadcast from the UPMC Presbyterian operating rooms, showcasing the endoscopic endonasal skull base approach. Paul Gardner, MD, and Carl Snyderman, MD, performed and commented on aspects of the surgery while Eric Wang, MD, and Georgios Zenonos, MD, hosted the broadcast.

December 2021

- Walking Miracle, an autobiography from former Pittsburgh Steelers Ryan Shazier detailing his recovery from a career-ending spinal cord injury, prominently discussed the role of David Okonkwo, MD, PhD, and Joseph Maroon, MD, in his treatment.

January 2022

- The book Vascular Challenges in Skull Base Surgery, coauthored by Paul Gardner, MD; Carl Snyderman, MD; and Brian Jankowitz, MD—described as the essential multidisciplinary guide for the prevention and management of vascular injury—was released by Thieme.

- Alp Ozpinar, MD, won the Charles Kuntz Scholar Award from the AANS/CNS Joint Section on Disorders of the Spine and Peripheral Nerves for his paper “ASD Patient Outcomes Planned for a Two-Staged Scoliosis Correction: A Case for Standalone Anterior Lateral MIS Fusion.”

- The third edition of Intracranial Stereotactic Radiosurgery, co-edited by L. Dade Lunsford, MD, and Jason Sheehan, MD—a 432-page comprehensive update on the practice of stereotactic radiosurgery—was released by Routledge/CRC Press.

February 2022

- The Joseph C. Maroon Fund/Chuck Noll Foundation was established by the Neurosurgery Research and Education Foundation (NREF) to fund research in the diagnosis, treatment and prevention of brain injury in sports. This fund honors Dr. Maroon for his pioneering dedication to research and education in the prevention and treatment of sports-related injuries to the brain.

- The Center for Cranial Base Surgery’s Christina Jackson, MD; Yun-Kai Chan, MD; S. Tonya Stefko, MD; Georgios Zenonos, MD; and Paul Gardner, MD, received the first place poster award for their poster “Lateral Orbitotomy for Resection of Trigeminal Schwannoma” at the North American Skull Base Society annual meeting.

- Michael McDowell, MD, was selected as the winner of the 2021 Hydrocephalus Association Award from the AANS/CNS Section on Pediatric Neurological Surgery, awarded for best paper on hydrocephalus presented at the Pediatric Section Annual Meeting.

- Georgios Zenonos, MD, and Hussam Abou-Al-Shaar, MD, won the North American Skull Base Society Research Grant for their project “The Clinical Application of High-Definition Fiber Tractography in Detecting Vision Recovery Following Skull Base Surgery.”

- Robert Friedlander, MD, was featured on the popular Outdoors With The Morgans podcast, discussing his surgical care of a Morgan family member with Chiari malformation.
• Joseph Maroon, MD, was one of many health experts and celebrities on Radically Reframing Aging, a special five-day online summit hosted by Maria Shriver that featured conversations on aging, nutrition, fitness and mental health.

• Ian F. Pollack, MD, was elected chair of the American Board of Pediatric Neurosurgery for its 2022 term.

March 2022
• Hanna Algattas, MD, and Michael McDowell, MD, both won abstract awards from the American Association of Neurological Surgeons. Dr. Algattas won the Mizuho Minimally Invasive Brain Tumor Surgery Award for his abstract “Endoscopic Endonasal Resection of Rathke’s Cleft Cysts: A Single Institution Analysis of 113 Consecutive Patients.” Dr. McDowell won the Hydrocephalus Association Award, for his abstract “Diffuse Correlation Spectroscopy as an Accurate and Precise Option for Non-Invasive ICP Measurement.”

• Researchers at Department of Neurological Surgery were awarded $186,000 in research grants from the Pittsburgh Foundation’s Walter L. Copeland Fund—part of $1.3 million in grant money awarded University of Pittsburgh health science researchers.

April 2022
• The Clear Thoughts Foundation awarded $200,000 in research funding to department chair Robert Friedlander, MD, to begin preclinical research on how melatonin might affect dementia-related processes in the brain.

• A groundbreaking study led by David Okonkwo, MD, PhD—reported in the journal Radiology—showed that an advanced machine-learning algorithm can analyze brain scans and relevant clinical data from TBI patients to quickly and accurately predict survival and recovery at six-months after the injury.

• Kamil Nowicki, MD, PhD, and Ali Alattar, MD, were members of a team—CAT-7—that took home second place in the University of Pittsburgh’s 2022 Randall Family Big Idea Competition, an iteration of a business pitch and idea development competition.

• In a paper published in Nature Cancer, researchers from the Department of Neurological Surgery, reported on a potentially better, non-invasive way to treat diffuse midline gliomas (DMG). It was discovered that these tumors are uniquely dependent on methionine—an amino acid that humans must receive from food. Developing drugs that specifically target methionine-processing machinery in cancerous cells in the brain, but not in the rest of the body, might pave the way for new non-invasive treatments.

• Arka Mallela, MD, was awarded a National Institutes of Health F32 grant for his project “Exploring the Expressive Language Function of the Supplementary Motor Area Institution.”

• David Okonkwo, MD, PhD, was featured in an ESPN.com article for his role in helping Clemson University football standout Justyn Ross in his journey back from a career-threatening spine condition—Klippel-Feil syndrome.
Department Overview

• A paper by Kalil Abdullah, MD—reporting on an efficient method for producing faithful in vitro models of lower-grade glioma, generating new experimental platforms to support preclinical studies of LGG—was featured on the cover of the journal Neuro-Oncology.

• Robert Friedlander, MD, was awarded the special faculty rank of Distinguished Professor at the University of Pittsburgh at a special faculty honors convocation ceremony at Soldiers & Sailors Memorial Hall & Museum. The award is the highest honor the university can accord a faculty member.

• Joseph Maroon, MD, was interviewed by nationally known nutrition and health expert Johnny Bowden on his webcast where they discussed Dr. Maroon’s book *Square One: A Simple Guide to a Balanced Life* and the explosion of stress, depression and other mental health issues in America.

• Peter Gerszten, MD, was appointed assistant editor for the journal *Neurosurgery*.

• Hussam Abou-Al-Shaar, MD, was selected as the 2022-23 *Neurosurgery* Publications resident fellow by the Congress of Neurological Surgeons and Neurosurgery Publications.

• Michael McDowell, MD, was selected as a candidate fellow of the Scoliosis Research Society.

• Visiting Peter J. Jannetta/Dorothy Klenke Nash lecturer Martina Stippler, MD, was featured in a *Pittsburgh Post-Gazette* article that talked about Dr. Nash’s prominence as the first female neurosurgeon in the United States and the importance of encouraging more women to pursue roles in the field of neurosurgery.

May 2022

• Joseph Maroon, MD, inaugurated a weekly half-hour radio talk show, *Living Well*, broadcast on Beaver County Radio and the St. Barnabas Radio Network discussing simple health and wellness topics.

• The National Institutes of Health (NIH) National Cancer Institute (NCI) awarded a R01 $2.39 million grant to Baoli Hu, PhD, to support the continuing investigation of the immune microenvironment of glioblastoma.

• Twelve University of Pittsburgh neurosurgeons were named among this area’s best doctors in their field in a national survey published locally in *Pittsburgh Magazine*. The list includes Matt El-Kadi, MD, PhD; Robert M. Friedlander, MD; Paul A. Gardner, MD; Peter C. Gerszten, MD; Jorge A. Gonzalez-Martinez, MD, PhD; Stephanie Greene, MD; D. Kojo Hamilton, MD; L. Dade Lunsford, MD; Vincent Miele, MD; David O. Okonkwo, MD, PhD; Ian Pollack, MD; and Daniel Wecht, MD.

• Joseph Maroon, MD, finished second in his age group in the men’s triathlon event at the 2022 National Senior Games held in Fort Lauderdale, Fla. Dr. Maroon was later featured in the *Pittsburgh Tribune Review* for his accomplishment and his dedication to a “sound body, sound mind” way of life.

• Hussam Abou-Al-Shaar, MD, was selected as a socioeconomic fellow for 2022-23 by the Council of State Neurosurgical Societies.

• L. Dade Lunsford, MD, was the featured guest at the Baptist Health Miami Neuroscience Institute for the inaugural L. Dade Lunsford Radiosurgery Lectureship.
June 2022

- Joseph Maroon, MD, received the 2022 Distinguished Medical Alumni Award from the Indiana University School of Medicine, the highest award an alumni can receive from IU.

- A study published in *JAMA Network Open*, coauthored by Shawn Eagle, PhD, indicating that a child’s history of depression and concussion within the previous year—along with their race, ethnicity and sex—can help predict the likelihood of a suicide attempt, was widely reported in media across the country.

- Robert Friedlander, MD, was interviewed on WTAE-TV discussing the benefits of the new UPMC Presbyterian Hospital during groundbreaking ceremonies of the $1.5 billion state-of-the-art facility.

- A study published in *Nature Neuroscience*, coauthored by Marco Capogrosso, PhD, regarding improved arm control in paralyzed monkeys, received substantial media play across the country.
Department Overview
Education Programs
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
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.

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

• 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 at the University of Pittsburgh School of Medicine is devoted to fostering an interest in the exciting field of neurological surgery. The group
Education Programs

connects medical students to key resources in the Department of Neurological Surgery and provides opportunities to shadow, conduct cutting-edge research, and network with the department. Mentoring from several senior residents in our program helps to stimulate interest in the field.

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

Residency Program

The UPMC Department of Neurological Surgery offers a seven-year (PGY 1-7) residency program that is internationally renowned as a training ground for exceptional neurosurgeons. Accredited by the UPMC Graduate Medical Education Council, as well as the Accreditation Council on Graduate Medical Education (ACGME), the program is currently approved to train 28 residents, four each year (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.

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. Still another article, published in InformaHealthcare, showed that our stereotactic research effort was the most productive in the world.

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.

- **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 spend eight months on various neurosurgical services, two months on critical care medical services (trauma, neuro, surgical ICU), and two months on neuropathology. The first year of training is critically evaluated each year by the faculty and trainees 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.

- **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 pediatric service (UPMC Children’s Hospital of Pittsburgh) 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 midlevel providers, including physician assistants and nurse practitioners, provide support both on the hospital floors and in the outpatient clinics.

- **PGY-3**
  The PGY-3 year emphasizes clinical experience in brain and spinal surgery including vascular neurosurgery (an initial introduction to endovascular and exovascular techniques), image-guided surgery, functional neurosurgery and neurosurgical oncology at UPMC Shadyside.

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

- **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 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
Education Programs

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 infolded fellowship opportunities exist in spine (CAST approved), skull base, endovascular (CAST approved), and stereotactic-functional (CAST approved) training. For selected residents pursuing the surgeon scientist pathway, further research opportunities as well as mentoring for grant submission can be pursued.

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

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

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.
Education Programs

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 the faculty). For 2021-22, the faculty award was given to Pascal Zinn, MD, PhD (top). The resident honor was presented to Enyinna Nwachuku, MD (bottom).

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

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

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

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

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

*Principles and Practice of Intraoperative Neuromonitoring*, co-directed by Partha Thirumala, MD, and Jeffrey Balzer, PhD, is designed for advanced professionals who perform or support intraoperative neuromonitoring (IONM) procedures. The course highlights practice specifications, multimodality protocols, recent advances in the field, pre-/post-operative neurological evaluation, and telemedicine in IONM.
New for 2022 is *Frontiers in Neurosurgery and Neuromodulation*, a two-day presentation and discussion on innovations in epilepsy, movement disorders and spasticity care. Under the direction of Jorge A. González-Martínez, MD, PhD, this event is a focused and practical symposium dedicated to neurologists, general practitioners, mid-level providers, students, surgeons and patients interested in learning and discussing current state-of-the-art treatment methods, as well as the future of the neuromodulation field.

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

Martina Stippler, MD, was the Jannetta Lecturer for 2022, presenting a talk on “Triage of Complicated Mild TBI” on April 6, 2022. Dr. Stippler also presented the inaugural Dorothy Klenke Nash Lecture at a special evening event held at the Pittsburgh Golf Club. Dr. Nash was the first female neurosurgeon to practice in the United States, working with Stuart Niles Rowe, MD, at the University of Pittsburgh in the 1940s. Dr. Stippler spoke on the current state and future opportunities for women in neurosurgery.
Education Programs

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 prominent 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.

Due to the COVID-19 pandemic, the Stuart Rowe Lecture for 2021-22 was canceled.

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

Fridays with Friedlander
Fridays with Friedlander is a live webcast hosted by department chairman Robert M. Friedlander, MD, featuring department faculty, residents, alumni and prominent figures in medicine presenting updates on topical neurological surgery issues—followed by an interactive Q&A session.

Spotlight Videos
Spotlight videos are short educational videos featuring department faculty and residents discussing various aspects of their work, research activities or educational program efforts. The videos are posted on social media and are available on the department’s website.

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.
Education Programs
Kalil G. Abdullah, MD
Assistant Professor
Director, Translational Neuro-Oncology

Kalil G. Abdullah, MD, MSc, is a neurosurgeon specializing in the treatment of adult brain tumors and is director of translational neuro-oncology at the UPMC Hillman Cancer Center. Dr. Abdullah treats brain tumors using microsurgery techniques and awake craniotomies to map intricate regions of the brain during surgery. He also uses endoscopic and tubular approaches, intraoperative fluorescence, and laser therapy to provide minimally invasive surgery options to his patients. Dr. Abdullah is an NIH-funded investigator and directs the department’s Translational Neuro-Oncology Laboratory, developing new drug and treatment targets for brain cancers. He has been the principal investigator for numerous clinical trials for glioma 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 key neuro oncology advances in journals such as Neuro-Oncology, Cancer Cell, Nature Medicine, and Clinical Cancer Research, and co-edited Glioblastoma, a seminal textbook on malignant gliomas. 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 open and endoscopic 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.

Hospital Privileges
UPMC Presbyterian
UPMC Shadyside

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

Professional Activities
Tissue and Biospecimen Steering Committee, Glioma Therapeutics Network, National Cancer Institute
Scientific Committee, Children’s Brain Tumor Research Network

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
Eugene P. Frenkel Scholar Endowment 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: 2021-22
• Refereed Articles:


• Published Abstracts:

**Research Activities**
Dr. Abdullah is a neurosurgeon-scientist who focuses on high grade gliomas and developing novel drug targets for treatment. His work involves leveraging brain tumor tissue to trace and identify metabolic vulnerabilities in brain tumors.

**Taylor Abel, MD, FAANS**
*Assistant Professor*
*Chief, Pediatric Epilepsy Surgery*
*Surgical Director, UPMC Children’s Hospital of Pittsburgh Epilepsy Center*

Taylor Abel, MD, is an American Board of Neurological Surgery and American Board of Pediatric Neurological Surgery certified pediatric neurosurgeon specializing in epilepsy surgery. He is surgical director of the Pediatric Epilepsy Surgery Program at UPMC Children’s Hospital of Pittsburgh. Dr. Abel is from Seattle, Wash. and completed his undergraduate and medical education at the University of Washington. After his medical education in Seattle, Dr. Abel completed neurosurgery residency at the University of Iowa, where he received specialized training in epilepsy surgery and brain mapping techniques. At Iowa, Dr. Abel completed an NIH-funded postdoctoral fellowship—receiving the Ruth L. Kirschstein National Research Service Award—focusing on electrophysiologic mechanisms of face and voice identification in the temporal lobe. He is one of the few neurosurgeons in North America who has 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 movement disorders. 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.

**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 League Against Epilepsy
Joint Section on Pediatric Neurosurgery (AANS/CNS)
Society for Neurobiology of Language

Professional Activities
American Epilepsy Society:
  Chair, Early Career Committee
  Membership Council
  Scientific Review Committee
Guidelines Committee, AANS/CNS Joint Section on Pediatric Neurosurgery

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

Honors & Awards
Pittsburgh Magazine 40 under 40, 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

Publications: 2021-22
• Refereed Articles:


**Research Activities**

Dr. Abel’s NIH-funded (R01, R21) research program focuses on understanding how the brain processes auditory signals, such as voice and speech, using a combination of electrophysiology, neuroimaging, and lesion mapping techniques. Dr. Abel’s clinical research focuses on clinical trials in epilepsy surgery and comparative effectiveness of different treatments for drug-resistant epilepsy.

**Sameer Agnihotri, PhD**

Assistant Professor

Director, Brain Tumor Biology and Therapy Lab

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

**Specialized Areas of Interest**

Pediatric and adult high-grade gliomas.

**Professional Activities**

Scientific Committee, Children’s Brain Tumor Tissue Network

Membership Committee, Society of Neuro-oncology

**Education & Training**

BSc, (hons), Biology, University of Toronto, 2005

PhD, Medical Biophysics, University of Toronto, 2011
Fellowship, Hospital for Sick Children, Toronto, 2016
Fellowship, Princess Margaret Cancer Centre, Toronto, 2016

**Honors & Awards**
- V-Foundation Scholar, 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 Tumor Research, Pediatric Brain Tumor Research Foundation, 2007

**Publications: 2021-22**

- **Refereed Articles:**
  


**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 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**

JC Blair Memorial Hospital
Excela Health Hospital System
Indiana Regional Medical Center
Monongahela Valley Hospital
Trinity Health System
UPMC Altoona
UPMC Bedford
UPMC Children’s Hospital of Pittsburgh
UPMC Cranberry
UPMC East
UPMC Greenville
UPMC Hamot
UPMC Harrisburg
UPMC Horizon
UPMC Jameson
Professional Organization Membership
American Academy of Neurology
American Clinical Neurophysiology Society

Professional Activities
Course Co-Director, Principles and Practice of Intraoperative Monitoring, 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

Publications: 2021-22
• Refereed Articles:


Katherine M. Anetakis, MD


**Robert L. Bailey, MD**

*Clinical Assistant Professor*

Robert L. Bailey, MD—an ABNS-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. 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 such as Butler, Pa. and Sewickley, Pa.

**Specialized Areas of Interest**

Back and spine care.

**Board Certifications**

American Board of Neurological Surgery

**Hospital Privileges**

UPMC Mercy

UPMC Passavant

UPMC Presbyterian

UPMC Shadyside

**Professional Organization Membership**

American Association of Neurological Surgeons

American Medical Association

Congress of Neurological Surgeons

Pennsylvania Neurological Society
Robert L. Bailey, MD

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. 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 125 refereed articles and 19 book chapters.

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

Board Certifications
American Board of Neurophysiological Monitoring

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

Professional Organization Membership
American Association for the Advancement of Science
American Clinical Neurophysiology Society
American Society of Electroencephalographic Technologists
American Society for Neurophysiological Monitoring (Fellow)
Pittsburgh Neuroscience Society
Professional Activities
Co-Course Director, Principles and Practice of Intraoperative Monitoring, UPMC
Secretary/Treasurer, American Board of Neuropysiological Monitoring
Board of Directors, American Society of Neuropysiological Monitoring

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

Publications: 2021-22
• Refereed Articles:

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

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

Education & Training
MD, West Virginia University, 1999
Residency, Neurosurgery, Allegheny General Hospital, 2005

Honors & Awards
Orthopedic Teaching Award, UPMC Hamot, 2011-12

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; lateral access spine surgery; artificial disc technology; spinal cord stimulation; 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
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—in 2005. 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 and completed an enfolded complex spine fellowship under Justin Smith, MD. He then attended Duke University for a spine fellowship training program under Isaac Karikari, MD, and Christopher Shaffrey, MD. Dr. Buell is a prolific academian, having already published over 100 papers in peer-reviewed journals. He is also an ad hoc reviewer for a number of scientific journals.

Specialized Areas of Interest
Spine surgery

Hospital Privileges
UPMC Presbyterian
UPMC Mercy
UPMC Shadyside

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

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**

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  
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 Dueterhoef Endowed Presidential Scholarship, University of Texas at Austin, 2003-2005  

**Publications: 2021-22**

- **Refereed Articles:**
  


**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 receiving his PhD, Dr. Capogrosso completed his post-doctoral training at the Ecole Polytechnique Fédérale de Lausanne, Switzerland where he worked on the development of brain spinal interfaces for the restoration of voluntary motor control in animals and humans with spinal cord injury. Before joining the University of Pittsburgh, he directed his own research group as a research faculty at the primate center of the University of Fribourg, Switzerland 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.

**Specialized Areas of Interest**
Neuroprosthetics; computer models of electrical stimulation; arm paralysis; spinal cord injury; brain computer interfaces, motor control.
Professional Organization Membership
Society for Neuroscience

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

Honors & Awards
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
Finalist, Tomorrow’s PI Prize, Swiss Life Science Annual Meeting, 2015

Publications: 2021-22
• Refereed Articles:

Research Activities
In 2021-22, Dr. Capogrosso, initiated a first in-human clinical trial testing the efficacy of spinal cord stimulation (SCS) to restore arm and hand function in people with chronic stroke that was approved by the University of Pittsburgh IRB (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 Medicine.

The group’s hypothesis is that SCS can support residual motor function in people with upper limb paralysis in consequence of stroke and significantly improve motor control. They implanted two subjects and observed unexpectedly large effect sizes that substantially improved strength, motor control and daily-life abilities of people with stroke. The results of this work are preliminary, reported as a pre-print on MedRxiv. They believe that data shows technology has the potential of becoming the first effective therapy for permanent post-stroke upper limb hemiparesis.

In relation to this work, they also published the foundational work for this trial, executed in monkeys with a lesion of the cortico-spinal tract on Nature Neuroscience. This shows the unique value of pre-clinical research in monkeys which is the most relevant animal model for human motor control. They developed and tested their technology in monkeys which allowed us to rapidly translate the work to a human trial.

Finally, this year, Dr. Capogrosso obtained a $2 million research grant to explore the feasibility of using SCS to treat motor deficits and slow disease progress in people with spinal muscular atrophy, a genetic disease that progressively destroys spinal motoneurons leading to paralysis.

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, Mass.

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

Diane L. Carlisle, PhD

Professional Activities

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

Publications: 2021-22
• Refereed Articles:

Research Activities
In the past year, Dr. Carlisle used patient-specific induced pluripotent stem cells (iPSCs) to investigate mitochondrial function of neural progenitors and neurons from sporadic and familial ALS patients as well as from Huntington's Disease patients. She differentiated iPSCs into neural progenitors and mature neurons and isolated mitochondria for analysis. Dr. Carlisle found proteomic and functional differences between neurons and controls from neurodegenerative disease patients.

Shaun W. Carlson, PhD
*Research Assistant Professor*

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

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

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

Publications: 2021-22

• Refereed Articles:

Yue-Fang Chang, PhD
Research Associate Professor

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

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

Education & Training
BS, Statistics, National Chung-Hsing University, Taiwan, 1984
MS, Statistics, University of Illinois at Urbana-Champaign, 1987
PhD, Statistics, University of Illinois at Urbana-Champaign, 1991
MPH, Epidemiology, University of Pittsburgh, 1994
Publications 2021-22:

• Refereed Articles:


Or Cohen-Inbar, MD PhD
Clinical Associate Professor

Or Cohen-Inbar, MD, PhD, joined the faculty at the University of Pittsburgh Department of Neurological Surgery in 2019. He completed his medical degree at the Technion Israel Institute of Technology in Haifa, Israel in 2008 and completed his residency in neurological surgery at Rambam Health Care in Haifa in 2014. He obtained his doctorate in immunology and tumor immunotherapy from Technion in 2015. Dr. Cohen-Inbar completed a two-year fellowship in surgical oncology and stereotactic radiosurgery at the University of Virginia in Charlottesville, Va. in 2016. His research has focused on developing new multi-modality approaches to battle benign and malignant brain tumors, with his basic research focusing on new immuno-therapeutical approaches to help battle malignant brain tumors. Dr. Cohen-Inbar completed several mini-fellowships encompassing a wide range of neurosurgical techniques, including those related to the different techniques in managing degenerative spine surgery and neuro-endoscopy. Dr. Cohen-Inbar has authored several books such as Focused Neurosurgery published by Jaypee Brothers Publishing House in 2016, and Focused Neuro-Anatomy for Medical Students published by Nova Science Publishers in 2015. He also has contributed chapters to many other books and publications, including the recently published edition of the well renowned and famous Youmans and Winn Neurological Surgery, 8th Edition. Dr. Cohen-Inbar currently serves on the editorial boards several leading neurosurgical and neuro-oncological journals.

Specialized Areas of Interest
Neuro-oncology; stereotactic radiosurgery; pituitary lesions, pain syndromes, psychiatric illnesses; neurotrauma; degenerative spine diseases.

Board Certifications
Israeli Board Certified in Neurosurgery

Hospital Privileges
UPMC Western Maryland

Professional Organization Membership
American Association of Neurological Surgeons
Congress of Neurological Surgeons
European Association of Neurosurgical Societies
Foundation for International Education in Neurological Surgery
Israeli Neurosurgical Association
Or Cohen-Inbar, MD PhD

**Professional Activities**

**Education & Training**
- MD, Technion Israel Institute of Technology, Haifa, Israel, 2008
- PhD, Technion Israel Institute of Technology, Haifa, Israel, Molecular Immunology, 2014
- Residency, Rambam Health Care, Haifa, Israel, 2014
- Fellowship, University of Virginia, Surgical Neuro-Oncology and Radiosurgery, 2016

**Honors & Awards**
- Young Investigator Award, Clinical/Translational Research, Biennial Canadian Neuro-Oncology Meeting, 2016
- Israeli-Cancer-Association Award, Cancer Research and Treatment, 2014
- Rambam Knowledge Center Fellowship Grant, 2014
- Best Poster Award, Third German-Israeli Cancer Research School, DKFZ-MOST, 2010
- MD Thesis Cum Laude, Technion Institute of Technology, 2007
- Magna Cum Laude Rector’s Honor, University of Debrecen, Hungary, 2003

**Publications: 2021-22**
- Book Chapters:

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Donald J. Crammond, PhD

*Associate Professor*

*Associate Director, Movement Disorder Surgery*

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

Dr. Crammond is the associate director for microelectrode recording and subcortical mapping for the Movement Disorder Surgery Program at UPMC. Dr. Crammond is the chairman of the American Board of Neurophysiologic Monitoring (ABNM).

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

**Board Certifications**
American Board of Neurophysiological Monitoring

**Hospital Privileges**
- Excela Health - Westmoreland and Latrobe Hospitals
- Indiana Regional Medical Center
Donald J. Crammond, PhD

UPMC Altoona
UPMC Bedford
UPMC Children’s Hospital of Pittsburgh
UPMC East
UPMC Horizon
UPMC Magee-Womens Hospital
UPMC McKeesport
UPMC Mercy
UPMC Northwest
UPMC Passavant
UPMC Passavant, Cranberry
UPMC Pinnacle
UPMC Presbyterian
UPMC St. Margaret
UPMC Shadyside
UPMC Somerset
UPMC Susquehanna
UPMC Western Maryland

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

Professional Activities
Chairman, American Board of Neurophysiologic Monitoring
Education Committee, American Society of Neurophysiologic Monitoring
University of Pittsburgh IRB, DSMB
Carnegie Mellon University IRB, DSMB

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: 2021-22
• Refereed Articles:


Research Activities

Dr. Crammond's major clinical research interest is the study of basal ganglia and cerebral cortical interactions related to the control of movement in movement disorders including Parkinson's disease, Dystonia and Essential Tremor. This is accomplished by recording neurophysiological data from micro-electrode single-unit (MER) and local field potential (LFP) recordings in the basal ganglia simultaneously with Electrocorticography (ECoG) and LFP from sensorimotor cortex and by stimulating various structures, to examine the physiological relationship between basal ganglia and functional areas of cerebral cortex. This 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, we are studying the motor control of the hand and how activity in basal ganglia and thalamus regulates motor output through the primary motor cortex and corticospinal tract. Current research is examining if DBS in thalamus and/or basal ganglia may facilitate arm/hand function that may be beneficial in stroke patients who have impaired arm/hand function. As we understand more about basal ganglia physiology and cortical-basal ganglia interactions, we hope this will also help us to improve the targeting for optimal DBS placement within the basal ganglia to be more specific to movement disorder patients’ symptoms and to decrease the incidence of post-operative DBS side effects. Related studies are examining how to better use brain imaging and potential electrophysiological biomarkers of PD, to improve DBS targeting.

Dr. Crammond’s ongoing clinical research interest is to review clinical outcome data to determine the impact of various modalities of Intra-Operative Neurophysiological Monitoring (IONM) to prevent and/or reduce iatrogenic injury and to use neurophysiological mapping of the basal ganglia and cerebral cortex to map motor and language functions in various neurosurgical procedures in awake patients. For example, to map and locate eloquent cortical areas in tumor resection and in epilepsy surgeries.
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 Neurosurgery 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 chair of research in the Department of Neurological Surgery in 2008. In 2011, Dr. Dixon was honored with one of the highest honors the university can present a faculty member when he was awarded The Neurotrauma Chair in Neurosurgery at the University of Pittsburgh. In 2021, Dr. Dixon became a member of a Multi-PI Steering Committee for an interagency (VA, DOD, and NIH) resource to accelerate development of therapies for traumatic brain injury by elevating rigor, reproducibility, and transparency in preclinical research. 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 248 papers in refereed journals, two books (coeditor), 29 book chapters, and two editorials.

Specialized Areas of Interest
Mechanisms of induction and recovery of functional deficits following traumatic brain injury; neurotransmitter agonist therapies for recovery of post traumatic functional deficits; models of traumatic brain injury; clinical studies of pharmacotherapy.

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

Professional Activities
Scientific Board Member, Texas Institute for Rehabilitation Research  
Grant Reviewer, Congressionally Directed Medical Research Programs (CDMRP)  
Study Section Member, Kentucky Spinal Cord & Head Injury Study Section
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: 2021-22
• Refereed Articles:
  Whitener R, Henchir JJ, Miller TA, Levy E, Krysiewicz-Bell A, Abrams ESL, Carlson SW,
  Menon N, Dixon CE, Whalen MJ, Rogers CJ. Localization of Multi-Lamellar Vesicle
  Nanoparticles to Injured Brain Tissue in a Controlled Cortical Impact Injury Model of
  Dixon CE, Bennett MV, Chen J. Intranasal delivery of interleukin-4 attenuates chronic
  cognitive deficits via beneficial microglial responses in experimental traumatic brain injury. 
  Zusman BE, Dixon CE, Jha RM, Vagni V, Henchir J, Carlson SW, Janesko-Feldman K, Bailey
  Z, Shear DA, Gilsdorf J, Kochanek PM. Choice of Whole Blood versus Lactated Ringers
  Resuscitation Modifies the Relationship between Blood Pressure Target and Functional
  Outcome after Traumatic Brain Injury Plus Hemorrhagic Shock in Mice. J Neurotrauma
  Fronczak KM, Li Y, Henchir J, Dixon CE, Carlson SW. Reductions in Synaptic Vesicle Gly-
  coprotein 2 Isoforms in the Cortex and Hippocampus in a Rat Model of Traumatic Brain
  Mi Z, Liu H, Rose ME, Ma J, Reay DP, Ma X, Henchir JJ, Dixon CE, Graham SH. Mutation
  of a Ubiquitin Carboxy Terminal Hydrolase L1 Lipid Binding Site Alleviates Cell Death,
  Axonal Injury, and Behavioral Deficits After Traumatic Brain Injury in Mice. Neuroscience

Research Activities
With funding from the NIH and VA, Dr. Dixon is conducting MRI tractography studies on
neurotransmitter pathways after experimental TBI. He is also examining retinoic acid modu-
lation of markers of synaptic plasticity after TBI and the epichaperome response to TBI.

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 has published over 85 papers
in refereed journals and presented his research at local, national and international scientific
conferences. He is an ad-hoc reviewer for 33 peer-reviewed journals.
**Specialized Areas of Interest**
Optimizing identification, assessment and management of traumatic brain injury using objective assessments and biological markers to improve long-term patient outcomes.

**Board Certifications**
Certified Athletic Trainer, Board of Certification

**Professional Organization Membership**
National Athletic Trainers’ Association
National Neurotrauma Society

**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

**Publications 2021-22**
- **Refereed Articles:**


**Research Activities**

Since joining the department in January of 2022, Dr. Eagle has actively integrated into the NCTC’s ongoing research projects by reviewing and contributing to research grant applications, providing statistical analysis for existing projects, and writing manuscripts on subjects such as prognostic modeling of severe TBI and the impact of media on chronic traumatic encephalopathy research. Dr. Eagle has had three first-author abstracts accepted as presentations at the 2022 annual meetings for the National Neurotrauma Society, International Neurotrauma Symposium, and Military Health System Research Symposium.

**Matt El-Kadi, MD, PhD**

*Clinical Professor<br>Vice Chair<br>Chief, Neurosurgery, UPMC Passavant<br>Director, UPMC Passavant Spine Center*

Matt El-Kadi, MD, PhD, FACS, joined the Department of Neurological Surgery as a clinical assistant professor in September of 1999. He became clinical associate professor in January 2003 and clinical professor in June 2006. He became vice chairman of the Department of Neurological Surgery in 2010 and has been chief of neurosurgery at UPMC Passavant since 2005. Dr. El-Kadi is also director of the UPMC Passavant Spine Center and is a member of the Tri-State Neurosurgical Associates. Dr. El-Kadi is board-certified in neurological surgery and has been nominated as one of Pittsburgh’s best doctors in the region since 2012 and as one of the best doctors in America by Castle Connely 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 outcome.

**Specialized Areas of Interest**

Minimally invasive spine surgery; complex spine disorders; spinal stabilization; spinal tumors.
Board Certifications
American Board of Neurological Surgeons

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

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

Professional Activities
Board of Directors, UPMC Passavant and St. Margaret
Board of Directors, Passavant Foundation

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
Pittsburgh’s Best Doctors, Pittsburgh Magazine, 2021-22
Marquis Who’s Who in America, 2019-20
Castle Connelly Top Doctors, 2009-2020
UPMC Passavant Legacy of Caring Award, 20014
UPMC Champion of Nursing Award, 2011

Salem El-Zuway, MD
Clinical Assistant Professor

Salem El-Zuway, MD, FRCSC, FAANS, FACS, is a board-certified neurosurgeon by the Royal College of Physicians and Surgeons of Canada. He received his medical degree from the University of Garyounis in Libya and completed his neurosurgery residency training at McMaster University in Canada followed by a neuro spine fellowship at Hamilton Health Sciences, Canada, with additional year of complex spine/trauma fellowship at Sunnybrook Hospital at University of Toronto. Before joining UPMC, Dr. El-Zuway attended at St. Michael’s hospital in Toronto and completed a three-year term of clinical associateship in neuro trauma,
open cerebrovascular surgery and skull base surgery with the renown doctors R. Loch MacDonald, MD, PhD and Michael Cusimano, MD, PhD. Dr. El-Zuway has a wide scope of neurosurgery training experience managing complex cranial and spinal conditions. He is also involved in clinical research with interest focused in cranial neurotrauma and spine focusing on cervical spondylotic myelopathy. He is also interested in advancement of medical education and medical student teaching programs including problem-based medicine.

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

**Board Certifications**
Royal College of Physicians and Surgeons of Canada

**Hospital Privileges**
UPMC Hamot

**Professional Organization Membership**
American Association of Neurological Surgeons
College of Physicians and Surgeons of Ontario
Congress of Neurological Surgeons
Ontario Medical Association
Pennsylvania State Board of Medicine
Royal College of Physicians & Surgeons of Canada

**Education & Training**
MD, Garyounis University, 2000
Residency, Hamilton Health Sciences, McMaster University, 2006-12
Fellowship, neurospine, Hamilton Health Sciences, McMaster University, 2012-13
Fellowship, complex spine/trauma, Sunnybrook Hospital, University of Toronto, 2013-14
Clinical Associate, St. Michael’s Hospital, Toronto, 2014-17

**Honors & Awards**
Surgical Foundations Research Award, third rank, McMaster University, 2008
The Libyan National Assembly of High Achievers and Talent Award, 2001
Undergraduate Academic Excellence Award, University of Benghazi, 2000

**Chikezie I. Eseonu, MD, FAANS**
*Clinical Assistant Professor*

Chikezie Eseonu, MD, is a clinical assistant professor at UPMC Central Pennsylvania. He received his undergraduate degree at Harvard University in biomedical engineering in 2007 and completed his medical education at Yale School of Medicine in 2011. Following medical school, Dr. Eseonu completed his neurosurgery residency at Johns Hopkins Hospital in Baltimore, Md., where he also completed an enfolded neuro-oncology/endoscopic/skull base fellowship. Dr. Eseonu’s clinical interests embrace several aspects of brain tumor treatment, including open surgical, minimally invasive or radiosurgical techniques. He is also involved in the treatment of trigeminal neuralgia, Chiari malformation, hydrocephalus, and other general neurosurgical conditions including degenerative spine, spinal stenosis, and disc herniation. Dr. Eseonu’s research has encompassed such areas as surgical technique and outcome studies for gliomas, pituitary adenomas, trigeminal neuralgia, and awake craniotomy.
Chikezie I. Eseonu, MD, FAANS

for brain tumors, as well as cost efficacy studies in neurosurgery. He has published over 30 peer reviewed papers and book chapters. He is licensed to practice in Pennsylvania, and is a member of the American Association of Neurological Surgeons, the Congress of Neurological Surgeons, and the Facial Pain Association.

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

**Board Certifications**
American Board of Neurological Surgery

**Hospital Privileges**
UPMC Central Pennsylvania

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

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

**Publications 2021-22**
- Refereed Articles:

**Research Activities**
Dr. Eseonu is currently involved in grant-supported research evaluating the utility of intraoperative MRI diffusion tractography with brain tumor surgery.

**Robert M. Friedlander, MD**
*Chair, Walter E. Dandy Distinguished Professor*
*Head of Cerebrovascular Neurosurgery*
*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-chairman of neurosurgery, associate director of cerebrovascular surgery and co-director of the Neuroscience Research Center at the Brigham and Women’s Hospital in Boston. Dr. Friedlander has received 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. He directs a busy and prolific laboratory. 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.

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 Mercy
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
Co-director, UPMC Neurological Institute
Society of Neurological Surgeons:
   Director, RIJNN Course
   Research Committee
NINDS National Advisory Council:
   Clinical Trials Subcommittee
   Fellowships and Training Subcommittee
   Basic Science Subcommittee
American Association of Neurological Surgeons:
   Annual Meeting Committee
   Research Committee
American Academy of Neurological Surgery:
   Chair, Scientific Program Committee
   Chair, AANS/CNS Joint Cerebrovascular Section
Host, Fridays with Friedlander weekly webcast, neurosurgery.pitt.edu

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

Honors & Awards
Distinguished Professor, University of Pittsburgh, 2022
Distinguished Chancellor University of Pittsburgh Research Award, 2021
Pittsburgh’s Best Doctors, Pittsburgh Magazine, 2012-22
National Academy of Medicine induction, 2019
Honored Guest, US Ambassador, Belgrade, Serbia, 2013
America’s Top Surgeons, 2013
Castle Connolly Top Doctor in the Field of Neurological Surgery, 2013
H. Richard Winn Prize for Neurosurgical Research, 2012
Charcot Young Investigator Prize, Motor Neuron Disease Association, 2002
Bayer Cerebrovascular Award, Joint Section of Cerebrovascular Surgery, 2002
Neurosurgery Resident Award, Congress of Neurological Surgeons, 2001
Fellowship Award, American Brain Tumor Association, 1996-97
Neurosurgical Resident Research Award, AANS/CNS Joint Section on Cerebrovascular Surgery, 1994
Phi Beta Kappa, Brandeis University, 1987
Nathan and Bertha Richter Award for Excellence in Research, Brandeis University, 1986

**Media Appearances: 2021-22**

“Outdoors With The Morgans Visits Dr. Friedlander,” outdoorswiththemorgans.com, February 2, 2022.


**Publications: 2021-22**

- **Refereed Articles:**
Research Activities

The focus of Dr. Friedlander’s research is the study of the basic mechanisms of apoptosis, as mediated by the caspase apoptotic family in neurological diseases. In addition, discovering novel approaches to ameliorate the impact of cell death in a variety of neurological diseases is a central theme of his Neuroapoptosis Laboratory.

• Dr. Friedlander is evaluating the impact apoptotic cell death, and, in particular, that mediated by the caspase cell death family on the pathogenesis of neurodegenerative diseases. Neurodegenerative diseases presently being investigated are Amyotrophic Lateral Sclerosis (ALS) as well as Huntington’s Disease (HD). Activation of the caspase cell death cascade appears to play an important role in a variety of neurodegenerative diseases. Dr. Friedlander has demonstrated that inhibition of the Caspase-1 (also known as ICE) apoptotic protein slows the progression and delays mortality in transgenic mouse models of ALS and Huntington’s disease. Furthermore, delivering caspase inhibitors directly into the brain of these transgenic mice prolongs their survival. This was the first time that any intervention had been demonstrated efficacious in an ALS or HD model. Adding relevancy to these findings, he has demonstrated that caspase-1 is activated in the brain and spinal cord of humans with HD and ALS respectively. Dr. Friedlander has also demonstrated that Minocycline demonstrates neuroprotection in a mouse model of HD.

• Apoptotic cell death plays a significant role in stroke as well as traumatic brain and spinal cord injury. Dr. Friedlander is evaluating the impact caspase activation has on apoptotic cell death in these conditions. The relation of the caspase family and free radical production is also being investigated. Targeted caspase-mediated pharmacoprotection is also being investigated.

• Using in vitro models, Dr. Friedlander is evaluating both the mechanisms involved in the activation of ICE, as well as the post-ICE activation pathways involved cell death. The role of Interleukin-1 in apoptosis continues to be a focus of research. He is continuing to evaluate the basic mechanisms of cell death, and especially as they relate to neurologic diseases.

Paul A. Gardner, MD

Peter J. Jannetta Professor
Executive Vice Chair, Surgical Services
Neurosurgical Director, Center for Cranial Base Surgery
Director, Surgical Neuroanatomy Lab

Paul A. Gardner, MD, joined the faculty at the University of Pittsburgh Department of Neurological Surgery in 2008 after completing his residency and fellowship training at the University of Pittsburgh. He completed his undergraduate studies at Florida State University, majoring in biochemistry, and received his medical degree from the University of Pittsburgh School of Medicine. Dr. Gardner completed a two-year fellowship in endoscopic endonasal pituitary and endoscopic and open skull base surgery. His research has focused on evaluating patient outcomes following these surgeries and more recently on genomic and molecular analysis of 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, 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. Dr. Gardner is an author on over 300 peer-reviewed articles.

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

**Board Certifications**
American Board of Neurological Surgeons

**Hospital Privileges**
UPMC Children’s Hospital of Pittsburgh
UPMC Mercy
UPMC Presbyterian
UPMC Select Specialty
VA Pittsburgh Healthcare System

**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
CNS Foundation Liaison, AANS/CNS Tumor Section
Course Co-Director, Comprehensive Endoscopic Endonasal Course, UPMC
Course Co-Director, Complex Endoscopic Endonasal Course, UPMC
Member, Medical Advisory Board, Chordoma Foundation

**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

**Honors & Awards**
Pittsburgh’s Best Doctors, *Pittsburgh Magazine*, 2012-22

**Media Appearances**
Publications 2021-22

• Refereed Articles:


**Books:**

**Published Abstracts:**


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

**Board Certifications**
American Board of Neurological Surgery

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

**Professional Organization Membership**
Allegheny County Medical Society
American Academy of Neurological Surgery
American Association of Neurological Surgeons
American 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
Peter C. Gerszten, MD, MPH

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  
Lecturer, Principles and Practice of Gamma Knife Radiosurgery, UPMC  
Course Lecturer, Spine Surgery Anatomy Course, University of Pittsburgh School of Medicine  
UPMC Presbyterian Physician Unit Partner Program Leader, Unit 6D  
UPMC Presbyterian/Shadyside Hospitals Quality and Safety Committee Clinical Leader  
UPMC Presbyterian/Shadyside Hospitals Quality and Safety Leadership Committee  
University of Pittsburgh Rehabilitation Neural Engineer Laboratories  
Scientific Program Committee, 15th Annual Meeting of the International, Stereotactic  
Radiosurgery Society, Milan, Italy, June 19-24, 2022

**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**
Pittsburgh’s Best Doctors, Pittsburgh Magazine, 2016-22  
Winner, University of Pittsburgh Innovation Institute Michael G. Wells Student Healthcare,  
Competition 2021, “Spinal cord stimulation for the restoration of movement in chronic stroke”

**Publications: 2021-22**
• Refereed Articles:
Perez JL, Ozpinar A, Agarwal N, Hacker E, Alan N, Gerszten PC. Safety and efficacy of  
balloon kyphoplasty for vertebral fractures with posterior wall disruption. Int J Spine Surg  

Nwachuku E, Njoku-Austin C, Patel KP, Anthony AW, Mittal A, Hamilton DK, Kanter A,  
Gerszten PC, Okonkwo D. Isolated traumatic occipital condyle fractures: Is external cervical  

Luy DD, Tonetti D, Gerszten PC. The need for a broad differential: intramedullary neurosarco-

Nikoobakht M, Pourmanhmoudian M, Gerszten PC, Pourmahmoudian M. Global sagittal  
angle and spinopelvic sagittal alignment: A step toward investigation of sagittal plane de-
**Book Chapters:**


**Research Activities**

Dr. Gerszten has a research interest in spinal neuromodulation. His work explores the role of spinal cord electrical stimulation for an expanding variety of indications. His previous work documented the potential use of radiosurgery for spinal neuromodulation, and his current research expands on this work in larger animal models. Dr. Gerszten collaborates with members of the University of Pittsburgh Rehabilitation Neural Engineering Laboratories and the Neurosciences Institute of Carnegie Mellon University to conduct 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. 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. The team is expanding our indications to several neurodegenerative disorders including Spinal Muscular Atrophy (SMA).

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 of 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.

Finally, this year Dr. Gerszten has collaborated with other members of the department to develop and evaluate an Augmented Reality (AR)-Based Surgical Guidance System. We hypothesize that headset-based AR platforms will be superior to current surgical techniques and image-guidance technologies in terms of accuracy, operative time, and use of radiation with fewer complications. Operative and procedural efficiency will be increased using Augmented Reality in comparison to standard surgical approaches.
Avniel Singh Ghuman, PhD
Associate Professor
Director, Cognitive Neurodynamics Lab

Avniel Singh Ghuman, PhD, joined the Department of Neurological Surgery in September of 2011. Dr. Ghuman received his undergraduate education in math and physics at The Johns Hopkins University. He completed his doctoral education in biophysics at Harvard University. He completed his postdoctoral training at the National Institute of Mental Health prior to joining the faculty at the University of Pittsburgh. As director of MEG (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. 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
**Publications: 2021-22**

- **Refereed Articles:**


**Research Activities**

Over the past year, Dr. Ghuman’s lab has made a number of new and ongoing discoveries. Using intracranial recordings in epilepsy patients and MEG in Parkinson’s patients, the lab has illuminated how brain networks behave during real world behavior, how deep brain stimulation modulates cortical brain networks, and described a novel model regarding how the brain processes written words.

The mechanism of action of deep brain stimulation (DBS) to the basal ganglia for Parkinson’s disease remains unclear. Studies have shown that DBS decreases pathological beta hypersynchrony between the basal ganglia and motor cortex. However, little is known about DBS’s effects on long range corticocortical synchronization. Here, Dr. Ghuman uses machine learning combined with graph theory to compare resting-state cortical connectivity between the off and on-stimulation states and to healthy controls. He found that turning DBS on increased high beta and gamma band synchrony (26 to 50 Hz) in a cortical circuit spanning the motor, occipitoparietal, middle temporal, and prefrontal cortices. The synchrony in this network was greater in DBS on relative to both DBS off and controls, with no significant difference between DBS off and controls. Turning DBS on also increased network efficiency and strength and subnetwork modularity relative to both DBS off and controls in the beta and gamma band. Thus, unlike DBS’s subcortical normalization of pathological basal ganglia activity, it introduces greater synchrony relative to healthy controls in cortical circuitry that includes both motor and non-motor systems. This increased high beta/gamma synchronization may reflect compensatory mechanisms related to DBS’s clinical benefits, as well as undesirable non-motor side effects.

During the course of a day, our brains must accomplish a wide range of tasks and demonstrate a remarkable amount of flexibility despite their anatomic stability. How do ecologically valid brain states balance the tension between these demands of flexibility and stability? To answer this question, Dr. Ghuman explored how the human functional connectome changes using continuous intracranial electroencephalography recordings in six epilepsy patients while they went about their day: eating, talking with visitors, reading, etc. over the course of a week. By tracking how the coherence between all pairs of the 100-120 electrodes implanted in each patient changes over each five second time window over the course of the entire week, he was able to use unsupervised autoregressive methods to identify the prevalent dynamic patterns of connectivity.

Two major patterns emerged. First, brain networks had a stable baseline state that the brain would consistently return to after individual subnetworks took excursions of various types throughout the day. This stable state was similar across all our subjects, consisting of elevated lower beta coherence and decreased theta and gamma coherence. His second finding was that there was a discrete set of probable ways to leave this baseline state. Different subnetworks of the brain were not activated or inactivated randomly to each other: they formed a specific set of patterns of which networks could be activated together over which frequencies. These patterns were well-preserved from day to day: if one network’s beta activation were linked to another network’s gamma inactivation in one day, the same would generally hold true in other days. Additionally, the length of the excursion (e.g. the autocorrelation of each dynamic pattern) was consistent from day-to-day.
These patterns show that, after perturbations, the brain’s functional networks are pulled to return within a stable baseline dynamic range, which may represent an optimal homeostatic state for the functional connectome. Excursions from this state occur frequently, presumably to accomplish tasks such as sleep or heightened activity, but the excursions are always marked by a return back to homeostasis. The day to day consistency of the largest excursions from homeostasis may indicate some underlying anatomic or energy limitation that forces departures from homeostasis to follow characteristic trajectories. Taken together, these results suggest a homeostasis-like mechanism by which the functional connectome achieves stability, while allowing for neurocognitive flexibility, through characteristic perturbations and return to this homeostatic state.

Scientists have long debated the nature of the visual networks that support humans’ unique ability to read. Reading is built upon visuo-linguistic transformations that map written words to their sounds and meanings. Independent of reading, computationally parallel visuo-linguistic transformations well-suited to perform operations necessary for word recognition underpin the perception of social-communication and visual object and face naming. A key node of the reading brain, the visual word form area (VWFA), lies where circuits that underpin visuo-linguistic transformations diverge from earlier visual processing in ventral occipitotemporal cortex. Dr. Ghuman proposes a model in which literacy leverages preexisting circuits that perform visuo-linguistic transformations well-suited to those required for fluent reading.

**Jorge A. González-Martínez, MD, PhD**

Professor  
UPMC Endowed Chair in Epilepsy Surgery  
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, FAANS, is a board-certified and world-renowned neurosurgeon subspecializing in epilepsy and functional neurosurgery. He is director of the University of Pittsburgh Department of Neurological Surgery Epilepsy & Movement Disorders Program, co-director of the UPMC Epilepsy Center, and director of the University of Pittsburgh Cortical Systems Laboratory. He currently holds the UPMC Endowed Chair in Epilepsy Surgery. Dr. González-Martínez is a medical pioneer in novel surgical methods for treating medically refractory seizures such as stereo-electroencephalography, SEEG guided laser ablative procedures, neuromodulatory interventions and robotic guided surgeries, bringing for the first time innovative surgical interventions to the United States and other countries. His particular field of interest and academic drive is related to neuro-electrophysiology, intracranial signal processing and behavioral neuroscience studies. Combined, the clinical and basic science efforts have been guiding his academic and clinical pathway for safer and more efficient methods for treating patients with severe seizures and abnormal movement disorders, promoting the improvement of symptoms, in combination with better functional and quality of life outcomes. Dr. González-Martínez has published more than 200 peer-reviewed articles and book chapters related to epilepsy surgery and methods of brain mapping for patients with medically intractable epilepsy and movement disorders. He has been a member of the American Society of Stereotactic and Functional Neurosurgery executive committee since 2013, and part of the American Epilepsy Society board of directors since 2022, developing high relevant projects and topics related to the field of functional neurosurgery and epilepsy. He is also a member of the American Association of Neurological Surgery, Congress of Neurological Surgery and American Epilepsy Society.
Specialized Areas of Interest
Adult and pediatric epilepsy surgery; movement disorder surgery; neuro-oncology; general neurosurgery.

Board Certifications
American Board of Neurological Surgeons

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

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

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

Honors & Awards
Pittsburgh’s Best Doctors, Pittsburgh Magazine, 2020-22
Legacy Award, Cleveland Epilepsy Association, 2017
Harvey Cushing Award, Congress of Neurological Surgeons, 2005
Preuss Award, National Brain Tumor Foundation, 2002

Publications: 2021-22
• Refereed Articles:


**Research Activities**

- **Establishing novel properties of dynamic systems models to identify epileptogenic networks in patients with drug resistant epilepsy**

The objectives of the proposed computational approaches and experiments are to 1) develop and validate a new EEG marker based on dynamical systems modeling, and 2) develop a method to guide periodic cortical stimulation to elicit seizures for EZ localization – which, if successful, have the potential to significantly reduce invasive monitoring times, avoiding further risks to patients and reducing costs.
• **Uncover motor cortical dynamics underlying grasp control**
The overall goal of the proposal is to uncover motor cortical dynamics underlying grasp control by performing bidirectional clinical trial in human subjects implanted with Utah array.

• **A Biomimetic Approach Towards a Dexterous Neuroprosthesis**
The loss of arm and hand function experienced by people with chronic cervical spinal cord injury limits independence and employment opportunities, increasing the extent, duration, and overall cost of care. A sensorimotor brain-computer interface can bypass the injured spinal cord to restore lost movement and sensation. Dr. González-Martínez will investigate the potential of biomimetic intracortical microstimulation for sensory restoration and motor decoding schemes that enable control over grasp kinematics and kinetics to restore dexterity for people with tetraplegia.

• **The Role of Basal Ganglia in Language and Motor Control**
The goal of this proposal is to explore the role of subcortical nodes in the basal ganglia-thalamocortical network and the cortex in coding various aspects of motor control through electrophysiological study of networks targeted during deep brain stimulation surgery.

• **NCS-FO: Collaborative Research - Human Decision-Making in Complex Environments**
The overall goal of the proposal is to understand the neural circuit involved in 1) representing relevant decision variables, 2) integrating these variables to form subjective values, and 3) selecting one of the options in multi-attribute decisions.

• **Thermocoagulation device for diagnosis and treatment of medically refractory epilepsy**
The overall reach for this proposal is to develop and evaluate a portable and user-friendly radio-frequency generator device, compatible with the current DIXI depth electrodes. Dr. González-Martínez will develop and evaluate the efficacy and safety of the device through a series of rigorous bench testing and clinical studies with the ultimate goal of enabling its clinical use to map seizures and to allow bedside, thermocoagulation-based, treatment.

• **Impact of cortico-spinal tract lesions on the regulation of sensory input for motor control**
In this project, Dr. González-Martínez will investigate whether the cortico-spinal tract regulates sensory feedback by performing or modulating presynaptic inhibition of the proprioceptive afferents and quantify the impact of a sub-cortical lesion of the internal capsule on these regulatory mechanisms in monkeys.

• **Exploring the expressive language function of the supplementary motor area**
This is a combined cross-sectional study in healthy controls and in epilepsy patients undergoing invasive neuromonitoring to explore and compare the roles of the supplementary motor area (SMA) and cingulate motor areas (CMA) in hierarchical language processing and speech production. It specifically tests mechanistic hypotheses regarding the role of the CMA and SMA in language production and may help elucidate why injury to the SMA creates a largely reversible aphasia. This project will provide superb training in cognitive neuropsychology, neurophysiology, and advanced neuroimaging as they pertain to language production as well as a substantial opportunity for professional development.

• **Cortico-Subcortical-Hippocampal Interactions Supporting Word Retrieval in Spoken Language Production**
We hypothesize that the hippocampal formation and the white matter fibers in the temporal/occipital regions are associated with language processing, in special in word retrieval. The program will explore this possibility by studying and correlating the intracranial signals acquired by the placement of depth electrodes for seizure’s localization.
Faculty Biographies

Jorge A. González-Martínez, MD, PhD

- **Deep brain stimulation of VOP to improve cortico-spinal control of muscles after stroke**
  We hypothesize that 1) VOP stimulation will increase excitability of the motor cortex; 2) this increased excitability will lead to potentiation of cortico-spinal tract (CST) motor outputs immediately after stroke; and 3) in awake animals with chronic lesions of the CST VOP stimulation will improve motor performances.

- **Imaging Focal Epilepsy Sources by Means of Biophysically Constrained Deep Neural Networks**
  A hypothesis driven program decisively tests the utilization of MEG and electrophysiological signals in the localization of epileptogenic zone in patients with medically intractable epilepsy.

- **Cortico-spinal gating of proprioceptive inputs in the primate spinal cord**
  New evidence in mice, shows that PAD facilitates transmission of action potentials in primary afferents suggesting that the brain uses PAD to enable proprioceptive input towards specific motoneurons thus controlling excitability on-demand e.g., axons controlling hand flexors will amplify PAD in flexors when needed while inhibiting PAD in extensors. This hypothesis requires experimental demonstration that cortico-spinal axons can selectively modulate PAD at distinct spinal locations to control flexor/extensor excitation.

Stephanie Greene, MD

**Professor**
**Vice Chair for Education**
**Director, Vascular Neurosurgery, UPMC Children’s Hospital of Pittsburgh**
**Director, Perinatal Neurosurgery, UPMC Children’s Hospital of Pittsburgh**
**Director, Pediatric Neurosurgery Fellowship**

Stephanie Greene, MD, is a nationally recognized expert in pediatric vascular neurosurgery and congenital neurosurgical disorders. She joined the faculty of the Department of Neurological Surgery in the pediatric neurosurgery division at UPMC Children’s Hospital of Pittsburgh in 2009. She was the director of pediatric neurosurgery at Hasbro Children’s Hospital, affiliated with Brown University, prior to accepting her position at UPMC Children’s Hospital of Pittsburgh. She is the director of vascular neurosurgery and perinatal neurosurgery at Children’s Hospital of Pittsburgh. Dr. Greene graduated from Dartmouth College in 1993 with a degree in biology and psychology, and a concentration in neuroscience. She earned her medical degree from Albany Medical College, and completed her neurosurgical residency at Harvard University in the Brigham & Women’s and Children’s Hospital of Boston program. Dr. Greene received additional subspecialty fellowship training pediatric neurosurgery through the University of Washington at Seattle Children’s Hospital in 2005. She is board certified in both adult and pediatric neurosurgery. She is a fellow of the American Association of Neurological Surgeons, and a member of the Congress of Neurological Surgeons and American Society of Pediatric Neurosurgeons.

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

**Board Certifications**
American Board of Neurological Surgery
American Board of Pediatric Neurological Surgery
Hospital Privileges
UPMC Children’s Hospital of Pittsburgh
UPMC Magee-Womens Hospital

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

Professional Activities
Editorial Board, Journal of Neurosurgery: Pediatrics
Resident Mentorship Program, American Association of Neurological Surgeons
Resident Mentorship Program, Women in Neurosurgery Resident Mentorship Program
CNS/AANS Joint Section on Pediatric Neurosurgery Executive Committee
Steering Committee, North American Fetal Treatment Network
Oral Board Guest Examiner, American Board of Neurological Surgeons
Coordinating Committee, National Spina Bifida Patient Registry

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

Honors & Awards
Pittsburgh’s Best Doctors, Pittsburgh Magazine, 2021-22
Castle Connolly Top Doctor, 2016-22
Marquis Who’s Who in the World, 2018-22
Marquis Who’s Who in America, 2018-22
Castle Connolly Exceptional Women in Medicine, 2017-22
American’s Most Honored Professionals (American Registry), 2017-22
Castle Connolly Regional Top Doctor, 2017-22
Castle Connolly Metro Area Top Doctor, 2016-22
Top Ten Doctor, Metro Area, City, and State (Vitals.com), 2013-22
Patients’ Choice 5-Year Honoree, 2013-22
America’s Most Compassionate Doctors, 2011-22
Patients’ Choice Award, 2008-22

Publications: 2021-22
• Refereed Articles:


**Research Activities**

Dr. Greene’s Moyamoya studies include one identifying a noninvasive, radiation-free method of quantifying vascular reserve and a patient’s risk of stroke, both pre- and postoperatively. Another study seeks to standardize the anesthetic management of these patients to minimize their perioperative stroke risk. Also, a large series of patients with cavernous malformations and Chiari I malformation are in preparation for publication. Finally, a fetal surgery study for isolated aqueductal stenosis is progressing toward humanitarian use. The shunt design has been patented and initial studies are nearly complete.

**Bradley Gross, MD**

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

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

**Specialized Areas of Interest**
Intracranial aneurysms; arteriovenous malformations; arteriovenous fistulas; cavernous malformations; brain tumors; carotid stenosis; 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, Associate Editor, *Stroke: Vascular and Interventional Neurology*

**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: 2021-22**

- *Refereed Articles:*
  


- Book Chapters:

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 clots. 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**

*Professor of Neurosurgery*

*Executive Vice Chair*

*Director, Center for Image-Guided Neurosurgery*

*Director, Brain Tumor Nanotechnology Laboratory*

*Co-Director, UPMC Brain Tumor Center, UPMC Hillman Cancer Center*

Costas G. Hadjipanayis, MD, PhD, is a board-certified neurosurgeon 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 with additional neurosurgical oncology training at the University of California, San Francisco. Dr. Hadjipanayis is executive vice chair for the University of Pittsburgh Department of Neurological Surgery and has succeeded L. Dade Lunsford, MD—his mentor—as director of the UPMC Center for Image-Guided Neurosurgery. He is also co-director of the newly formed UPMC Brain Tumor Center at the Hillman Cancer 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, foundation, and NIH-funded grants focused on brain tumors. He was recently recruited back to the University of Pittsburgh from the Icahn School of Medicine at Mount Sinai in New York City where he served as the chair 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, Dr. Hadjipanayis was the first to use 5-ALA (Gleolan) and 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 also led the development of a voice-controlled robotic-assisted exoscope for neurosurgery. He is an elected member of the American Academy of Neurological Surgeons and the Society of Neurological Surgeons (SNS). Dr. Hadjipanayis has been a tireless brain tumor advocate serving on the nonprofit boards of the Southeastern Brain Tumor Foundation (SBTF) and StacheStrong.
Costas G. Hadjipanayis, MD, PhD

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

**Board Certifications**
American Board of Neurological Surgery

**Hospital Privileges**
UPMC Presbyterian
UPMC Shadyside

**Professional Organization Membership**
American Academy of Neurological Surgeons
American Board of Neurological Surgery
American Association of Neurological Surgeons
Congress of Neurological Surgeons
Neurosurgery Research Education Fund
Society of Neuro-Oncology
Society of Neurological Surgeons

**Professional Activities**
Tumor Section Executive Committee, AANS/CNS

**Education & Training**
BA, Medical Scholar’s Program, University of Delaware, 1994
MD, Sydney Kimmel Jefferson Medical College, 1998
General Surgery, University of Pittsburgh School of Medicine, 1999
PhD, Biochemistry/Molecular Genetics, University of Pittsburgh, 2005
Gamma Knife Radiosurgery Fellowship, University of Pittsburgh 2004
Neurological Surgery Residency, University of Pittsburgh, 2006
Surgical Neuro-oncology Fellowship, University of California, San Francisco, 2006

**Honors & Awards**
Top Doctor for Neurosurgery, Castle Connolly, 2018-22
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
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

Publications: 2021-22

• Refereed Articles:


D. Kojo Hamilton, MD
Professor
Director, UPMC Neurosurgical Spine Services
Director, Residency Training Program
Co-Director, Spine Fellowship Program

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

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

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

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

Professional Organization Membership
American Association of Neurological Surgeons (AANS)
AANS/CNS Joint Section of Disorders of the Spine and Peripheral Nerves
AANS/CNS Joint Section of Neurotrauma and Critical Care
AOSpine North America (AOSNA)
International Spine Study Group
Scoliosis Research Society
D. Kojo Hamilton, MD

**Professional Activities**
IMAST Committee, Scoliosis Research Society
MOC/CME Committee, American Association of Neurological Surgeons
AANS/CNS Joint Section Spine and Peripheral Nerves:
  - Executive Committee
  - Scientific Program Committee
DSPN Drugs & Devices Committee
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**
Pittsburgh’s Best Doctors, *Pittsburgh Magazine*, 2016-22
Faculty Teaching Award, Department of Neurological Surgery, 2020
Distinguished Alumni, University of Virginia Summer Medical and Dental Education Program

**Publications: 2021-22**
- **Refereed Articles:**


- **Book Chapters:**

Research Activities

• A Post-Market, Prospective, Multi-Center, Nonrandomized Study To Assess Posterolateral Lumbar Fusions Using Fibergraft® BG Matrix

A prospective, non-randomized (single arm), multi-center, post-market clinical study designed to evaluate FIBERGRAFT® BG Matrix in participants with degenerative disc disease (DDD) with or without radiculopathy, or spinal stenosis and/or spondylolisthesis requiring a fusion. Enrolled participants undergo posterolateral fusion using FIBERGRAFT BG Matrix in combination with autograft and bone marrow aspirate. Participants are followed for two years with outcomes and imaging. Supported by Prosidyian, Inc. Dr. Hamilton is the principal investigator.

• A Prospective, Multicenter Study Evaluating the Safety and Performance of Interbody Implants for the Treatment of Patients with Degenerative Conditions of the Thoracic and/or Lumbar Spine

A prospective, uncontrolled, multicenter study to evaluate the safety and performance of select interbody implant devices in patients who undergo interbody fusion surgery for degenerative conditions in the lumbar spine. Enrolled participants at our site undergo interbody fusion surgery using the NuVasive Modulus TLIF implant. Participants are followed for two years with outcomes and imaging. Supported by Nuvasive, Inc. Dr. Hamilton is the principal investigator.

• Prediction of Postoperative Global Sagittal Alignment Using Musculoskeletal Modeling – Validation Study

This retrospective study looks to validate a novel method of predicting post-operative global sagittal alignment, including compensatory and reciprocal changes from pre-operative radiographic imaging. Participants are categorized into local fusions (1-2 segments), short fusions (3-4 segments), and long fusions (5+). Our site submits pre-operative and post-operative radiographs, surgical and complication information. Supported by Nuvasive, Inc. Dr. Hamilton is the principal investigator.

• Multi-Center Prospective Evaluation of Complex Adult Spinal Deformity Surgery (CADS)

A prospective, multi-center study to identify best practice guidelines for complex adult spinal deformity (ASD) patients, including radiographic and clinical outcomes, surgical and post-operative complications, risk factors for and revision surgery rates, and the role of standard work to improve patient outcomes and reduce surgical and postoperative complications. Enrolled participants are followed for 10 years with outcomes and imaging. Supported by International Spine Study Group Foundation (ISSGF). Dr. Hamilton is the principal investigator.

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

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

Publications: 2021-2022
- Refereed Articles:

Research Activities
Dr. Henry is involved in various projects aimed at understanding and improving outcomes across a range of conditions and diseases treated neurosurgically, including epilepsy, movement disorders, meningiomas, gliomas, and Chiari malformations. He is a collaborator on multiple grants as a co-investigator.
Baoli Hu, PhD
Assistant Professor
Director, Brain Tumor Evolution & Therapy Lab

Baoli Hu, PhD, joined the faculty of the University of Pittsburgh Department of Neurological Surgery at UPMC Children’s Hospital of Pittsburgh in July of 2017. 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 tumors evolution, including tumor progression and recurrence after the treatment; and developing new strategies for the treatment of these devastating diseases.

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

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

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

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

Professional Activities
Ad Hoc Reviewer, The Children’s Brain Tumor Network (CBTN)
Grant Reviewer, Dean’s Year-Off Fellowship Program, University of Pittsburgh

Honors and Awards
Richard King Mellon Scholar, UPMC Children’s Hospital of Pittsburgh, 2018
UPMC Competitive Medical Research Fund Award, 2018
B*CURED Brain Cancer Research Investigator Award, 2018
Caroline Ross Endowed Fellowship Award, MD Anderson Cancer Center, 2017
Publications: 2021-2022

• Refereed Articles:


• Published Abstracts:


**Research Activities**

Over the past year, Dr. Hu’s research efforts in the Brain Tumor Evolution Therapy Lab have mainly focused on the completion of two projects, which include 1) understanding molecule mechanisms of the immune-suppressive microenvironment, and 2) studying metastatic dissemination of medulloblastoma. The results of these projects have been generated for research grants application and paper publications. Specifically, one research proposal was funded by the National Institute of Health (NIH)/National Cancer Institute (NCI) R01 grant. The other proposal was funded by the NIH/The National Institute of Neurological Disorders and Stroke (NINDS) R21 grant. Furthermore, one manuscript was published in the *Journal of Clinical Investigation* and the other manuscript is under revision with *Nature Cell Biology*. The lab members have presented the results at the local and international conferences, such as the 11th Annual Children’s Hospital Research Symposium at UPMC Children’s Hospital of Pittsburgh and the International Symposium on Pediatric Neuro-Oncology (ISPNO). There were three undergraduate students and one medical student who have been mentored and trained. Furthermore, along with other faculty members in the Division of Pediatric Neurosurgery, the CHP brain tumor tissue bank continued to grow and expand.

**Esther Jane, PhD**

*Research Assistant Professor*

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

**Specialized Areas of Interest**

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

**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

**David L. Kaufmann, MD**

*Clinical Assistant Professor*

*Chief, Neurosurgery, UPMC Mercy*

David L. Kaufmann, MD, is clinical assistant professor of neurological surgery at the University of Pittsburgh School of Medicine and is chief of neurosurgery at UPMC Mercy. He maintains a general neurosurgery practice with an emphasis on treating degenerative disorders of the spine and traumatic injuries of the brain and spine. He also has an interest in complex spinal reconstructive surgery for conditions involving spinal deformity and brain tumors. Dr. Kaufmann received his medical degree from the Albert Einstein College of Medicine in New York City and completed a general surgery internship at the Johns Hopkins Hospital in
Faculty Biographies

David L. Kaufmann, MD

Baltimore. He performed his neurosurgical residency at Montefiore Medical Center and the Hyman-Newman Institute for Neurology and Neurosurgery at Beth Israel Medical Center in New York City. He is board certified in neurological surgery. Dr. Kaufmann is a member of the American Association of Neurological Surgeons, the Congress of Neurological Surgeons and the Pennsylvania Neurosurgical Society.

Specialized Areas of Interest
Spinal decompression and fusion surgery; complex spine surgery; brain and spine trauma; brain tumors; neurosurgical treatment of pain.

Board Certifications
American Board of Neurological Surgeons

Hospital Privileges
UPMC Mercy

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

Education & Training
BA, Philosophy, Emory University, 1989
MA Candidate, Columbia University, 1990
MD, Albert Einstein College of Medicine, 1994
Residency, Montefiore Medical Center, 2000
Residency, Beth Israel Medical Center, 2000

Robert Kellogg, MD
Assistant Professor

Robert Kellogg, MD, joined the Department of Neurological Surgery, as an assistant professor in September of 2020 specializing in pediatric neurosurgery. His clinical and research interests include the comprehensive management of spasticity and movement disorders, craniofacial surgery, hydrocephalus, tethered spinal cord, pediatric brain tumors, and Chiari malformations. Dr. Kellogg grew up in Connecticut but has deep ties to Pennsylvania. He is married and has two sons. Dr. Kellogg received his medical education from Indiana University School of Medicine and did his internship and residency training in neurological surgery at Rush University Medical Center in Chicago. Dr. Kellogg completed a pediatric neurosurgery fellowship at UPMC Children’s Hospital of Pittsburgh.

Specialized Areas of Interest
Spasticity and movement disorders; Cerebral palsy; back/spine pain; craniofacial/ craniosynostosis; plagiocephaly; pediatric brain tumors, hydrocephalus, Chiari malformations, tethered spinal cord.

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

Hospital Privileges
UPMC Children’s Hospital of Pittsburgh
UPMC Magee-Womens Hospital
Gary Kohanbash, PhD
Assistant Professor
Director, PNIO Laboratory

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

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

Professional Organization Membership
Society for Immunotherapy of Cancer
Society for Neuro-Oncology
World Molecular Imaging Society

Professional Activities
University of Pittsburgh:
  Faculty Assembly Member
  Senate Library Committee
  Senate Member
Scientific Committee Member, Childhood Brain Tumor Tissue Consortium
Study Section, St. Baldrick’s Foundation Fellowship
Study Section, American Brain Tumor Association

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

Publications: 2021-22
- Refereed Articles:

Gary Kohanbash, PhD
Research Activities

Dr. Kohanbash’s research focuses on developing and improving immune-therapeutic strategies for brain tumors. Significant progress over the past decade has started to bridge the gap between basic science and clinical care of tumors, with key advances now making translation of new cancer therapies more feasible.

One key focus area of Dr. Kohanbash’s work addresses the major challenges facing cancer therapy in the current inability to monitor and deplete tumor-associated myeloid cells. His work developed an immunoPET strategy using a radiolabeled antibody to quantify myeloid cells in CNS cancer. Building upon this, he recently showed that myeloid cells could be imaged and targeted to improve therapy for gliomas using a new chelator and labeling with two separate radionuclide-labeled antibodies. This work is complemented by ongoing studies in the lab developing and evaluating immunoPET strategies to quantify T-cell activation and cytotoxicity to allow for early detection of immunotherapy responsiveness in CNS tumors.

Another focus area of Dr. Kohanbash’s research includes the use of high-dimensional sequencing such as single cell RNAseq (scRNAseq) to identify rational immunotherapy combination strategies for adult and pediatric brain tumors and to better understand the complex immunobiology of brain tumors. Recently, he analyzed checkpoint inhibitor immunotherapy for brain tumors and, through scRNAseq, demonstrated that multiple myeloid cell subtypes express specific checkpoint receptors that he then validated in preclinical models.

In a separate study, Dr. Kohanbash performed bulk RNAseq on blood samples from immunotherapy treated oncology patients and revealed key biomarkers and molecular signatures of responders versus non-responders. A significant advancement in the field resulted from his prior work using scRNAseq to distinguish infiltrating macrophages from microglia in gliomas. Through ongoing collaborations he has demonstrated new and exciting phenotypes of proliferating glioma cells. His ongoing work includes using a single-cell RNAseq and single-cell TCR sequencing to develop both personalized and off-the-shelf T-cell receptor engineered T-cells (TCR-T) and adoptive cell therapy strategies for brain tumor patients.

Michael J. Lang, MD

Assistant Professor

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

Board Certifications
American Board of Neurological Surgery

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

Honors & Awards
Physician Excellence Award, UPMC, 2021

Daniela Leronni, PhD
Research Instructor

Daniela Leronni, PhD, has been a research instructor at the University of Pittsburgh Department of Neurological Surgery since January 2017. She earned her BS/MS in biological sciences with a thesis in molecular biology at the University of Bari, Italy, in 2007. She completed her doctorate in genetics and molecular evolution at the University of Bari, in 2011. Dr. Leronni’s early work as a PhD student and research assistant at the University of Bari from 2008 to 2011 focused on the functional characterization of genetics elements in the genome of model organisms with a low number of chromosomes, such as Drosophila Melanogaster (fruit fly) and Culex Quinquefasciatus (southern house mosquito). She studied the insulator activity of retrotransposons, genomic elements present in all organisms’ genome. The study of the genetics of regulatory elements was the basis for Dr. Leronni’s background in molecular biology and her interest in gene therapy. In 2009, Dr. Leronni was offered a fellowship as a visiting research student in the Department of Surgery at Harvard University. Here she contributed to the finding that demonstrates that mitochondria host segregated cAMP cascades with distinct functional and kinetic signatures. In this way, she began to investigate biological mechanism at a cellular level and applied her knowledge in molecular biology to carry on research in cellular biology. In 2012, Dr. Leronni joined the University of Pittsburgh via the Department of Microbiology and Molecular Genetics as a postdoctoral associate.
Daniela Leronni, PhD

Under the supervision of Joseph C. Glorioso III, PhD, she gained experience in the design and generation of gene therapy vectors that can be used to deliver multiple protective genes simultaneously to neurons, with the long-term goal of using these vectors as new approaches to neurological disease. In 2015, Dr. Leronni was recruited by Robert Friedlander, MD, as postdoctoral associate to develop novel approaches for gene therapy for Huntington’s disease (HD) and amyotrophic lateral sclerosis (ALS) and to study the basic mechanism of these diseases. One of the main objectives of her research is the creation of gene therapy vectors for HD, including, vectors targeting melatonin synthesis, which plays a protective role in the brain. Additionally, Dr. Leronni leads a research project investigating mitochondrial dysfunction in neurodegenerative disease and mitochondria signal transduction.

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

**Board Certifications**
Biologo Professionista, Italy

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

**Education & Training**
BS/MS, Biology/Molecular Genetics, Università degli Studi Aldo Moro, Bari, Italy, 2007
Research Scholar, Cell Signaling, Harvard Medical School, 2010
PhD, Genetics and Molecular Evolution, Università degli Studi Aldo Moro, Bari, Italy, 2011
Postdoctoral Fellowship, Molecular Genetics/Gene Therapy, University of Pittsburgh, 2014
Postdoctoral Fellowship, Neurodegenerative Diseases, University of Pittsburgh, 2016

L. Dade Lunsford, MD

*Lars Leksell Distinguished Professor*

*Director, Center for Image-Guided Neurosurgery*

L. Dade Lunsford, MD, is the Lars Leksell Professor and Distinguished Professor at the Department of Neurological Surgery at the University of Pittsburgh. He is also director of the Center for Image-Guided Neurosurgery at the University of Pittsburgh Medical Center and an internationally recognized authority on stereotactic surgery, radiosurgery, and minimally invasive surgery. In 1987, Dr. Lunsford was responsible for bringing the Gamma Knife to the University of Pittsburgh Medical Center, the first center in the United States to offer this state-of-the-art, minimally invasive form of brain surgery. Dr. Lunsford received his medical degree in 1974 from the Columbia University College of Physicians and Surgeons. He completed his internship in surgery at the University of Virginia Hospital and his residency in neurological surgery at the University of Pittsburgh training under Peter Jannetta. Following a one-year fellowship in stereotactic and functional neurosurgery at the Karolinska institute in Stockholm, Sweden—where he studied with professors Lars Leksell and Erik-Olof Backlund—he joined the Department of Neurological Surgery faculty in 1981. He is an active staff member of several UPMC hospitals and was president of the medical staff at UPMC Presbyterian from 1999-2001 and past president of the Council of Clinical Chairs for the University of Pittsburgh School of Medicine in 2001-2003. Dr. Lunsford chairs the UPMC Health System Technology and Innovative Practice (TIPAC) committee and co-chairs the UPMC Brain Mapping (MEG) Center. Dr. Lunsford has been board-certified by the American Board of Neurological Surgery since 1983. He is the author of more than 1,400 published articles, abstracts, and book chapters and has served as the editor or co-editor of 17 books
Dr. Lunsford served as department chairman 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 director from 1987 until 2020. Since 2012, he has served as a team physician (neurosurgeon) for the National Hockey League’s Pittsburgh Penguins. In 2016, Dr. Lunsford received the Cushing Award for Technical Excellence and Innovation in Neurosurgery from the American Association of Neurological Surgery. In December of 2017, he received the prestigious Herbert Olivecrona Award—known by some as the “Nobel Prize of Neurosurgery”—from the Karolinska Institute & Karolinska University Hospital in Stockholm, Sweden. In April of 2018, he was honored to present the 2018 Van Wagenen Lecture during the American Association of Neurological Surgeons Annual Meeting in New Orleans. On June 19, 2020, via live stream, he delivered the inaugural Dan Leksell Lecture at the 4th IRRF/ISRS Biennial Radiosurgery Research and Education meeting. 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. Since 2002 he has been a Castle Connolly Top Doctor and currently serves on their Board of Medical Advisors. In May 2022 Dr. Lunsford delivered the inaugural Lunsford Radiosurgery Lecture at the Miami Baptist Cancer Institute.

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

**Board Certifications**
American Board of Neurological Surgery

**Hospital Privileges**
UPMC Children’s Hospital of Pittsburgh
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)
North American Skull Base Society
Pennsylvania Medical Society
Pennsylvania Neurosurgical Society

**Professional Activities**
Course Co-Director, Principles and Practices of Gamma Knife Radiosurgery, UPMC
Past Chair and Founder, International Radiosurgery Research Foundation
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

Inaugural Lunsford Radiosurgery Lecture, Miami Baptist Cancer Institute, 2022
Pittsburgh’s Best Doctors, Pittsburgh Magazine, 2012-22
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
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
Guide to America’s Top Surgeons, 2006-09
Allegheny County Medical Society Ralph C. Wilde Award, 2008
Castle Connolly Medical Ltd. National Physician of the Year Award, 2008
Distinguished Professor, University of Pittsburgh, 2007
Who’s Who in Science and Engineering, 2007
Congress of Neurological Surgeons Honored Guest, 2007
AANS Young Neurosurgeon Award, 2005
Academic Keys Who’s Who in Medical Sciences Education, 2005
Lars Leksell Provost Lecture, 2000
International Stereotactic Radiosurgery Jacob Fabrikant Award, 1997
William S. McEllroy Award, University of Pittsburgh School of Medicine, 1997
Good Housekeeping, Best Doctors, 1996
William P. Van Wagenen Fellowship, AANS, 1980
Phi Beta Kappa - University of Virginia, 1970
BA with High Honors - University of Virginia, 1970

Publications 2021-22

• Refereed Articles:


- **Books:**

- **Book Chapters:**

**Research Activities**

Long-term clinical outcomes research based on data mining of a large patient data base of 17,000 patients who have had Gamma Knife stereotactic radiosurgery over a 35-year interval. Projects are related to vascular malformations, metastatic cancer, meningiomas, vestibular schwannomas, and skull base neoplasms. Peer reviewed publication productivity ranges from 20-30 per year.

**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 the World Wrestling Entertainment Corporation (WWE). Also in 2008, he was named senior vice president of the American Academy of Anti-Aging Medicine (A4M). Honored as one of America’s best neurosurgeons for 12 consecutive years he has written over 290 papers, 40 book chapters and five books. His most recent book, published in February of 2017 and re-released in December of 2018, is entitled \textit{Squaring 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 \textit{Fish Oil: The Natural Anti-Inflammatory}, published in 2006, and \textit{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 Jabbar—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.

\textbf{Board Certifications}

American Board of Neurological Surgery
**Professional Organization Membership**

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

**Professional Activities**

The Chuck Noll Foundation for Brain Injury Research:
- Medical Advisory Panel
  - Chairman, Scientific Committee
Team Neurosurgeon, Pittsburgh Steelers
- Medical Consultant, Viatris
- Medical Director, 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
- POP Advisor, Citron 33 Foundation
- NFL Alumni Association (NFLAA)
- Sanford Health and Biobank Scientific Committee

**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**

- Arthur C. Rettig Award for Academic Excellence in Research in Advancing the Health and Safety of NFL Players, NFL Physicians Society, 2022
- 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
- Pittsburgh’s Best Doctors, Pittsburgh Magazine, 2017-19
- 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, Pittsburgh, Pa., 2012
Distinguished Alumni Service Award, Indiana University, Bloomington, Ind., 2011
National Fitness Hall of Fame, 2010
Western Pennsylvania Chapter of the Sports Hall of Fame, 2009
Lou Holtz/Upper Ohio Valley Hall of Fame inductee, for excellence in athletics and medicine, June 1999

Media Appearances: 2021-22
“At age 82, Joseph Maroon credits oxygen therapy for his triathlon success,” Pittsburgh Post-Gazette, June 12, 2022.
“Steelers neurosurgeon Dr. Joseph Maroon recognized with research award,” TribLive, March 4, 2022.
“Dr. Joseph C. Maroon: Dr. Freddie Fu, visionary,” TribLive, September 29, 2021.

Publications: 2021-22
• Refereed Articles:
  Sreeramaneni PGA, Yalamanchi A, Konda MR, Cherukuri SHV, Maroon JC. A Proprietary Herbal Blend Containing Extracts of Punica granatum Fruit Rind and Theobroma cocoa Seeds Increases Serum Testosterone Level in Healthy Young Males: A Randomized, Double-Blind Placebo-Controlled Study. J Diet Suppl [Online ahead of print], 2022
Michael McDowell, MD

Assistant Professor

Michael McDowell, MD, joined the University of Pittsburgh Department of Neurological Surgery in July of 2022 after serving a fellowship at UPMC Children’s Hospital of Pittsburgh. He is a graduate of the University of Pittsburgh neurosurgery residency program and the Columbia University’s College of Physicians and Surgeons medical school. He completed skull base and pediatric neurosurgery fellowships at UPMC. He received undergraduate degrees in biochemistry and Latin dance from Arizona State University in 2005, graduating as valedictorian. Dr. McDowell has been heavily involved in teaching since medical school and was voted clinician of the year for his contributions to the Columbia Student Medical Outreach clinic in Washington Heights. He is the founder and director of the University of Pittsburgh School of Medicine’s mini-elective for second year medical students titled “Brain and Blade: The World of Neurosurgery.” As well as general pediatric neurosurgery, Dr. McDowell has specific interests in skull base and cranio-cervical junction disorders in children. His research interests also include non-invasive monitoring and he is actively collaborating with investigators at Carnegie Mellon University in a clinical investigation using near infrared light to measure intracranial pressure in adults and children.

Specialized Areas of Interest
Skull base and pituitary neurosurgery, Chiari malformation; pediatric neurosurgery; non-invasive intracranial pressure measurement; medical education.

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

Professional Organization Membership
Allegheny County Medical Society
Alpha Omega Alpha
American Association of Neurological Surgery
AANS Section on the History of Neurological Surgery
AANS Young Neurosurgeons Committee
AANS/CNS Joint Section on Pediatric Neurosurgery
Congress of Neurological Surgeons
Pennsylvania Medical Society House of Delegates
Radiosurgical Society
Scoliosis Research Society

Professional Activities
Chair, Trainee Subcommittee, AANS/CNS Pediatric Section

Education & Training
BS, Biochemistry, Arizona State University, 2009
MD, Columbia University College of Physicians and Surgeons, 2014
Fellowship, UPMC Skull Base Division, 2020
Residency, University of Pittsburgh, 2021
Fellowship, UPMC Children’s Hospital of Pittsburgh, 2022

Honors & Awards
Hydrocephalus Association Award, AANS/CNS Section on Pediatric Neurosurgery, 2021
University of Pittsburgh School of Medicine Faculty Teaching Award, 2021
Pennsylvania Neurological Society Oral Presentation Award, 2019
Copeland Grant Winner, Pittsburgh Foundation, 2015, 2019
Gold Medal, Top Gun Surgical Completion, Lumbar Pedicle Screw Placement, American Association of Neurological Surgeons, 2017
Charlie Kuntz Scholar, AANS/CNS Spine Summit, 2016
Christopher Getch Chair of Research, Brain Aneurysm Foundation, 2013

Publications: 2021-22
- Refereed Articles:

Research Activities
Dr. McDowell is actively leading a clinical investigation on the use of near infrared light as a method of measuring intracranial pressure non-invasively. Preliminary results in pediatric patients compared to intracranial pressure monitors have been promising, and a combined adult and pediatric investigation is underway. He is actively working with investigators at Carnegie Mellon University to develop an automated, portable model in the near future. He is also heavily invested in advancing and optimizing endoscopic skull base approaches for pediatric patients.

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 in 2004 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 in 2014 from the University of Delhi where he functionally characterized the rare and common variants of dopaminergic pathway genes associated with schizophrenia. He subsequently completed his postdoctoral training at the Arthur and Sonia Labatt Brain Tumor Research Centre at the Hospital for Sick Children in Toronto. While at SickKids, Dr. MichealRaj established patient derived disease models and unraveled the underlying disease mechanism, metabolic pathways that rewire the epigenetic landscape of lethal infantile ependymomas.
Specialized Areas of Interest
Functional genomics and metabolism of pediatric and adolescent central nervous system tumors.

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
MSc, Biotechnology, Loyola College, University of Madras
PhD, Genetics, University of Delhi
Postdoctoral Fellowship, Hospital for Sick Children, Toronto, Canada

Publications: 2021-22:
• Refereed Articles:

Research Activities
Dr. MichealRaj’s basic research laboratory is focused on exploring the underlying disease mechanism of pediatric brain tumors, with specific interest in pediatric cancer stem cell, brain tumor metabolism and epigenetics and post transcriptional and translational regulation.

His team is investigating three major themes: 1) functional cancer genomics of pediatric ependymomas and gliomas; 2) metabolic dependencies and epigenetic regulation in pediatric brain tumors; and 3) unraveling the crosstalk between cell signaling and epigenetics.

Dr. MichealRaj’s is using patient derived disease models (cell lines, xenografts) and transgenic mouse models and cutting edge next-generation genomic technologies (bulk and single cell sequencing, ChIP seq, long read sequencing), metabolomics (total and targeted), genetic engineering tools (Genome-wide and focused CRISPR screen) to advance our existing knowledge on pediatric brain tumors and probe novel therapeutic options.

Vincent J. Miele, MD
Clinical Associate Professor

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. Dr. Miele also has a strong background in cranial neurosurgery and treats peripheral nerve conditions such as carpal tunnel syndrome. Dr. Miele frequently evaluates and manages sports-related head and spine injuries, and works at a national level with athletes on return to play issues. He is involved in the development of devices used to detect and prevent concussion and is frequently invited to speak on this subject nationally. He also is an independent neurosurgical consultant for the National Football League and the Pittsburgh Steelers. He is licensed to practice in Pennsylvania, Ohio, and West Virginia and has established clinics in Coraopolis, Monroeville, Mt. Morris, Bethel Park, UPMC Mercy and Bridgeville in 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
Education & Training
MD, West Virginia University, 2001
Residency, West Virginia University, 2007
Fellowship, Complex Spine, Cleveland Clinic, 2008

Honors & Awards
Pittsburgh’s Best Doctors, Pittsburgh Magazine, 2016-20, 2022
Best Faculty Teaching, Department of Neurological Surgery, 2021

Publications: 2021-22
• Refereed Articles:

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

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

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

Board Certifications
American Board of Neurological Surgery

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

Professional Organization Membership
Allegheny County Medical Association
American Association of Neurological Surgeons (AANS)
American Medical Association
Carroll F. Reynolds History of Medicine Society
Pennsylvania Medical Association
Pennsylvania Neurosurgical Society
Section on Pain of the AANS/CNS
Ajay Niranjan, MD
Professor
Associate Director, Center for Image-Guided Neurosurgery
Director, Radiosurgery Research
Director, UPMC Brain Mapping Center

Dr. Niranjan received his medical training at the King George’s Medical College in Lucknow, India from 1980 to 1985, graduating with a bachelor of medicine and bachelor of surgery degree. Dr. Niranjan completed general surgery residency in 1989 and neurological surgery residency 1992. Dr. Niranjan joined the University of Pittsburgh as a fellow in image-guided neurosurgery in 1997 and completed his fellowship in 2000. He joined the faculty of neurological surgery in July of 2000. Dr. Niranjan has co-authored over 240 articles in refereed journals, over 170 book chapters and five books. His most recent book, Leksell Radiosurgery—presenting an update on state-of-the-art radiosurgery technology, including outcomes—was published in May of 2019. He has contributed guidelines for stereotactic radiosurgery for trigeminal neuralgia, pituitary adenomas, arteriovenous malformation, acoustic tumors, and brain metastases. Dr. Niranjan is the director of UPMC Brain Mapping Center which houses a magnetoencephalography unit. MEG is performed for pre-surgical mapping of critical brain functions in patients with brain tumors and for localization of seizure focus in patients with long standing epilepsy.

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

Hospital Privileges
UPMC Presbyterian

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

Professional Activities
Board Member, American Association of Neurological Surgeons
Board Member, American Society for Radiation Oncology (ASTRO)
Member, International Radiosurgery Research Foundation
Course Co-Director, Principles and Practices of Gamma Knife Radiosurgery, UPMC
Ajay Niranjan, MD

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

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

**Publications: 2021-22**

- Refereed Articles:


Research Activities
Dr. Niranjan’s major research interest is the analysis of clinical outcomes of Gamma Knife radiosurgery for tumors, vascular malformations, and functional disorders of brain. Dr. Niranjan’s other research interests include the development of pre-surgical brain mapping using magnetoencephalography (MEG), and the development of strategies to enhance the effect of radiosurgery on brain tumors. His laboratory has studied the radiobiological effects of radiation on brain-tumor microenvironment and has evaluated the effects of radiation on neural stem cells implantation in the brain. Dr. Niranjan serves as principal investigator on the project: “Thalamic Segmentation using Advanced MR Imaging Techniques.”

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

David Okonkwo, MD, PhD, is professor of neurological surgery and director of the Neurotrauma Clinical Trials Center at the University of Pittsburgh. He is also director of neurotrauma and the scoliosis and spinal deformity program at UPMC Presbyterian. Dr. Okonkwo is past chair of the AANS/CNS Section on Neurotrauma and Critical Care. In addition, Dr. Okonkwo is team neurosurgeon for the Pittsburgh Steelers. Dr. Okonkwo completed his undergraduate work at the University of Virginia, where he was a Howard Hughes Undergraduate Biomedical Research Scholar. He completed his medical and doctoral education through the MD/PhD program of the Medical College of Virginia of Commonwealth University. He joined the University of Pittsburgh Department of Neurological Surgery in 2006 following completion of neurosurgical residency at the University of Virginia and a fellowship at Auckland Public Hospital in Auckland, New Zealand. He has additional specialized training in scoliosis surgery. Dr. Okonkwo’s clinical interests are traumatic injuries to the brain and spine as well as scoliosis and spinal deformity. His research endeavors involve developing biomarkers, advanced neuroimaging modalities and novel therapeutic interventions for brain and spinal cord injury. Dr. Okonkwo is a principal investigator of a national clinical research network (TRACK-TBI) to advance our understanding and treatment of traumatic brain injury. He is also principal investigator of several ongoing clinical
David O. Okonkwo, MD, PhD

studies in neurotrauma in Pittsburgh. Dr. Okonkwo has published more than 350 papers in refereed journals, authored numerous book chapters, and garnered several awards for his scientific research. He is a member of the American Association of Neurological Surgeons, the Congress of Neurological Surgeons and the National and International Neurotrauma Societies.

**Specialized Areas of Interest**
Sports medicine; brain and spine trauma; scoliosis; spinal deformity; minimally invasive spine surgery; 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**

**Media Appearances**
"Machine learning model quickly and accurately predicts outcomes for TBI patients," *Health Imaging*, April 26, 2022
"Following congenital fusion in his spine, Justyn Ross looks to make NFL history," *ESPN.com*, April 11, 2022.


“Fearless and faithful, Clemson’s Justyn Ross is ready to make the most of his second chance,” cbssports.com, August 26, 2021.

**Publications: 2021-22**

*Refereed Articles:*


- **Book Chapters:**

- **Research Activities**

  - **Transforming Research and Clinical Knowledge in Traumatic Brain Injury (TRACK-TBI):** TRACK-TBI is an 18-site consortium that is rapidly changing the landscape for TBI care and research through more precise TBI diagnosis, prognosis, and treatment. Dr. Okonkwo is a Principal Investigator of the effort.

  - **Comprehensive Biomarker Panel for Trauma-Related Dementia: Mechanistic Links Among Axonal Injury, Neuroinflammation, and Neurodegeneration**

    A Department of Defense-funded study with a goal to establish a comprehensive neuro-imaging and biomarker panel of trauma-related dementia, so that the pathophysiologic mechanisms underlying persistent trauma-induced cognitive impairments may be better understood and targeted for therapy.

  - **Brain Oxygen Optimization in Severe Traumatic Brain Injury-Phase 3 (BOOST-3)**

    A major randomized prospective clinical trial for severe TBI patients. The first randomized controlled trial of brain tissue oxygen monitoring in severe TBI (BOOST-2) demonstrated improvement in brain physiology through multimodal neuromonitoring. BOOST-3 will determine if there is evidence of clinical efficacy of a treatment protocol based on PbtO2 monitoring compared to treatment based on ICP monitoring alone.

  - **Canadian American Spinal Cord Perfusion and Biomarker (CASPER) Study**

    An international collaboration to advance, diagnosis, treatment, prognosis and outcomes for traumatic spinal cord injuries.
Ian F. Pollack, MD
A. Leland Albright Distinguished Professor
Vice Chair, Academic Affairs
Chief, Pediatric Neurosurgery, UPMC Children’s Hospital of Pittsburgh
Co-Director, Neurosurgical Oncology
Professor of Clinical and Translational Science

Ian Pollack, MD, is chief of pediatric neurosurgery at UPMC Children’s Hospital of Pittsburgh, A. Leland Albright Professor of Neurosurgery at the University of Pittsburgh School of Medicine, and co-director of the Neurosurgical Oncology Program at the Hillman Cancer Institute. Prior to joining the faculty of the Department of Neurological Surgery at the University of Pittsburgh in 1992, he was awarded the 1991 Van Wagenen Traveling Fellowship, which afforded him a year of subspecialty training in the Department of Neurosurgery at the Hospital for Sick Children in Toronto, the Neuro-Oncology Laboratory of the University of Lausanne in Switzerland, and the Laboratory of Tumor Biology of the University of Uppsala in Sweden. Dr. Pollack graduated magna cum laude from Emory University in 1980, where he earned a BS degree in chemistry. He received his medical degree from the Johns Hopkins University School of Medicine in 1984, then completed a surgical internship and neurosurgical residency at the University of Pittsburgh School of Medicine. He also was a research fellow in neuropathology and neurobiology during some of that time. Dr. Pollack has published more than 395 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 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. He is currently chair of the American Board of Pediatric Neurosurgery and a director on the Accreditation Council for Pediatric Neurosurgery Fellowships.

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

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

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

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

Professional Activities
Pediatric Brain Tumor Consortium:
  Institutional PI
  Steering Committee
  Executive Committee
  Chair, Translational Biology Committee
Institutional PI, Hydrocephalus Clinical Research Network
Institutional PI, Synostosis Research Group
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

Honors & Awards
Pittsburgh's Best Doctors, Pittsburgh Magazine, 2012-22
Joan Venes Lectureship, University of Michigan, 2019
Albert Nelson Marquis Lifetime Achievement Award, Marquis Who's Who, 2018
Castle Connolly's America's Top Doctors, 2002-22
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
Publications: 2021-22

• Refereed Articles:


- Book Chapters:

- Published Abstracts:


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 NAD metabolic pathway as a key intermediate 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, such as QPRT and NMNAT2. Gene set enrichment analysis has demonstrated that these mediators hijack glycolytic signaling. 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 and RNA interference-based strategies for reversing resistance as well as metabolic manipulations that may provide novel approaches for promoting tumor cell killing. 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.

Dr. Pollack and his group have also continued their NIH-funded activities that focus on immunotherapy for pediatric brain tumors. They have applied RNA sequencing of peripheral blood mononuclear cells in their low-grade glioma cohort to characterize gene expression patterns associated with favorable response to vaccine therapy, and those associated with resistance to therapy. They are working to counteract the latter in preclinical therapeutic studies. Accrual continues on ongoing clinical trials for recurrent low-grade gliomas and ependymomas.
Daniel R. Premkumar, PhD
Research Assistant Professor

Prior to joining the faculty of the Department of Neurological Surgery at the University of Pittsburgh in 2008, Daniel R. Premkumar, PhD, was a senior scientist at a biotechnology company. He graduated from Madurai Kamaraj University in India where he earned his masters and doctorate degrees. Dr. Premkumar then completed his post-doctoral training at Case Western Reserve University in Cleveland. Dr. Premkumar has published more than 50 papers in refereed journals and has been awarded patents to characterize protein-protein interaction biosensors for cellular systems biology profiling. He is currently examining the efficacy of promising various receptor inhibitors, for inhibiting glioma proliferation in vitro, using genotypically diverse panel of malignant glioma cell lines to identify potential genotype-response associations.

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

Professional Organization Membership
American Association for Cancer Research
American Society of Pharmacology and Experimental Therapeutics

Education & Training
BS, Biology, Madura College, 1982
MS, Animal Sciences, Madurai University, 1984
PhD, Entomology, Madurai Kamaraji University, 1990

Publications: 2021-22
• Refereed Articles:

Research Activities
Glioblastomas are highly invasive primary tumors with poor prognosis despite current therapies. Individual targeted therapies have failed to offer long-term survival benefits, although combinations of rationally selected inhibitors may have significant therapeutic applicability for these tumors. Studies by Dr. Prekumar's group and others have also shown aberrant, constitutive activation of NF-kB and Akt as common features of malignant gliomas, supporting their functional role in contributing to apoptosis resistance and refractory growth despite cytotoxic chemotherapy, irradiation, and molecularly targeted therapies. This activation may in part reflect deletions of NF-kB inhibitor-α, a common alteration in malignant gliomas,
dysregulated stimulation by cell surface tyrosine kinases, such as EGFR and PDGFRα, which are amplified in molecular subsets of malignant gliomas, and mutations in PTEN and other molecular targets that drive Akt and NF-κB activation. Thus, new therapeutic approaches are urgently needed. Dr. Premkumar’s group has demonstrated that inhibition of important “survival nodes” may constitute a promising strategy to enhance the efficacy of conventional therapies, such as irradiation and cytotoxic chemotherapy, and potentiate the activity of agents targeted against growth signaling mediators.

Ava Puccio, RN, PhD
Associate Professor
Co-Director, Neurotrauma Clinical Trials Center

Ava M. Puccio, RN, PhD, is an associate professor in the department of neurological surgery and also co-director of the Neurotrauma Clinical Trials Center in collaboration with David O. Okonkwo, MD, PhD. Dr. Puccio received her bachelor of science degree in neuroscience in 1988 and bachelor degree in nursing in 1994, both from the University of Pittsburgh. In 1995, she joined the Department of Neurological Surgery as a nurse coordinator on the National Acute Brain Injury Study: Hypothermia (NABIS:H) study and also the coordinator for the Brain Trauma Research Center. Throughout her years of employment as a nurse coordinator, she pursued part-time advanced schooling to graduate with a master’s degree in nursing from the University of Pittsburgh in 2000 and as a university scholar (top 2% of class) from the University of Pittsburgh School of Nursing with a doctoral degree, emphasis in neuroscience in 2008. Her dissertation, “Effect of short periods of normobaric hyperoxia on local brain tissue oxygenation and cerebrospinal fluid oxidative stress markers in severe traumatic brain injury” was published in the Journal of Neurotrauma in 2009. Dr. Puccio was appointed assistant professor in the Department of Neurological Surgery at the University of Pittsburgh in 2010 and received her adjunct faculty position with The School of Nursing, Department of Acute/Tertiary Care in 2010 with collaborations with Yvette Conley, PhD and Richard Henker, RN, PhD.

Specialized Areas of Interest
Traumatic brain injury research

Board Certifications
RN License: Pennsylvania

Hospital Privileges
UPMC Mercy
UPMC Presbyterian

Professional Organization Membership
Eastern Nursing Research Society
National Neurotrauma Society
Neurocritical Care Society
Sigma Theta Tau International Nursing Honor Society
Society of Critical Care Medicine
Women in Neurotrauma Research (WINTR)

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

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
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

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

Rodwan K. Rajjoub, MD, joined UPMC Susquehanna in March of 2017 after 38 years in private practice. He served his residency at George Washington University and the National Institute of Health after receiving his medical degree and undergraduate degree from Damascus University in Syria. He is married, a father of five physicians and enjoys playing tennis in his spare time.

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

Board Certifications
American Board of Neurological Surgery, Diplomate

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

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

Education & Training
BA, (Physics, Chemistry, Biology), Damascus University, 1967
MD, Damascus University, 1972
Residency, George Washington University, 1979
Honors & Awards
Continuing Education Award, American Association of Neurological Surgeons, 2019

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

Michael J. Rutigliano, MD, MBA, was appointed to the University of Pittsburgh faculty in 1996. An active staff member of the University of Pittsburgh Medical Center, Dr. Rutigliano lives in Greensburg, Pa., and the primary focus of his clinical practice is in Westmoreland County at the hospitals of the Excela Health System through a cooperative venture between UPMC and Excela Health. His clinical interests include a wide range of neurosurgical diseases, focusing mostly in the areas of spinal and peripheral nerve disorders, and 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 is retired from the United States Army Reserve. He 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
Varun Shandal, MD
Clinical Assistant Professor

Varun Shandal, MD, joined the University of Pittsburgh Center of Clinical Neurophysiology in April of 2021. Dr. Shandal specializes in intraoperative neurophysiological monitoring of 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. Shandal completed his neurology residency at Lewis Katz School of Medicine at Temple University Hospital in Philadelphia. He completed his clinical neurophysiology fellowship at North Shore University Hospital in Manhasset, N.Y. and intraoperative neurophysiologic monitoring fellowship at UPMC Presbyterian in Pittsburgh. Prior to residency, he completed his internship training in internal medicine at Medstar Good Samaritan Hospital in Baltimore, Md. Dr. Shandal completed his medical school at All India Institute of Medical Sciences in New Delhi, India.

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

Board Certifications
American Board of Psychiatry and Neurology; Neurology
American Board of Psychiatry and Neurology; Clinical Neurophysiology

Hospital Privileges
Excela Health Hospital System
Indiana Regional Medical Center
Trinity Health System
UPMC Altoona
UPMC Bedford
UPMC Children’s Hospital of Pittsburgh
UPMC East
UPMC Hamot
UPMC Hamot Surgery Center
UPMC Horizon
UPMC McKeesport
UPMC Mercy
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
Education & Training
MBBS, All India Institute of Medical Sciences, New Delhi, India, 2008
Internship, Internal Medicine, Medstar Good Samaritan Hospital, Baltimore, 2013
Residency, Neurology, Temple University Hospital, Philadelphia, 2016
Fellowship, Clinical Neurophysiology, North Shore University Hospital, Manhasset, N.Y., 2017
Fellowship, Intraoperative Neurophysiological Monitoring, UPMC, Pittsburgh, 2021

Publications: 2021-22
• Refereed Articles:

Natalie Sandel Sherry, PsyD, ABPP-CN
Assistant Professor

Natalie Sherry, PsyD, ABPP-CN, is a board-certified clinical neuropsychologist in the Departments of Neurological Surgery, Neurology, and Hematology/Oncology. She completed her undergraduate degree at the University of Pittsburgh in neuroscience graduating summa cum laude. She also has a joint degree from Widener University including a doctorate in clinical psychology and a master’s in business administration. She completed internship rotations in the Department of Neurology at the Hospital of the University of Pennsylvania and the Department of Physical Medicine and Rehabilitation at Temple University Hospital. She completed a post-doctoral fellowship in clinical neuropsychology at the UPMC Sports Concussion Program. Dr. Sherry conducts neuropsychological testing for a variety of neurological, medical and psychological conditions and is actively involved in clinical research.

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
Pennsylvania Psychological Association

Education & Training
BS, Neuroscience, University of Pittsburgh, 2011
MA, Clinical Psychology, 2014
MBA, Widener University, 2016
PsyD, Widener University, 2018
Clinical Neuropsychology Fellowship, UPMC, 2018

Honors & Awards
Senior Researcher Award, American Academy of Child & Adolescent Psychiatry, 2019
Jeremy G. Stone, MD  
*Clinical Assistant Professor*  
*Medical Director, Stroke Research, UPMC Hamot*

Jeremy G. Stone, MD, is a board-eligible neurosurgeon with CAST-accredited subspecialty fellowship training in neuroendovascular surgery, completing both residency and fellowship at the University of Pittsburgh. He currently practices with Great Lakes Neurosurgery and Neurointervention at UPMC Hamot in Erie, Pa., serving as clinical assistant professor and medical director of stroke research. Dr. Stone enjoys general neurosurgery with clinical focus on open cerebrovascular, neuroendovascular, 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 (board eligible)

**Hospital Privileges**
UPMC Hamot  
UPMC Mercy  
UPMC Presbyterian

**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

**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  
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

• 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, and 3) clopidogrel + aspirin.

• Protection Against Emboli During Carotid Artery Stenting Using a 3-in-1 Delivery System Comprised of a Post-Dilation Balloon, inteRgrated 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 and bioinformatics. He has more than 460 publications.

Specialized Areas of Interest

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

Professional Organization Membership

American Institute for Medical and Biological Engineering
Institute of Electrical and Electronics Engineers

Education & Training

BS, Instrumentation/Industrial Automation, Shenyang Chemical Institute, 1982
MS, Electrical Engineering, University of Pittsburgh, 1986
PhD, Electrical Engineering, University of Pittsburgh, 1989
Postdoc, Neurological Surgery, University of Pittsburgh, 1991

Publications: 2021-22

• Refereed Articles:


**Research Activities**

- **A Leadless EEG Sensor**
  Non-Convulsive Seizures (NCS) and Non-Convulsive Status Epilepticus (NCSE) are critical neurophysiological conditions which do not have overt clinical signs. These conductions can be diagnosed only with EEG monitoring. Unfortunately, approximately 2% of the patients in the ICU undergo continuous EEG monitoring. Primary reasons for the underuse of this technology is due to the complexity in setting up EEG equipment in busy, human resource constrained ICU. Dr. Sun is developing a self-contained EEG sensor in the size of a U.S. quarter with no electrode leads. By simply pressing the EEG sensor against the unprepared scalp and twisting slightly, the device can grasp the skin firmly and start acquiring and transmitting EEG wirelessly to a bedside monitor, a smartphone, a tablet, or a Bluetooth enabled device within an ambulance. With these unique features, the aforementioned problem can be solved.

- **Losing Weight Electronically: An AI and Control Systems Approach**
  There is a strong and urgent need to find solutions for prediabetes which has a profound impact on American health. Although there is no cure for diabetes, prediabetes is reversible by 1) eating more healthfully, 2) losing weight, and 3) exercising more. To help people make these lifestyle changes, the National Institutes of Health developed the Diabetes Prevention Program (DPP). Participants in the lifestyle change groups undergo intensive training to eat less fat and fewer calories and increase exercise. The lifestyle change program has successfully prevented or delayed type 2 diabetes. However, the vigorous diet control program and the substantial time commitments have caused high dropouts. Dr. Sun’s multidisciplinary research team is investigating an electronic approach to lose weight. Three technologies are utilized: 1) wearable sensors and a stationary camera will acquire each participant’s diet and physical activity data passively and objectively; 2) AI algorithms will process these data to assess energy intake and expenditure automatically, significantly reducing the current manual procedural burdens on participants; And 3) a closed-loop feedback control system will regulate energy balance based on the information provided by the sensors and mathematical models. All the electronically obtained information will be provided weekly to both the DPP coach and participants who work collaboratively to achieve a personalized weight loss goal. At the end of Dr. Sun’s technological developments, a pilot study will be conducted to evaluate the feasibility of the proposed weight control system involving research participants who are both prediabetic and overweight.

**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. Dr. Sweiss 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 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.

**Hospital Privileges**
UPMC Williamsport

**Education & Training**
BS, Biology, Virginia Tech, 2006
MD, Northeast Ohio Medical University, 2013
Residency, George Washington University, 2020

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

Parthasarathy D. Thirumala, MD, joined the Center of Clinical Neurophysiology in June 2008. He specializes in intraoperative neurophysiological monitoring to adult and pediatric neurosurgical, orthopedic, ENT, vascular and interventional neuroradiology procedures. Dr. Thirumala completed his neurology residency and clinical neurophysiology fellowship training at the University of Pittsburgh Medical Center. He completed his internship in internal medicine training at Brookdale University Hospital and Medical Center in Brooklyn, N.Y. Prior to clinical training he completed his masters degree in biomedical engineering at the University of Illinois at Chicago. Dr. Thirumala completed his medical training in India at Stanley Medical College in Chennai, India. His clinical and research interests include intraoperative neurophysiological monitoring during expanded endonasal approach, functional cortical mapping during awake craniotomies, ICU EEG. He has published over 90 peer reviewed articles, book chapters, and invited articles in the journals including *JAMA, Neurology, Neurosurgery, Journal of Neurosurgery,* and *Journal of Clinical Neurophysiology.* He has given lectures both nationally and internationally on the value of intraoperative neurophysiological monitoring.

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

**Board Certifications**
American Board of Clinical Neurophysiology: Intraoperative Monitoring
American Board of Neuroimaging
American Board of Neurophysiologic Monitoring
American Board of Psychiatry and Neurology

**Hospital Privileges**
Jameson Hospital
Monongahela Valley Hospital
UPMC Children’s Hospital of Pittsburgh
UPMC Hamot
UPMC Horizon  
UPMC Magee-Womens Hospital  
UPMC Mercy  
UPMC Passavant  
UPMC Presbyterian  
UPMC St. Margaret  
UPMC Shadyside

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

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

Media Appearances

Publications 2021-22
• Refereed Articles:


**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. He was board-certified with the American Board of Neurological Surgery in 2000 and was recertified in 2010. Dr. Wecht specializes in the treatment of brain tumors and 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.

**Specialized Areas of Interest**

General neurosurgery; brain tumors; spinal and peripheral nerve microsurgery; chiari malformation.
Fang-Cheng Yeh, MD, PhD
Associate Professor
Director, High-Definition Fiber Tractography Lab

Fang-Cheng (Frank) Yeh, MD, PhD, joined the Department of Neurological Surgery in 2016 as a tenure-track assistant professor. Prior to joining the faculty at the University of Pittsburgh, Dr. Yeh received his MD degree from National Taiwan University and completed his PhD study in biomedical engineering at Carnegie Mellon University in 2014. Dr. Yeh is currently working on diffusion MRI and its role as image biomarkers for neurological and psychiatric disorders. His research focuses on novel applications of computational methods to brain connectome research, a challenging field with a lot of known unknowns and unsolved questions that require extensive technological development. He has developed several diffusion MRI methods and applied them to both clinical and translational studies. Dr. Yeh is known for his development of DSI Studio, an integrated platform for diffusion MRI analysis, fiber tracking, and 3D tractography visualization. In 2020 alone, DSI Studio facilitated more than 100 peer-reviewed publications. DSI Studio provides the core technique for “high accuracy fiber tracking,” which has been widely used by many research groups to investigate how major fiber pathways are affected by neurological and psychiatric diseases. In an open competition sponsored by the International Society for Magnetic Resonance in Medicine (ISMRM) in 2015, Dr. Yeh’s method achieved the highest valid connection score (92.49%, ID:03) among 96 different approaches submitted by a total of 20 groups from around the world.

Specialized Areas of Interest
Diffusion MRI, tractography, network analysis, medical image analysis, pathology informatics.
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 2021-2022:
• Refereed Articles:


**Research Activities**

- **Tractography Atlases for Human and Animal Brains**
  Population averaged tractography atlas created using human connectome project data. Dr. Yeh collaborates with Duke CIVM to build expert-vetted, tractography atlases of the brain connections using ultra-high-resolution diffusion MRI data.

  This was achieved by tractography to generate trajectories of representative white matter fascicles. The trajectories were clustered and labeled by a team of experienced neuroanatomists.

  This atlas of the structural connectome represents normative neuroanatomical organization of human brain white matter, complementary to traditional histologically-derived and voxel-based white matter atlases, allowing for better modeling and simulation of brain connectivity for future connectomic studies as well as clinical and educational applications.

- **Diagnosis of Brain Disorders using Differential Tractography**
  Differential tractography is another novel tractography modality invented in Dr. Yeh’s lab. It aims to explore individual brain connections to find neuronal change that leads to better clinical diagnosis or prognosis evaluation.

  Differential tractography uses a “tracking-the-differences” paradigm to track pathways with neuronal change in a patient. It can be applied to either longitudinal studies or cross-sectional studies. The approach boosts the sensitivity and specificity of the imaging findings through the fiber tracking algorithms.
Dr. Yeh is currently applying the technique to ALS patients, with an aim to achieve accurate early diagnosis.

**Georgios A. Zenonos, MD, FAANS**

Assistant Professor  
Associate Director, Center for Cranial Base Surgery  
Director, Cranial Nerve Disorders Program  
Director of Clinical Operations, UPMC Presbyterian

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

**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

**Professional Activities**
Director, Neurosurgery Preceptorship Program, University of Pittsburgh
Director, Integrated Life Sciences Neurosurgery and ENT Course, University of Pittsburgh School of Medicine
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, Skull Base and Cerebrovascular Neurosurgery, University of Miami, 2019

**Honors & Awards**
North American Skull Base Society Research Grant Award, 2022
Best Basic Science Abstract, NASBS meeting, 2021 (senior author)
Best Neurosurgical Fellow Teacher Award, University of Miami, 2019
First Place, North American Skull Base Society Jeopardy Knowledge Competition, 2018
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
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: 2021-22**
• Refereed Articles


• Book Chapters:


• Published Abstracts:


Faculty Biographies


Research Activities
Dr. Zenonos’ research interests include genetics of skull base tumors; surgical anatomy (refinement of skull base approaches, and surgical technique); skull base outcomes research; and high-definition fiber tractography.

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

Pascal O. Zinn, MD, PhD, joined the University of Pittsburgh Department of Neurological Surgery in 2019. He is an assistant 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 molecular biology laboratory, studying approaches in personalized tumor treatments and patient care. Dr. Zinn strongly believes in the individuality of every patient and is an expert in patient-tailored treatment approaches throughout the course of diagnosis (imaging/biopsy), possible surgical tumor removal/medical management, and follow-up. Dr. Zinn 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.

Specialized Areas of Interest
Neurosurgical oncology; brain, skull base, and spinal cord tumors; personalized precision care for brain and spinal tumor patients; laser ablation treatment for brain tumors.

Hospital Privileges
UPMC Hamot
UPMC Hillman Cancer Center
UPMC Magee-Womens Hospital
UPMC Mercy
UPMC Presbyterian
UPMC Shadyside

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

Professional Activities
NRG Oncology IDH Wildtype Glioma Expert Group
AANS and CNS Tumor Section:
  - Executive Committee
  - Young Neurosurgeons Co-Chair
Faculty Biographies

Pascal O. Zinn, MD, PhD

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
Natus Award, Congress of Neurological Surgeons, 2022
Faculty Teaching Award, University of Pittsburgh Department of Neurological Surgery, 2022
Kinjiro Iwata Award for excellence and leadership in residency training, Baylor College of Medicine, 2019
Caroline Ross Endowed Fellowship for outstanding achievements and dedication in the field of brain cancer research, MD Anderson Cancer Center, 2018
Rosenblum-Mahaley Clinical Research Award, Congress of Neurological Surgeons, 2018
Resident Award, Congress of Neurological Surgeons, 2018
Runner-Up Oral Platform Presentation Competition, Texas Association of Neurological Surgeons Annual Meeting, 2017
National Brain Tumor Society Mahaley Award, Congress of Neurological Surgeons, 2016
Kinjiro Iwata Academic Award, Baylor College of Medicine, 2016
Journal of Neuro-Oncology Award, Congress of Neurological Surgeons, 2015
William R. Cheek Award, Texas Children's Hospital, 2015
Best Oral Platform Presentation Award, American Society of Neuroradiology, 2015
Best Scientific Poster Award, American Society of Functional Neuroradiology, 2014
Kinjiro Iwata Academic Award, Baylor College of Medicine, 2013
Best Scientific Poster Award, American Society of Functional Neuroradiology, 2013
Travel Award, European Association of Neurological Surgeons, 2013
Best Oral Platform Presentation Award, American Society of Neuroradiology, 2012
Journal of Neuro-Oncology Award, Congress of Neurological Surgeons, 2012
The Thomas H. and Mayme P. Scott Fellowship in Cancer Research Award, 2012
Poster Award, MD Anderson Brain Tumor Center Retreat, 2011
First Prize, Clowes Visiting Professor Research Competition, Beth Israel Deaconess Medical Center, Harvard Medical School, 2010
Cold Spring Harbor Course on Brain Tumors Scholarship, American Brain Tumor Association, 2010
Swiss National Science Foundation two-year fellowship, Harvard Medical School, 2009
Socrates-Erasmus Scholarship, 2004
Acceptance to Swiss Army Special Forces: Honors in Marksmanship, Combat, Commando, and Fit Test, 2000

Media Appearances: 2021-22

Publications: 2021-22
• Refereed Articles
Faculty Biographies

Pascal O. Zinn, MD, PhD


Research Activities

The Molecular Tumor Biology and Personalized Precision Therapy Lab, under the direction of Dr. Zinn, focuses on patient-centered care for brain and spinal tumors. Every patient is unique and so is every tumor; therefore, a personalized precision approach is fundamental to the treatment of tumors.

Utilizing humanoid brain disease models, Dr. Zinn replicates the patient’s condition in the laboratory and thus studies how tumors form and how tumors can be treated using tumor genetics precision approaches.

David S. Zorub, MS, 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, Ark., where he received his primary education. Dr. Zorub received his undergraduate degree from Tulane University College of Arts and Sciences, graduating summa cum laude with a major in history. His subsequent education was at Tulane University School of Medicine where he received his medical degree.
David S. Zorub, MS, MD

Faculty Biographies

cum laude and a masters of science in neuroanatomy. Post-graduate education was at Duke University Medical Center where he completed his internship and residency in neurologic surgery. While at Duke he did a special postdoctoral fellowship for the Veteran’s Administration and did research at the Institute of Physiology in Pisa, Italy. Upon completion of training at Duke University Medical Center, Dr. Zorub came to the University of Pittsburgh and Presbyterian University Hospital where he served as director of residency education and director of stereotactic surgery. He subsequently relocated to Shadyside Hospital and Foundation in 1979 and has served as director of neurosurgery, and subsequently as chief of neurosurgery from 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 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 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

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Hussam Abou-Al-Shaar, MD
PGY-5 Resident

Hussam Abou-Al-Shaar, MD, received his medical degree from Alfaisal University College of Medicine in Riyadh, Saudi Arabia where he graduated summa cum laude, valedictorian and the top of his class. During medical school, Dr. Abou-Al-Shaar spent several years in the neurogenetics lab studying the genetics and novel therapeutic treatments for Parkinson’s disease patients. After graduating from medical school, Dr. Abou-Al-Shaar completed 10 months of post-doctoral research fellowship in the Department of Neurosurgery at the University of Utah and a year of neurosurgery internship at Hofstra Northwell School of Medicine in New York. Dr. Abou-Al-Shaar is an avid researcher with deep interest in skull base and cerebrovascular neurosurgery. To date, he has published over 130 peer-reviewed articles and 25 book chapters and has spoken at several national and international conferences, with over 70 oral and poster presentations. He is also the section editor on two published books, most recently the tumor section in *Neurosurgery Case Review: Questions and Answers*, published by Thieme Publishing in January of 2020. He also edited *The Surgical Handbook*, published by Thieme Publishing in July of 2020. Dr. Abou-Al-Shaar is actively involved in teaching medical students interested in neuroscience and neurosurgery. He was recently selected by the Congress of Neurological Surgeons to serve as the neurosurgery publications resident fellow and was also selected as a member of the Council of State Neurosurgical Societies. His hobbies outside of neurosurgery include soccer, tennis, and traveling.

**Specialized Areas of Interest**
Skull base, cerebrovascular neurosurgery, and stereotactic radiosurgery.

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

**Education & Training**
MD, Alfaisal University College of Medicine, 2017
Fellowship, University of Utah, 2018
Residency Internship, Hofstra Northwell School of Medicine, New York, 2019

**Honors & Awards**
Neurosurgery Publications resident fellow, Congress of Neurological Surgeons, 2022-23
Top Operative Technique Poster Award, Functional Section, Congress of Neurological Surgeons 2021 Annual Meeting, 2021.
Finalist, The Virginia Kaufman Pain Research Challenge, 2021
Best Resident Teacher Award, Department of Neurosurgery, Hofstra, 2018-19.
Summa Cum Laude and Valedictorian, Alfaisal University 2017
Academic Dean’s List Scholarship, Alfaisal, 2010-17
PORCHE award for the best student in surgical clerkship, 2013
Best Poster Presentation, Alfaisal University Annual Research Day Poster Competition, 2015 & 2016
Teacher of the year, Alfaisal University, 2012
Resident Biographies

Hussam Abou-Al-Shaar, MD

Publications: 2021-22

• Refereed Articles:


Resident Biographies


Resident Biographies

Hussam Abou-Al-Shaar, MD


Research Activities
Dr. Abou-Al-Shaar is looking at the outcomes of patients who underwent endoscopic endonasal surgery for pituitary adenomas, chordomas, among other pathologies. Additionally, he is investigating the role of combined transcranial and endoscopic endonasal approaches for various skull base lesions to determine their efficacy and limitation. Dr. Abou-Al-Shaar is investigating the role of a novel imaging tool in determining visual recovery and outcomes following endoscopic endonasal surgery for pituitary adenoma. He is also interested in studying the effects of hormonal medications of the growth of meningiomas as well as elucidating the role of gamma knife radiosurgery in the management of various skull base and cerebrovascular pathologies.

Prateek Agarwal, MD, MBA

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’s clinical neurosurgical research focuses 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 elected to serve on the Young Neurosurgeons Committee (YNC) in 2021 and was appointed as an early career member on the AANS Education Committee in May 2022. Previously, he 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.

Professional Organization Membership
Alpha Omega Alpha
American Association of Neurological Surgeons
American Medical Association
Congress of Neurological Surgeons
Prateek Agarwal, MD, MBA

**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**

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

**Publications: 2021-22**

- **Refereed Articles:**
  
  
  
  

**Ali Alattar, MD**

*PGY-4 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 weightlifting.

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

Hanna Algattas, MD
PGY-7 Resident

Hanna Algattas, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in June of 2016 after graduating from the University of Rochester School of Medicine. He previously graduated summa cum laude from Colgate University with a degree in cellular neuroscience with high honors at which time he also participated in research at the National Institute of Neurological Disorders and Stroke (NINDS). Dr. Algattas is currently involved in research regarding complex endoscopic endonasal skull base surgery, neuro-oncology, neurotrauma, and traumatic brain and spinal cord injury. His clinical interests overlap with those research interests and also include neurosurgery as it pertains to sports medicine. He is currently in the midst of completing an enfolded fellowship in complex open and endoscopic skull base surgery. In June of 2021, he was named the inaugural recipient of the Joseph C. Maroon Aequanimitas Award from the Department of Neurological Surgery for his compassion, empathy, and patient care skills. Dr. Algattas was born and raised in Syracuse, N.Y. Interests outside neurosurgery include spending time with his family, playing fetch with his dog—Zeus—weightlifting, squash, professional sports, and crossword puzzles.

Specialized Areas of Interest
Skull base neurosurgery; expanded endoscopic endonasal approaches; neuro-oncology; traumatic brain injury; spinal cord injury; sports medicine neurosurgery; degenerative spine disease.
Resident Biographies

Hanna Algattas, MD

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

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

Honors & Awards
Joseph C. Maroon Aequanimitas Award, University of Pittsburgh, 2021
Neuroscience Research Foundation/Heindl Foundation Research Grant, NRF, 2020
Young Neurosurgeons Forum Oral Presentation, AANS, 2015
Office of Medical Education Research Award, University of Rochester SOM, 2013
James M. Maury MD Endowed Scholarship, Colgate University, 2012
Elias J. Audi Scholarship, Colgate University, 2012
Charles A. Dana Scholar, Colgate University, 2012
Dr. Leo Speno Health Sciences Prize, Colgate University, 2012
William K. Edmonton Neuroscience Award, Colgate University, 2012

Publications: 2021-22
• Refereed Articles:


Sharath Anand, MD
PGY-2 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
Sharath Anand, MD

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

**Edward Andrews, MD**
*Chief Resident*

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

**Specialized Areas of Interest**
Neuro-oncologic neurosurgery; technology innovation in neurosurgery.

**Professional Organization Membership**
Alpha Omega Alpha
American Association of Neurological Surgeons
American Board of Neurological Surgery
American Medical Association
Congress of Neurological Surgeons
Resident Biographies

Edward Andrews, MD

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

Honors & Awards
e-Poster Award, Pediatric Neurosurgery, AANS Annual Meeting, 2018
Physician Champion of Nursing Award, University of Pittsburgh, 2018
William F. Keller Prize, Sidney Kimmel Medical College, 2016
Dean's List, University of Pennsylvania, 2006-09

Research Activities
Dr. Andrews' research interests include maturation and validation of surgical augmented reality applications as well as clinical outcomes in neuro-oncology.

Hansen Deng, MD
PGY-4 Resident

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

Specialized Areas of Interest
Neuro-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

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
ThinkFirst Injury Prevention Award, American Association of Neurological Surgeons, 2020
Best Clinical Research Award, Neurotrauma and Critical Care, Congress of Neurological Surgeons, 2020
Best Clinical Research Award, 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: 2021-2022

• Refereed Articles:


Andrew Faramand, MD
PGY-2 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 has published more than 50 peer-reviewed articles and book chapters and collaborated with world-renowned neurosurgeons and radiation oncologists through the International Radiosurgery Research Foundation. Dr. Faramand has presented his work at several national and international conferences. 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, 2004-2007

David T. Fernandes Cabral, MD
Chief Resident

David T. Fernandes Cabral, MD, received his medical degree from the José María Vargas School of Medicine at the Universidad Central de Venezuela in Caracas, Venezuela where he graduated at the top of his class. While in medical school, Dr. Fernandes was a teacher assistant in the Department of Anatomy and Neuroanatomy, as well as a research assistant in 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 leader-
Resident Biographies

David T. Fernandes Cabral, MD

Ricardo J. Fernández-de Thomas, MD

Ricardo J. Fernández-de Thomas joined the University of Pittsburgh Department of Neurological Surgery residency program in July of 2021. Having graduated magna cum laude from the University of Puerto Rico Río Piedras Campus with a bachelor’s degree in cellular and molecular biology, he completed his medical education at the University of Puerto Rico School of Medicine, where he also obtained his degree with magna cum laude distinction. Dr. Fernández-de Thomas became interested in neurosurgery early in his education, meeting...
Resident Biographies

Ricardo J. Fernández-de Thomas, MD

and identifying key mentors since the early college years. He was recognized as a student leader and researcher at both the University of Puerto Rico, Río Piedras Campus, and the School of Medicine, obtaining various basic science and clinical research awards and becoming an active member of different student organizations. After completing medical school in Puerto Rico, Dr. Fernández-de Thomas completed four years of neurosurgery residency, also at the University of Puerto Rico School of Medicine. Dr. Fernández-de Thomas is also involved in community outreach and service projects, having spent time volunteering in different health clinics in Puerto Rico and Central America. His dedication to academics, community, and education led to his election into the Alpha Omega Alpha Medical Honor Society. Dr. Fernández-de Thomas was born and raised in San Juan, Puerto Rico. Outside of medicine, Ricardo enjoys spending time with family and friends, practicing martial arts, playing baseball, softball, tennis, volleyball, weightlifting, and enjoying outdoor activities.

Specialized Areas of Interest
Complex spine/minimally invasive spine surgery, spine tumors, deformity, spine oncology; neuro-oncology; neurotrauma; education in neurosurgery.

Professional Organization Membership
Alpha Omega Alpha
American Association of Neurological Surgeons
Arnold P. Gold Humanism Honor Society
Congress of Neurological Surgeons
North American Spine Society
Pennsylvania Medical Society
Society for Minimally Invasive Spine Surgery

Education & Training
BS, Cellular and Molecular Biology University of Puerto Rico, Río Piedras Campus, 2013
MD, University of Puerto Rico, Medical Science Campus, School of Medicine, 2017
Residency, University of Puerto Rico, Medical Science Campus, School of Medicine, 2021

Honors & Awards
Pitt-UPMC Senior Resident and Fellow Leadership Academy, July 2022 - June 2023
Society for Minimally Invasive Spine Surgery (SMISS) Young Surgeon Grant & Educational Track Award, September - October 2021
Alpha Omega Alpha Chapter Member, University of Puerto Rico, 2021
Dr. Ramón Ruiz Arnau, Clinical Research Award, 2017
María T. Sáez Endowment Fund Medical Student Scholarship Award, 2017
University of Puerto Rico Alumni and Friends Abroad Scholarship Award, 2016
National Institutes of Health Research Initiative for Scientific Enhancement Program Fellow, 2011-13
Outstanding Image of the Month Confocal Microscopy Award, University of Puerto Rico, 2012
Dean’s List Award, University of Puerto Rico, 2009-13

Publications: 2021-22
• Refereed Articles:

**Resident Biographies**

**Ricardo J. Fernández-de Thomas, MD**


**Daryl P. Fields II, MD, PhD**

*PGY-5 Resident*

Daryl Pinion Fields II, MD, PhD, joined the University of Pittsburgh Department of Neurological Surgery in July of 2018. He completed his undergraduate degree at Saint John’s University (Collegeville, Minn.), and his medical degree, as well as research doctorate, at the University of Wisconsin, Madison. Prior to medical school, Dr. Fields held several leadership positions as a firefighter captain and medic. In addition, he spent several years as a neural rehab personal trainer managing clients with debilitating neuromuscular disorders, including stroke, brain trauma, multiple sclerosis and spinal cord injuries. This work led him to discover his leadership abilities, manual adeptness, and human interaction skills, thus spurring interest in using these aptitudes to serve society through a career in medicine. Further medical training and development of a scientific skill set through a PhD has refined his passion towards caring for patients afflicted with debilitating neural motor deficits. He has personally designed and led projects involving the full spectrum of medical science research including disease modeling to development of novel drug therapies. This has resulted in several national research awards, numerous publications and a drug therapy patent for treating breathing disorders. These personal experiences, along with a track record of scientific innovation, have made him uniquely positioned for his current career of personally treating and actively investigating novel treatment strategies for incurable neural disorders. In his free time Dr. Fields enjoys working out, cooking, and catching up with friends.

**Specialized Areas of Interest**

Spine, trauma and rehabilitation.

**Professional Organization Membership**

- American Academy of Neurological Surgeons
- American Academy of Neurology
- American Physiological Society
- Society for Neuroscience
- Pennsylvania Medical Society

**Education & Training**

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

**Honors & Awards**

- Charlie Kuntz Spine Scholar Award, 2021
- Chuck Noll Foundation Research Award, 2021
- Physician Champion for Nurses, UPMC Presbyterian, 2020
- Physician Champion for Nurses, UPMC Children’s Hospital of Pittsburgh, 2020
- Walter Copeland Spine Research Award, 2019
- Runnerup Presentation Award, Stuart Rowe Society Lectureship Day, 2018
- NIH MD/PhD F30 Fellowship, 2015-18
Top Ambulatory Medicine Project, University of Wisconsin, 2017
UNCF/Merck Graduate Fellowship, 2015-17
Bennett Hiner Top Neuroscience Medical Student Award, 2016
Top Neuroscience Presentation Award, University of Wisconsin, 2016
Top Biomedical Science Presentation Award, University of Wisconsin, 2016
Caroline Tum Suden Abstract Award, 2016
Society for Neuroscience Abstract Award, 2015
Daryl and Sharon Buss Abstract Award, University of Wisconsin, 2015
Neuromuscular Graduate Fellowship, University of Florida, 2015
Science/Medicine Graduate Fellowship, University of Wisconsin, 2014

Joe Garcia, MD
PGY-1 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. 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
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

Publications: 2021-22
• Refereed Articles:

Resident Biographies


Zachary C. Gersey, MD
Chief Resident

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

Specialized Areas of Interest
Neurosurgical oncology; skull base neurosurgery.
Education & Training
BA, Biology, University of Florida, 2011
MA, University of Miami, 2016
MD, University of Miami, 2017

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

Jeffery R. Head, MD
PGY-3 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 zebrafish. 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 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 ossification of the posterior longitudinal ligament, mechanical thrombectomy in distal circulation strokes, and the risk-factors for infection in external ventricular drains. Dr. Head was born and raised in Fairfield, Conn. Outside of neurosurgery Dr. Head is an avid skier and enjoys cooking, hiking, running, softball, soccer, and spending time with his friends and family. Dr. Head enjoys finding new restaurants to enjoy around Pittsburgh and recently purchased a home in Lawrenceville with his fiancé, who is a resident at UPMC in the Department of Otolaryngology.

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
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
Resident Biographies

Jeffery R. Head, MD

Best Poster Award, Post-Baccalaureate Poster Day, NIH 2014
Honors, Neuroscience Concentration, Colgate University 2012

Research Activities
Dr. Head is currently involved with research that aims to advance the use of augmented reality for image guidance purposes in the field of neurosurgery. These include the use of augmented reality in thoraco-lumbar pedicle screw fixation, tumor biopsies, and ventricular catheterization procedures.

Joseph Scott Hudson, MD
PGY-4 Resident

Joseph Scott Hudson, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July 2019 after graduating with research distinction from the University of Iowa Carver College of Medicine. He also received his undergraduate degree from the University of Iowa with honors in biology, a minor in chemistry, and high distinction. During his undergraduate education, he became heavily involved in the Department of Neurosurgery at the University of Iowa Hospitals and Clinics. His work under the mentorship of David Hasan, MD, in cerebrovascular neurosurgery included basic science investigations into the pathogenesis of intracranial aneurysms, device development, and neurovascular imaging development. During medical school, Dr. Hudson received research support from the Neurosurgery Research and Education Foundation (NREF) as a medical student fellow, subsequently receiving the 2016 NREF best medical student abstract award. His research has led to numerous peer reviewed publications, abstracts, and oral presentations at national neurosurgical conferences. Dr. Hudson is an elected member of the Alpha Omega Alpha medical honor society. Dr. Hudson was born in Waterloo, Iowa. He was raised in Cedar Falls, Iowa and Plankstadt, Germany. His hobbies outside of neurosurgery include spending time with family and friends, golf, professional and collegiate sports, snow skiing, travel, and water sports.

Specialized Areas of Interest
Cerebrovascular neurosurgery; spine surgery; general neurosurgery.

Professional Organization Membership
Alpha Omega Alpha
American Association of Neurological Surgeons
American Heart Association/American Stroke Association
Congress of Neurological Surgeons

Education & Training
BA, Biology, Minor in Chemistry, University of Iowa, 2015
MD, University of Iowa Carver College of Medicine, 2019

Honors & Awards
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
Resident Biographies

Dean’s List, University of Iowa, 2011-2015
President’s List, University of Iowa, 2011-2015

Publications: 2021-22
• Refereed Articles:

  Hudson JS, Jeong S, Zhang X, Abel TJ. Spontaneous epidural pneumorrhachis in a 14 year 

  Hudson JS, Agarwal P, Zhang X, Zinn PO. T7-T11 Posterior Decompression and Instrument-
  ed Fusion, T9 partial corpectomy and Intradural Microsurgical Diskectomy: An Operative 

Research Activities
Dr. Hudson’s current research focuses on the treatment and pathophysiology of intracranial 
aneurysms. He is currently leveraging the University of Pittsburgh Medical centers large clinical 
volume, in conjunction with investigators from the University of Florida to determine if 
Clopidogrel (Plavix) use is associated with reduced odds of aneurysm rupture.

He has ongoing work pertaining to the rate of aneurysm occlusion after treatment with 
minimally invasive endovascular devices. Additionally, Dr. Hudson has identified trends 
in aneurysm morphology at presentation occurring during the COVID-19 pandemic.

Sakibul Huq, MD
PGY-2 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. As a medical student, Dr. Huq conducted research in multiple 
areas of neurosurgery. His translational research investigated targeted therapies and drug 
repurposing strategies for brain and skull base tumors. His clinical research involved applica-
tions of predictive analytics and frailty assessments to neurosurgical oncology. Dr. Huq is 
also passionate about medical education. He has organized educational cadaver labs, served 
as an active mentor to students at multiple stages of training, and written about education-
related topics in neurosurgery. His work has resulted in numerous awards and publications, 
which can be found in the National Library of Medicine’s publications database. Dr. Huq 
has been active in organized neurosurgery, having recently completed his term as the AANS 
Young Neurosurgeons Committee MISSION Fellow. Prior to medical school, he worked 
in management consulting, where he developed interests in healthcare quality, value and 
leadership. Dr. Huq is a native of Pittsburgh, Pa. Outside of neurosurgery, he enjoys fitness, 
soccer, basketball, travel and spending time with family and friends.

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

Rachel C. Jacobs, MD
PGY-3 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. 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, Ga.

Specialized Areas of Interest
Cerebrovascular neurosurgery; endoscopic endonasal and skull base neurosurgery.

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
Resident Biographies

Rachel C. Jacobs, MD

Publications: 2021-22

• Refereed Articles:


Justiss A. Kallos, MD

Chief Resident

Justiss Kallos, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in June of 2017 after graduating from the Vanderbilt University School of Medicine. Prior to matriculating for residency, she spent a year as project coordinator for a neuroplasticity lab working to improve stroke rehabilitation outcomes and expand access to rehabilitation services for rural veterans within the U.S. Department of Veterans Affairs in Atlanta, Ga. She also spent a postgraduate year studying at the University of St. Andrews as a Robert T. Jones, Jr. Memorial Scholar after graduating summa cum laude from Emory University with a degree in neuroscience and behavioral biology. She has a wide array of interests, having been involved in projects assessing perioperative factors that predict outcomes following vascular and skull base operations using traditional and machine learning models, Gamma Knife Radiosurgery, stroke rehabilitation and telemedicine, and social determinants affecting health outcomes. Outside of residency she enjoys international travel, playing board games, hiking, and spending quality time with family.

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

Education & Training
BS, Neuroscience/Behavioral Biology, Emory University, 2011
MD, Vanderbilt University School of Medicine, 2017

Honors & Awards
Cornelius Vanderbilt Scholar, Vanderbilt University School of Medicine, 2013-17
Gold Humanism Honor Society, Vanderbilt University School of Medicine, 2016
Robert T. Jones, Jr. Scholar, Emory University, 2011-12
Summa Cum Laude, Emory University, 2011
Andrew Legarreta, MD
PGY-4 Resident

Andrew D. Legarreta, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July of 2019 after receiving his medical degree from Vanderbilt University School of Medicine. He received his undergraduate degree from Duke University, completing a BA in history. During medical school, Dr. Legarreta studied the effects of sport-related concussion in the high school athlete population. Specifically, he examined predictors of post-concussion syndrome and, separately, structural and functional neuroimaging findings in football players. His peer-reviewed work has been presented at regional and national neurosurgical conferences in oral and abstract form. Dr. Legarreta enjoys playing guitar, international travel, and golf in his free time. He is a native of Buffalo, N.Y.

Specialized Areas of Interest
Cerebrovascular neurosurgery; endoscopic endonasal and skull base neurosurgery; scoliosis and complex spinal deformity; sport-related concussion.

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

Education & Training
BA, History, Duke University, 2014
MD, Vanderbilt University School of Medicine, 2019

Honors & Awards
Cornelius Vanderbilt Scholarship, Vanderbilt University School of Medicine, 2015-19

Arka N. Mallela, MD
PGY-5 Resident

Arka N. Mallela, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July 2018 after graduating from the University of Pennsylvania School of Medicine, earning his MD and MS in translational research. He received his undergraduate degrees from the Vagelos Scholars Program at the University of Pennsylvania, completing a BA in biophysics, biochemistry, and philosophy and an MS in biological chemistry. Dr. Mallela has a strong interest in the intersection of neuropsychology, neurophysiology, neuroimaging, and deep learning. He is currently utilizing these tools to study a variety of neurological processes and disease diseases, including fetal brain folding, epilepsy, and brain tumors. Dr. Mallela recently received an F32 Ruth L. Kirschstein Postdoctoral Individual National Research Service Award from the National Institutes of Health to study the language function of the supplementary motor area and was recently selected for the Burroughs Wellcome Foundation Physician Scientist Incubator Program at the University of Pittsburgh. He has also been a strong proponent of augmented/virtual reality in neurosurgery and is interested in applications to brain tumor and epilepsy surgery. In his free time, Dr. Mallela enjoys hiking, movie making, and spending time with his family, wife, dog, and friends.

Specialized Areas of Interest
Epilepsy surgery; neuro-oncology.
Resident Biographies

Arka N. Mallela, MD

Professional Organization Membership
American Association of Neurological Surgeons
American Epilepsy Society
American Society for Clinical Oncology
Congress of Neurological Surgeons

Education & Training
BS, Biophysics, Biochemistry, Philosophy, University of Pennsylvania, 2013
MS, Biological Chemistry, University of Pennsylvania, 2013
MS, Translational Research, University of Pennsylvania, 2018
MD, University of Pennsylvania Perelman School of Medicine, 2018

Honors & Awards
F32 Ruth L. Kirschstein Postdoctoral Individual National Research Service Award, 2022
Highest ABNS Score Award, UPMC Department of Neurosurgery, 2021
Physician Scientist Incubator Program, Burroughs Wellcome Foundation, 2021
Walter L. Copeland Grant, Copeland Foundation, 2020
American Brain Tumor Association Young Investigator Award, 2017
ITMAT Prize for Clinical/Translational Research, University of Pennsylvania, 2015

Publications: 2021-22
• Refereed Articles:
Resident Biographies


Research Activities

- **The Role of the Supplementary Motor Area in Expressive Language**
  Dr. Mallela is studying the role of the supplementary motor area in language dysfunction and recovery through stereo EEG recording and stimulation, multimodal advanced neuroimaging, and psycholinguistic testing.

- **Understanding Fetal Insular Development and Brain Folding**
  Dr. Mallela is investigating the fetal development of the insula and Sylvian fissure to propose a novel mechanism of insular formation and telencephalic folding through advanced fetal neuroimaging and data analysis.

- **Surreality Lab at the Alba Tull Center: Augmented and Virtual Reality in Neurosurgery**
  Dr. Mallela and Edward Andrews, MD, are developing intraoperative augmented reality solutions for cranial and spinal navigation, to integrate multiple monitoring modalities, and to streamline operative workflow.

David J. McCarthy, MD

PGY-3 Resident

David McCarthy, MD, MS, 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
Resident Biographies

David J. McCarthy, MD

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, compar-
ing 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 weightlifting.

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

Honors & Awards
Judson Scholarship Recipient, University of Miami Miller School of Medicine, 2014-2020
American Heart Association - ISC Junior Investigator Travel Award/Grant, 2019
Eastern Atlantic Student Research Forum (ESRF) - Second Place Clinical Poster Award, 2018
American Heart Association - Cerebrovascular Disease and Stroke Fellowship Recipient, 2017
Eugene J. Sayfie Research Day - Best Clinical Poster Presentation Winner, 2017
Neurosurgery Research and Education Foundation, Medical Student Research Fellow, 2017
Clinical and Translational Investigation Scholarship, University of Miami, 2017
Gold Humanism Honor Society Inductee, University of Miami Miller School of Medicine, 2017

Gautam M. Nayar, MD
PGY-5 Resident

Gautam M. Nayar, MD, joined the University of Pittsburgh Department of Neurological Sur-
gery residency program in July of 2018. After graduating from the University of Florida with
a degree in computer science, Dr. Nayar completed his medical education at Duke University
School of Medicine. As the Ruth K. Broad Foundation Neurosciences Fellow, he studied neu-onal response and processing towards integration of sensory brain-computer interfaces in
the laboratory of Miguel Nicolelis, MD, PhD. Dr. Nayar also cultivated an interest in spinal
outcomes research focusing on minimally invasive approaches, radiation reduction proto-
col, and identification of pre-operative risk factors. Dr. Nayar’s work on the clinical efficacy
of ultra-low radiation imaging protocols was awarded the 2017 AANS Donald Quest Clinical
Science Award. Although raised in Pittsburgh, Dr. Nayar moved to Gainesville, Fla. for high
school and college. In his free time, he enjoys hiking, weightlifting, and spending time with
his family.

Specialized Areas of Interest
Vascular neurosurgery, endovascular, spine surgery.
Resident Biographies

**Gautam M. Nayar, MD**

**Professional Organization Membership**
- American Association of Neurological Surgeons
- Congress of Neurological Surgeons
- North American Spine Society
- Society of Lateral Spine Access Surgery

**Education & Training**
- BS, Computer Science, University of Florida, 2014
- MD, Duke University, 2018

**Honors & Awards**
- Donald Quest Clinical Science Award, AANS, 2017

**Publications: 2021-22**
- **Refereed Articles:**

**Kamil W. Nowicki, MD, PhD**

**PGY-7 Resident**

Kamil W. Nowicki, MD, PhD, began his residency with the University of Pittsburgh Department of Neurosurgery in June of 2016. He graduated from University of Florida in 2008 with a degree in chemistry with the highest honors and earned his combined medical degree and a PhD in molecular cell biology from the University of Florida College of Medicine in 2016. During his medical school career, he conducted research in the department of neurosurgery under mentorship of Brian L. Hoh, MD, and Edward W. Scott, PhD. In his dissertation research he showed that blockade of shear stress-induced CXCL1 chemokines prevents cerebral aneurysm formation. He was awarded two research grants from the Brain Aneurysm Foundation. He was also the recipient of the Equal Access Clinic award for his work as director of a mobile clinic site while providing care for the underserved population of Gainesville, Fla. in 2012 and 2013. His current research efforts are focused on studying the platelet inflammatory axis in cerebral aneurysm formation and creation of a blood test to detect aneurysm formation. Dr. Nowicki was born in Poland and moved to Gainesville in 2001. His hobbies include soccer, digital photography, and cross-fit.

**Specialized Areas of Interest**
- Chemokines; hemodynamics; intracranial aneurysms; cerebrovascular surgery; biomedical engineering; inflammation; and shear stress.

**Professional Organization Membership**
- American Association of Neurological Surgeons
- American Heart Association: Council on Atherosclerosis, Thrombosis, and Vascular Biology
- American Physician Scientist Association
- Congress of Neurological Surgeons
Resident Biographies

Kamil W. Nowicki, MD, PhD

Professional Activities
University of Pittsburgh Innovation Institute
   First Gear Program, team lead (2021-22)
   Second Gear Program, team lead (2022-current)
Blast Furnace Program, University of Pittsburgh Big Idea Center, team lead (2022-current)

Education & Training
BS, Chemistry, University of Florida, Summa Cum Laude, 2008
PhD, Molecular Cell Biology, University of Florida College of Medicine, 2014
MD, University of Florida College of Medicine, 2016

Honors & Awards
Big Idea Advantage Fund Award, University of Pittsburgh Innovation Institute, 2022
Randall Big Idea Competition, 2nd Place Tie, University of Pittsburgh Innovation Institute, 2022
Duquesne New Venture Challenge Award, Duquesne University, 3rd Place, Video Pitch;
   4th Place, Finals, 2022
University of Pittsburgh Pitt Ventures First Gear Program, 2021, 2022
Best Basic Science Abstract, Cerebrovascular Section, CNS, 2019
Best Presentation Award, Stuart Rowe Society Lectureship Day, 2018, 2019
Walter L. Copeland Grant, Pittsburgh Foundation, 2019, 2021
Neurosurgical Topgun Competition 1st Place Tie, Myriad Minimally Invasive Tumor, 2018
Timothy P. Susco Chair of Research Grant Award, Brain Aneurysm Foundation, 2016
Dawn Brejcha Chair of Research Grant Award, Brain Aneurysm Foundation, 2016
Outstanding Academic And Research Accomplishment Award, University of Florida, 2016
College of Medicine Travel Award, University of Florida, 2015
Medical Guild Competition Bronze Award, University of Florida, 2014
Equal Access Clinic Award, University of Florida, 2012-13
Shirley Dudek Demmer Chair of Research Grant Award, Brain Aneurysm Foundation, 2013
Brain Aneurysm Center Chair of Research Grant Award, North Shore University Hospital, 2012
Summa Cum Laude, Bachelor of Science in Chemistry, University of Florida, 2008
Sanibel Symposium Superior Poster Award, University of Florida, 2007
Anderson Scholar of High Distinction, University of Florida, 2006
Florida Bright Futures Scholarship, University of Florida, 2005

Publications 2021-2022
• Refereed Articles:
  Kim S, Nowicki KW, Gross BA, Wagner WR. Injectable hydrogels for vascular embolization
  and cell delivery: The potential for advances in cerebral aneurysm treatment. Biomaterials

  Nowicki KW, Hect JL, Muthiah N, Mallela A, Zussman BM. Altered Mental Status with Mirror

Research Activities
Dr. Nowicki has been actively involved in the laboratory exploring the role of platelets and
inflammatory cytokines in cerebral aneurysm formation as well as design of novel biomedical
devices resulting in three patent applications. In the spring of 2021, his research team
was selected to participate in the University of Pittsburgh’s Pitt Ventures First Gear 2021 pro-
gram to explore the road towards commercialization.
Eric M. Nturibi, MD
PGY-1 Resident

Eric M. Nturibi, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July of 2022 after earning an MD degree from the University of Pittsburgh School of Medicine. He received his undergraduate education at Franklin and Marshall College in Lancaster, Pa., graduating cum laude in 2015.

Prior to residency, Dr. Nturibi was involved in basic science research aimed at understanding the molecular mechanisms underpinning influenza infections in cellular and animal models. He was also involved in clinical and translational neurosurgical research in the fields of neurocritical care and pediatric neurosurgery.

Dr. Nturibi was born and raised in Nairobi, Kenya. Outside of the hospital, he enjoys sports—particularly soccer and athletics—grilling, spending time with his friends and exploring the wonderful city of Pittsburgh.

Education & Training
BA, Biochemistry & Molecular Biology, Franklin and Marshall College, 2015
MD, University of Pittsburgh, 2022

Honors & Awards
The Theodore Kurze, MD, Senior Prize for Excellence in Neurological Surgery, UPMC Neurosurgery, 2022
Academic Achievement Award for Academic Merit and Community Service, Pittsburgh National Medical Association, 2018
Cum Laude, Franklin and Marshall College, 2015
Anthony Schulien, MD  
PGY-2 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 backcountry 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

Education & Training
BS, Neuroscience, University of Pittsburgh, 2015
MD, Physician Scientist Training Program, University of Pittsburgh, 2021

Honors & Awards
The 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
The Chancellor’s Undergraduate Research Fellowship, University of Pittsburgh Honors College, 2014
President’s Volunteer Service Award, Loudoun County Volunteer Rescue Squad, 2013-2014
Resident Biographies

Publications: 2021-22
• Refereed Articles:

Roberta K. Sefcik, MD
Chief Resident

Roberta K. Sefcik, MD, began her residency with the University of Pittsburgh Department of Neurosurgery in June of 2017. She graduated from Carnegie Mellon University in 2011 where she pursued an interdisciplinary degree in psychology and music performance, focusing on bagpipe performance. She was admitted to the Humanities and Medicine Program and the Patient-Oriented Research Training and Leadership Program at the Icahn School of Medicine at Mount Sinai in New York where she received her medical degree and a master of science in clinical research in 2017. Dr. Sefcik was born and raised in Dunedin, Fla.

Specialized Areas of Interest
Cerebrovascular surgery

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

Education & Training
BA, Psychology/Music Performance, Carnegie Mellon University, 2011
MS, Clinical research, Icahn School of Medicine at Mount Sinai, 2017
MD, Icahn School of Medicine at Mount Sinai, 2017

Honors & Awards
Distinction in Research, Icahn School of Medicine at Mount Sinai, 2017
Phi Beta Kappa, 201

Publications: 2021-22
• Refereed Articles:

William Shuman, MD
PGY-1 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
Resident Biographies

William Shuman, MD

postoperative outcomes for neurosurgical patients. Dr. Shuman was born and raised in Metro Detroit, Mich. In his free time, he enjoys playing guitar, listening to blues rock and folk music, weightlifting 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, pediatric neurosurgery, neurotrauma

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

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
PhD Beta Kappa, 2016

Publications: 2021-22
• Refereed Articles:
Resident Biographies


James Yoon, MD

*PGY-1 Resident*

James Yoon, MD, joined the University of Pittsburgh Department of Neurological Surgery residency program in July 2022 after earning his MD degree from Yale School of Medicine. Prior to medical school, he graduated magna cum laude from Brown University in 2017 with a BS in neuroscience with honors. Dr. Yoon’s research focuses on value-based healthcare aimed at improving patient experiences through policy reforms, delivery system innovation, and outcomes research that informs safe, evidence-based clinical practices. To this end, Dr. Yoon has published over 30 peer-reviewed publications and was named *Forbes 30 under 30* in 2022. During medical school, Dr. Yoon completed a health law and policy fellowship at the Solomon Center at Yale Law School. He is also active in organized neurosurgery and was elected to serve on the Young Neurosurgeons Committee (YNC) in 2020 and co-president of the Cushing Society at Yale School of Medicine in 2021. Dr. Yoon was born in South Korea. Outside of neurosurgery, he enjoys fencing, cooking Korean food, playing the viola, hiking, traveling, and spending time with his family and friends.

**Specialized Areas of Interest**

Open cerebrovascular neurosurgery; skull base neurosurgery; neuro-oncology; value-based healthcare, clinical outcomes research; socioeconomics in neurosurgery; organized neurosurgery; medical education.
Resident Biographies

James Yoon, MD

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

Education & Training
BS, Neuroscience, Brown University, 2017
MD, Yale School of Medicine, 2022

Honors & Awards
Forbes 30 Under 30, Forbes Magazine, 2022
Editor’s Choice Manuscript, Neurosurgery, 2021
National Institutes of Health (NIH) - National Heart, Lung, and Blood Institute Research Fellowship, 2019
Yale School of Medicine Student Travel Award, 2018, 2019, 2022
Sigma Xi Honor Society, 2017
Magna cum laude, Brown University, 2017
Karen T. Romer Undergraduate Teaching and Research Award, Brown University, 2016
Presidential Linking Internships and Knowledge Award, Brown University, 2015
Entrepreneurship Program Synapse Fellowship, Brown University, 2015
Sheridan Center Certificate in Research Mentorship, Brown University 2015
Texas Governor’s Award, 2013

Publications: 2021-22
• Refereed Articles:

Xiaoran Zhang, MD
Chief Resident

Xiaoran (Zel) Zhang, MD, MS, joined the University of Pittsburgh Neurological Surgery residency program in June of 2016 after graduating from the University of Pittsburgh School of Medicine. Dr. Zhang obtained a combined BS/MS degree from the Department of Microbiology, Immunology, and Molecular Genetics at University of California, Los Angeles. His master’s thesis was titled “Role of Vitamin D in the Toll-induced Antimicrobial Responses.” During medical school, Dr. Zhang was selected to participate in the Clinical Scientist Training Program and was awarded a master’s level certificate in clinical research. Additionally, he studied the mechanisms of immune escape in isocitrate dehydrogenase mutant gliomas. He was awarded The Theodore Kurze Senior Prize for excellence in Neurological Surgery and Clinical Neurosciences. Dr. Zhang is a native of Henan, China.

Specialized Areas of Interest
Neuro-oncology; cerebrovascular; and neurotrauma.

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

Xiaoran Zhang, MD

Education & Training
BS/MS, Microbiology, Immunology, and Molecular Genetics, UCLA, 2012
MD, University of Pittsburgh, 2016

Honors & Awards
The Theodore Kurze Senior Prize for Excellence in Neurological Surgery and Clinical Neurosciences, 2016

Publications 2021-22
• Refereed Articles:


Resident Biographies

Congratulations to 2022 graduating residents Alp Ozpinar, MD; Enyinna Nwachuku, MD; Matthew Pease, MD; and Nima Alan MD, on their successful completion of the University of Pittsburgh’s seven-year neurological surgery residency program. Following graduation, Dr. Ozpinar joined Oregon Neurosurgery in Springfield, Ore. to continue his work in complex spine and minimally invasive spine surgery; Dr. Nwachuku accepted a position as director of neurotrauma at the Cleveland Clinic; Dr. Pease began a neuro-oncology fellowship at Memorial Sloan Kettering Cancer Institute in New York; and Dr. Alan joined Barrow Neurological Institute in Phoenix, Ariz. for a minimally invasive complex spine fellowship.
The goal of the Department of Neurological Surgery at the University of Pittsburgh is to improve the care and treatment of patients with neurological disease. This goal is being achieved partly through the implementation and administration of state-of-the-art basic and translational research. Our department—with more than 40 faculty members and investigators—endeavors to be at the forefront of medical research. Numerous advances have already been achieved—research translated into practice.

Annually, the department has been highly ranked in total research funding, a direct result of the success and quality of our research and development. In the 2022 fiscal year, our faculty and residents were involved in almost 200 research projects having a total annual budget award of more than $13 million, an increase of 30% over the prior year.

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 that has often led to millions of dollars in federal grants for the Department of Neurological Surgery. In 2022, researchers from the department were awarded $186,000 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 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.

The Laboratory for the Neurotrauma Clinical Trials Center (NCTC) is located in the Copeland Laboratory. Under the direction of David O. Okonkwo, MD, PhD, and co-director, Ava M. Puccio, RN, PhD, the team conducts innovative clinical research with a focus on biomarkers as well as the evaluation of neurotherapeutics for traumatic brain injury.

The Surgical Neuroanatomy Laboratory—under the direction of Paul Gardner, MD—and the Fiber Tractography Laboratory—under the direction of Fang-Cheng (Frank) Yeh, MD, PhD—are also located in the Copeland Laboratory. Residents and visiting fellows train in neuroanatomy and the development of minimally invasive endoneurosurgical approaches to the brain. New routes to various brain locations are developed using in vitro models.

The Fiber Tractography Lab is focused on the application of HDFT for presurgical planning and intraoperative navigation to facilitate brain function preservation and improve resection rates in patients with complex brain lesions. The laboratory’s work is also centered on study-
Research

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

The Brain Trauma Research Center (BTRC) at the University of Pittsburgh is a multidisciplinary research program aimed at improving outcome following severe traumatic brain injury. Research conducted both at our center and at other brain injury research programs clearly demonstrates the potential for improving outcomes using therapies designed to treat biochemical derangements that occur following impact to the brain. In order to identify the most critical of these sequelae of brain injury and to find newer therapies that are effective in treating them, the BTRC has established several basic science head injury laboratories and clinical research projects.

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 and/or TBIs on long-term neurological health. The goal of this research is to identify clinical, advanced imaging, and blood biomarker correlates for mild cognitive impairment.
Brain Tumor Research

The Brain Tumor Research Program (BTRP) at the University of Pittsburgh is one of the largest and most productive basic and translational brain tumor science programs in the country, encompassing research across the adult and pediatric brain tumor science spectrum and supported heavily in funding from the National Institutes of Health and other generous foundations.

The BTRP is a world-class effort focused on delivering novel brain tumor therapies from the laboratory to the bedside. Areas of active investigation include immunotherapy, signal transduction pathways that contribute to the growth of tumor cells, metabolomics, oncolytic viruses, rare tumor exome sequencing, impact of hormonal treatments, and the development of preclinical models for the treatment of brain tumors.

At the core of our program is a commitment to high impact patient-centric therapies. This commitment begins in the operating room where—with patient consent—tumor samples are retrieved for laboratory investigation under controlled research tumor banking protocols. These specimens are critical to the understanding of tumor genetics and to the development of translational targets for brain tumor therapy. This initiative has led to the banking and study of thousands of unique tumor samples, facilitating impactful, patient-centered research.

• Basic Science Advances

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. These trials are ongoing at the University of Pittsburgh Cancer Institute and UPMC Children’s Hospital of Pittsburgh. Recent studies have identified patterns of gene expression in peripheral blood mononuclear cells that are associated with response and resistance to peptide-based vaccination in pediatric low-grade gliomas. Future studies will evaluate whether these features are also seen in other subgroups of childhood brain tumors incorporated on our vaccine trials.

Another strategy in brain tumor research is to inhibit the pathways that promote tumor growth or to stimulate those that promote tumor cell killing. The poor response of malignant gliomas to conventional therapies, such as cytotoxic chemotherapy or radiotherapy, reflects resistance of these tumors to undergoing apoptosis in response to DNA damage or mitogen depletion. Through a large-scale screening study, we have identified several exploitable targets, which when inhibited induce tumor cytotoxicity. We have been examining pharmacological agents to inhibit these targets, alone and in combination with agents that induce apoptotic signaling in these tumors.

Each tumor develops unique mechanisms to escape natural anti-tumor immune responses. We have recently discovered a unique immune escape mechanism that involves silencing of immune recognition genes. Importantly, we have discovered that a new class of tumor drugs, called ‘hypomethylating agents’, can awaken the expression of these genes and allow effective immune responses in IDH mutant gliomas. A Phase I clinical trial is currently being designed based on these findings and is currently being refined by the Alliance for Clinical Trials in Oncology consortium in preparation for a multicenter clinical trial. Recently, the BTRP has made several critical advances regarding depletion of tumor-associated myeloid cells, including development of an immunoPET strategy using a radiolabeled antibody to
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quantify myeloid cells in CNS cancer (Front Immunol 12:637146, 2021). We recently showed using a new chelator with two separate radionuclide-labeled antibodies that myeloid cells could be imaged and targeted to improve immunotherapy for gliomas. This work is complemented by ongoing studies to develop and evaluate immunoPET strategies to quantify T-cell activation and cytotoxicity to allow for early detection of immunotherapy responsiveness in CNS tumors. Our ongoing work includes using a single-cell RNAseq and single-cell TCR sequencing to develop both personalized and off-the-shelf T-cell receptor engineered T-cells (TCR-T) as adoptive cell therapy strategies for brain tumor patients.

Our program has additionally made some recent seminal discoveries that may provide translational relevance in both pediatric and adult high-grade gliomas (HGG). In some cases, such as diffuse midline gliomas (DMGs), maximum surgical resection may not be possible (Nat Cancer 2(6):584-586, 2021). Therefore, there is an urgent need to identify non-invasive ways to diagnose and treat these tumors. In a landmark multi-institutional collaboration headed by the University of Pittsburgh Department of Neurological Surgery, clinicians and researchers discovered that DMG tumors are uniquely dependent on methionine, an amino acid that humans must receive from food. Low-methionine dietary intervention, or use of clinical grade therapies targeting a key enzyme involved in converting methionine into other components indispensable for brain tumor cells, increased survival by 50% in pre-clinical models of DMG. Current research is focussed on preclinical testing of methionine metabolism inhibitors and the development of a Phase 1 clinical trial.

In an inter-departmental collaboration with the UPMC Hillman Cancer Center, researchers in the BTRP have identified that platelet-derived growth factor (PDGF) signaling induces N6-methyladenosine (m6A) accumulation, the most abundant RNA modification in human cells. Emerging evidence suggests that this modification, a critical driver of the activation of several GBM pathways and regulators of this pathway, are associated with poor clinical outcomes. We identified that Methyltransferase-Like 3 (METTL3) promotes GBM growth and pharmacologic targeting of METTL3 augmented the anti-tumor efficacy of PDGF receptor (PDGFR)-based therapy, a druggable target of interest in GBM. This work, and others, has opened an exciting and emerging field of epitranscriptomics presenting a new class of druggable targets and combinations previously not appreciated in GBM.

We have also initiated studies that define the mechanisms underlying resistance in childhood and adult malignant gliomas. We have developed a repertoire of “drug-resistance” tumor model systems, paired with treatment naïve counterparts (Molecular Cancer Research 18:1004-1017, 2020). We have leveraged this unique resource to identify the NAD metabolic pathway as a key intermediate through which multiple cell lines achieve treatment resistance. Using RNA sequencing studies and pathway analysis we have identified several common molecular drivers of this process, such as QPRT and NMNAT2. Gene set enrichment analysis demonstrated that these mediators hijack glycolytic signaling. 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 and RNA interference-based strategies for reversing resistance as well as metabolic manipulations that may provide novel approaches for promoting tumor cell killing. We have 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.

Another exciting area of research in our program involves the development of genetically engineered oncolytic herpes-simplex viruses (oHSV) that can selectively kill proliferating
glioma cells but not normal brain cells. Promising preclinical studies in mouse models indicate that this strategy is highly effective for the treatment of glioblastoma. Several patents have been generated and licensed based on this work, and studies are ongoing to evaluate safety testing in preclinical models in anticipation of oHSV clinical trials soon. This is in addition to a strong emphasis on developing personalized brain tumor therapy by studying humanoid brain organoid tumor models, a biologically more accurate model that simulates a patient’s condition. These organoids are subsequently used to evaluate the biological and genetic evolution of individual brain tumors and, subsequently, to generate and test personalized therapies based on these findings. The desire to develop truly personalized medicine strategies is at the heart of these efforts.

The Laboratory of Brain Tumor Evolution & Therapy has recently shown that cancer cell-intrinsic signaling reprograms tumor-associated macrophages (TAMs) to mediate tumor suppression by novel protein binding complexes CHI3L1-Gal3-Gal3BP (J Clin Invest 131(16):e147552, 2021). These studies are focused on understanding how these protein complexes regulate TAM recruitment, polarization, cytokine production, tumor-infiltrating lymphocyte inactivation, and how to target these protein complexes by developing new drugs in brain tumor immunotherapy.

The ability to develop preclinical models for glioma extends to specimens created directly from tumor resections, known as surgically explanted organoids (SXOs). These efforts have led to recent work demonstrating the first known ex vivo models of low-grade gliomas and an ability to rapidly assess tissue treatment change using advanced microscopy. Translational efforts to identify druggable targets in high grade glioma and further leverage these models has also led to the preclinical development of promising therapeutics and a modified nucleoside (6-thio-dG) that exhibits antitumor activity in gliomas (Clin Cancer Res 27(24):6800-6814, 2021). These developments have led to the University of Pittsburgh Department of Neurological playing a key role in the National Cancer Institute's Glioma Therapeutic Network, joining other leading medical centers in a collaborative effort to bring therapeutics to trial for high grade gliomas.

Other recent work in the BTRP includes the establishment of the Brain Tumor Metabolism and Functional Cancer Genomics Laboratory which explores the molecular network and metabolic dependencies which are essential for pediatric supratentorial ependymomas survival and proliferation. The Antony Michaelraj, PhD, lab explores single and combined therapeutic approaches to target this tumor by blocking the metabolic activity by selective and blood-brain barrier penetrant small molecules and nutrient limited diet. For the first time, they established a transgenic mouse model for supratentorial ependymoma which will be used as primary tool for investigating disease mechanism and novel therapeutic discoveries/validations.

• Translational Advances
The clinical research branch of our Brain Tumor Program currently runs “personalized” clinical studies based on patients’ gene markers, such as human leukocyte antigen (HLA)-A2 (for immunotherapy studies), epidermal growth factor receptor (EGFR) variant III and chromosome 1p/19q co-deletion. In addition, the program offers a host of molecularly targeted treatment approaches for children whose brain tumors have genomic alterations that make them ideally suited for specific novel-agent trials. These include studies of MEK inhibitors (e.g. Selumetinib) for children with BRAF-altered low-grade gliomas, which are being conducted by the PBTC and more recently, the Children’s Oncology Group. Similarly, members of our group are studying rare skull base tumors such as chordoma by performing whole exome sequencing to search for novel genetic alterations in these tumors that could
lead to a better understanding of their oncogenesis as well as targets for treatment. These targets are then evaluated to see if current therapies can be applied to these rare tumors. The impact of methylation in skull base tumors is also being studied to understand if these genetic changes, which occur throughout life, play a role in tumor prognosis. In addition, our surgeons and pathologists have identified a molecular panel that can help predict chordoma clinical behavior and prognosis. This panel is now applied on a regular basis to our patients to provide a personalized approach for current and future treatment.

In addition to these efforts, this year the Georgios Zenonos Lab established the most comprehensive full scale integrated molecular assessment of skull base chordomas in its field, leveraging the unique and world-leading clinical volume at UPMC to investigate best management options in this uncommon but important skull base tumor, and the Zinn Lab utilized molecular datasets to link a history of allergy to survival benefits in diffuse low grade glioma.

- **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 41 years, the Center for Image Guided Neurosurgery has provided care to more than 20,000 patients with such tumors 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 17,750 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.

Our BTRP has made recent significant clinical advances that have contributed to the scientific and clinical community. Jan Drappatz, MD, and colleagues described the UPMC experience with immune checkpoint inhibitors in meningioma (*Journal of Neurooncology*). Kalil Abdullah, MD, and colleagues described outcomes of bevacizumab vs. laser interstitial thermal therapy in cerebral radiation necrosis (*Journal of Neurooncology*) and Pascal Zinn, MD, PhD, and team described a first in-human working system to use enabled loupes to fluorescently guide glioma resection (*Operative Neurosurgery and Journal of Neurosurgical Science*). The BTRP continues to conduct numerous clinical trials as part of national collaborative efforts, led by neurooncologists Frank Lieberman, MD; Megan Mantica, MD; Jan Drappatz, MD; and Jeremy Rich, MD. Our pediatric program is also one of the founding sites of the Pediatric Brain Tumor Consortium (principal investigator, Ian Pollack, MD), an NCI-funded consortium that is designed to bring cutting edge clinical therapeutics to childhood brain tumors, and a founding member of the Children’s Brain Tumor Network (principal investigator, Ian Pollack, MD), which seeks to translate advances in molecular diagnostics to clinical therapeutics.

Working in concert with these advanced radiosurgery and radiation technologies, the UPMC Center for Cranial Base Surgery is the oldest skull base center in North America. They have been a source of innovation for decades, helping develop new and less invasive approaches, such as the endoscopic endonasal and transorbital approaches, to limit the impact of surgery for these challenging tumors. This year, Paul Gardner, MD, and colleagues described key postoperative care protocols in the management of patients with skull base tumors and a multimodality treatment paradigm for patients with esthesioneuroblastoma (*Otolaryngology Clinics of North America and Surgical Neurology International*).
Since 1975 the department has been noted as a source of innovation in brain tumor diagnosis and management. In 1981 the first dedicated CT scanner was installed in a unique operating room at UPMC Presbyterian to facilitate minimally invasive surgical techniques. Updated in 2009, this facility also serves as a site to explore less invasive strategies for tumor removals 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. Our pediatric program has also been enhanced by the opening of an intraoperative MRI suite, which facilitates the goal of achieving safer and more extensive resections in challenging childhood brain tumors. This year, 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.

Innovative imaging techniques are being developed and applied to better understand brain tumors and their structural relationship with surrounding white matter tracts. High-Definition Fiber Tractography (HDFT) provides a superior presurgical evaluation of the fiber tracts for patients with complex brain lesions, allowing us to reconstruct fiber tracts and design a less invasive trajectory into the target lesion. We are currently investigating its potential for not only presurgical planning and intraoperative navigation but also for neurostructural damage assessment, estimation of postsurgical neural pathway damage and recovery, and tracking of postsurgical changes, neuroplasticity, and responses to rehabilitation therapy. The 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 ultimate 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). MEG is a cutting-edge technology and the most advanced method of functional brain imaging. MEG recordings provide a direct measurement of brain functions. MEG allows 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**

The aim of MEG research, directed by Avniel Ghuman, PhD, is to facilitate, develop, and advance clinical and basic neuroscience research using magnetoencephalography (MEG). To this end, Dr. Ghuman is helping to develop new research applications for MEG in collaboration with researchers throughout the community.

MEG is the most powerful functional neuroimaging technique for noninvasively recording magnetic fields generated by electrophysiological brain activity, providing millisecond temporal resolution and adequate spatial resolution of neural events.

MEG is currently being used to study the healthy brain—both in adults and during development—in order to understand the neural basis of cognitive processes, including reading, vision, audition, motor control, semantic memory, executive functioning, emotional processing, and working memory. Furthermore, groups in the community are also using MEG to understand how neural processing is disturbed in a host of pathologies, including TBI, schizophrenia, spinal cord injury, HIV-AIDS, epilepsy, autism spectrum disorders, Alzheimer’s disease, and Parkinson’s disease. MEG currently supports both presurgical clinical services and seven major (R01 or equivalent) NIH grants.
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**Laboratory of Cognitive Neurodynamics**

The Laboratory of Cognitive Neurodynamics, under the direction of Avniel Ghuman, PhD, studies how our brain turns what falls upon our eyes into the rich meaningful experience that we perceive in the world around us. Specifically, the goal of these studies is to examine the spatiotemporal dynamics of how neural activity reflects the stages of information processing and how information flows through brain networks responsible for visual perception. The lab is particularly interested in the dynamic neural representation of faces, bodies, objects, words, and social and affective visual images. In collaboration with pediatric neurosurgeon Taylor Abel, MD, and José-Alain Sahel, MD, chair of the University of Pittsburgh Department of Ophthalmology, the Laboratory of Cognitive Neurodynamics is also embarking on a project to use a combination of functional neurosurgery, artificial intelligence and computational neuroscience approaches to restore sight to blind individuals.

**Neuroapoptosis Laboratory**

The Neuroapoptosis Laboratory at the University of Pittsburgh Department of Neurological Surgery, under the direction of Robert Friedlander, MD, focuses on the study of the basic mechanisms of apoptosis as mediated by the caspase apoptotic family in neurologic diseases. In addition, discovering novel approaches to ameliorate the impact of cell death in a variety of neurological diseases is a central theme of the laboratory. The role of synaptic mitochondrial vulnerability, specifically as it relates to synaptic degeneration, has been a recent emphasis.

The laboratory is evaluating the impact of apoptotic cell death, and in particular, neuronal death mediated by the caspase cascade on the pathogenesis of neurodegenerative diseases. Neurodegenerative diseases presently being investigated are Huntington’s Disease (HD), Alzheimer’s Disease (AD) and Amyotrophic Lateral Sclerosis (ALS). Given that ageing plays a role in all of these diseases, the impact of normal and pathological ageing is also being evaluated. Activation of the caspase cascade appears to play an important role in a variety of neurodegenerative diseases. Researchers have demonstrated that inhibition of the caspase-1 (also known as ICE) apoptotic protein slows disease progression and delays mortality in transgenic mouse models of ALS and Huntington’s disease. Furthermore, delivering caspase inhibitors directly into the brain of these transgenic mice prolongs their survival. This was the first intervention demonstrated to be efficacious in a HD model. Adding relevancy to these findings, researchers have also demonstrated that caspase-1 is activated in the brain and spinal cord of humans with HD and ALS respectively. They also have demonstrated that minocycline demonstrates neuroprotection in a mouse model of HD by inhibiting caspases.

Apoptotic cell death plays a significant role in stroke as well as traumatic brain and spinal cord injury. Researchers are evaluating the impact of caspase activation has on apoptotic cell death in these conditions. The relationship between caspases and free radical production is also being investigated as well as targeted through caspase-mediated pharmacoprotection.

Using in vitro models, researchers are evaluating both the mechanisms involved in the activation of caspases, as well as the post-caspase activation pathways involved in cell death. The role of inflammation in neurodegeneration continues to be a focus of research.

An additional recent focus of the Neuroapoptosis Laboratory has been the demonstration that neuronal melatonin is synthesized exclusively in mitochondria. This initiated a paradigm shift regarding our understanding of melatonin’s mechanisms of action. Additionally, the laboratory demonstrated that melatonin receptors are located on the mitochondrial outer membrane. Together, these new findings suggest melatonin is made in the mitochondrial where it is secreted and then binds to its high affinity receptor. This “automitocrine” pathways modulates mitochondrial stability and neuroprotection. To better understand the automitocrine pathway and
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its effect on neuronal function, we have generated a new mouse model where the rate limiting step of melatonin synthesis has been knocked out. This model has features of accelerated ageing and is an important tool in our ongoing studies.

Fiber Tractography Laboratory

Fiber tracking is an advanced MRI-based non-invasive imaging technique used to study the intrinsic structure and connectivity of the living human brain, both in normal subjects and neurosurgery/neurology patients.

The Fiber Tractography Lab—under the direction of Fang-Cheng (Frank) Yeh, MD, PhD—is focused on the application of fiber tracking for presurgical planning and intraoperative navigation to facilitate brain function preservation and improve resection rates in patients with complex brain lesions. Dr. Yeh developed DSI Studio and applied it to study the structure and connectivity of the fiber tracts forming the human brain, and their structural alteration in patients with brain tumors, vascular lesions, stroke, and neurodegenerative diseases. These are the main areas of research:

• Presurgical Assessment of Fiber Tracts and Surgical Planning
  Fiber tracking provides a superior presurgical evaluation of the fiber tracts for patients with complex brain lesions, including low grade and high-grade gliomas. Presurgical studies are built upon precise and accurate neuroanatomical knowledge, which allows doctors to reconstruct perilesional or intrallesional fiber tracts, design the less invasive trajectory into the target lesion, and apply more effectively intraoperative electrical mapping techniques for maximal and safe tumor resection in eloquent cortical and subcortical regions.

  Our clinical experience applying fiber tracking has been reported in Neurosurgery, Journal of Neurosurgery, and Neuro-oncology among others. The lab is actively investigating its potential for not only presurgical planning and intraoperative navigation, but also for neurostructural damage assessment, estimation of postsurgical neural pathways damage and recovery, and tracking of postsurgical changes and responses to rehabilitation therapy.

• Fiber Tract Integrity and Damage Progression in Neurological Disorders
  Researchers are currently studying patients with amyotrophic lateral sclerosis (ALS) and Huntington’s disease, aiming to obtain quantifiable measures of white matter tract integrity that can be correlated with the speed of disease progression and with clinical measures. The ultimate goal is to find an accurate biomarker of the disease that can be monitored and serve as a reference for treatment response.

• Mapping Normative Brain Connections Using Fiber Tracking
  Studies in the Fiber Tractography Lab have contributed to elucidate the structure, connectivity, and potential functional role of the major fiber pathways and how they give rise to brain functions. Innovative studies using data from the Human Connectome Project are being completed to construct population-based tractography atlases.

Surgical Neuroanatomy Laboratory

The Surgical Neuroanatomy Lab (SNL) has a dual educational and research role aiming to improve surgical techniques and outcomes by mastering knowledge of relevant surgical neuroanatomy. Under the joint direction of Paul Gardner, MD, and George Zenonos, MD, in the Department of Neurological Surgery, and Carl Snyderman, MD, MBA, and Eric Wang, MD, in the Department of Otolaryngology, the lab follows our clinical philosophies of teamwork and innovation.
Many national and international students, residents, and fellows have conducted training and research at the SNL during the last years. The working philosophy at the SNL is that of Albert L. Rhoton, Jr., MD, handed down from Juan Fernandez-Miranda, MD: meticulous and exquisite anatomical microdissections to better understand the intricacies of the complex anatomy of the human brain and skull base.

The lab has four main research/educational areas: endoscopic skull base anatomy, microsurgical neuroanatomy, new approach development, and white matter anatomy/brain connectivity/surgical planning.

• Endoscopic Skull Base Anatomy
  The Endoscopic Endonasal Approach (EEA) has revolutionized skull base surgery. The EEA has anatomical and technical advantages over open skull base approaches for the treatment of selected lesions. EEA is not minimally invasive but designed to be a maximally effective corridor for the treatment of a wide variety of ventral skull base lesions. The Surgical Neuroanatomy Laboratory at the University of Pittsburgh has pioneered anatomical work on the area of skull base endoscopy, and its goal is to continue providing landmark contributions to the skull base community. Meticulous knowledge of the ventral skull base anatomy as seen from the endoscopic perspective is critical to apply endonasal endoscopic surgery in an effective and safe manner.

• Microsurgical Neuroanatomy
  Conventional skull base approaches are being compared with novel endoscopic endonasal approaches to aid in understanding indications and limitations of different but complementary skull base approaches. Contemporary skull base surgeons should combine expertise in open and endoscopic skull base approaches to select the most appropriate approach and technique for each particular case. Emphasis is made on the circumferential conceptualization of the skull base and the selection of “anatomically-favorable” surgical routes.

• New Approach Development
  Following our philosophy of constant evaluation and innovation between the anatomy lab and the operating room, the SNL is used to develop and examine new approaches or expand known approaches to help define modern skull base surgery. Examples include the expansion of the lateral orbitotomy to the cavernous sinus and middle fossa, the development of the contralateral transmaxillary (CTM) approach and the anterior transmaxillary approach for temporal lobectomy (ATM-TL) for epilepsy.

• White Matter Anatomy
  Dissection of the white matter fiber tracts provides a unique insight into the complex intrinsic architecture of the brain and builds up an essential knowledge for operating on intra-axial tumors. A unique feature of our white matter studies is the combination with advanced imaging techniques, such as High-Definition Fiber Tractography (HDFT), to facilitate greater understanding of brain connectivity “in-vivo” and in neurosurgery patients. These techniques are also being studied to try to improve the imaging of cranial nerves.

Brain Tumor Evolution & Therapy Lab
The Laboratory of Brain Tumor Evolution & Therapy, under the direction of Baoli Hu, PhD, is interested in the genetic and epigenetic events contributing to the evolution of brain tumors. The long-term goal of the lab is to achieve a better understanding of brain tumor biology and to develop more effective diagnoses and therapeutic strategies for the treatment of brain cancer.
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Cancer is increasingly being viewed as an ecosystem where the cancer cells dynamically evolve and spatiotemporally communicate with surrounding cells and environmental factors. Deciphering this evolutionary complexity allows us to better understand brain tumor initiation, progression, recurrence, and drug resistance. The Brain Tumor Evolution & Therapy Lab is focusing on glioma which is the most common malignant brain tumor in adults, and the most common type of embryonal tumor arising in the central nervous system in childhood. Specific projects are as follows:

- **Modeling the evolution and complexity of brain tumors.** Intratumor genetic heterogeneity and phenotypic diversity are the hallmarks of glioma and medulloblastoma, which predict the risk of tumor development, progression, and response to treatment. To delineate the crosstalk mechanisms of these factors, Dr. Hu's lab is interested in generating various sophisticated models, which can faithfully recapitulate the molecular diversity, cellular heterogeneity, and microenvironmental complexity seen in patient tumors. These models include genetically engineered mouse brain tumor models, syngeneic and humanized mouse brain tumor models, ex vivo brain tumor models (e.g., brain slices), human-in-mouse model systems based on malignant transformation of human neural/cerebellar stem cells driven by subtype-specific genetic/epigenetic alterations, and so on. These models will deepen our understanding of tumor evolutionary dynamics at the molecular and cellular levels. The key regulators in this process are validated as diagnostic biomarkers and therapeutic targets for clinical application.

- **Interrogating consequences of neural stem cell/tumor cell plasticity within the brain tumor microenvironment.** Dr. Hu's lab previously found that glioblastoma stem cells (GSCs) differentiate into endothelial-like cells (GdECs), which recruit host endothelial cells (ECs) to form an invasive niche, resulting in tumor invasiveness and recurrence. They are continuing their efforts to gain a better understanding of the molecular mechanisms of these cancer stem cells, and how they communicate with their surrounding cells (e.g., endothelial cells, microglia/macrophages, astrocytes, etc.), which allows us to develop novel and more effective therapies by targeting critical components of the tumor microenvironment.

- **Targeting glioblastoma immunosuppression in brain tumor immunotherapy.** Glioblastoma is highly immunosuppressive and resistant to immunotherapy because glioma cells escape from effective antitumor immunity through programing the tumor microenvironment (TME). Dr. Hu's lab has recently found that cancer cell-intrinsic signaling reprograms tumor-associated macrophages (TAMs) to mediate tumor suppression by novel protein binding complexes CH13L1-Gal3-Gal3BP. Their interest is focused on understanding how these protein complexes regulate TAM recruitment, polarization, cytokine production, tumor-infiltrating lymphocyte inactivation, and how to target these protein complexes by developing new drugs in brain tumor immunotherapy.

- **Illuminating mechanisms governing cancer cell invasion and dissemination in the brain.** The major challenge in the clinical management of glioblastoma is that cancer cells extensively infiltrate into the surrounding tissue, leading to nearly universal recurrence. Group 3 medulloblastoma is characterized by frequent metastasis at diagnosis and the worst prognosis among all the subgroups. Dr. Hu's lab aim is to elucidate molecular mechanisms of de novo invasion and treatment-induced invasion (e.g. TMZ, bevacizumab, etc.), which enables us to identify “drivers” mediating cancer cell invasion and dissemination and to aid in the development of new therapies.
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Brain Tumor Biology and Therapy Laboratory
The Brain Tumor Biology and Therapy Laboratory, is under the direction of Sameer Agnihotri, PhD, and has a focus on several topics:

• It is now appreciated that HGG glioma comprises of several molecular subgroups and that the genetics of pediatric and adult HGG are distinct. Therefore a “one size that fits all” approach to therapy will not be successful. The Agnihotri Laboratory interests include using next-generation sequencing technology to identify and validate driver alterations of various HGG with a focus on DIPG and non-histone mutated “RTK” Glioblastoma (GBM).

• A defining hallmark of glioblastoma and DIPG is altered tumor metabolism. The metabolic shift towards aerobic glycolysis with reprogramming of mitochondrial oxidative phosphorylation, regardless of oxygen availability, is a phenomenon known as the Warburg effect. In addition to the Warburg effect, glioblastoma tumor cells also utilize the tricarboxylic acid cycle/oxidative phosphorylation in a different capacity than normal tissue. The Agnihotri Laboratory investigates the metabolic dependencies of brain tumors and if they can provide therapeutic vulnerabilities.

• The lab uses the genomic and metabolic information to build better representative brain tumor pre-clinical models for testing of novel therapies. Working closely with a clinical team use of these accurate models are essential to start early phase clinical trials.

Pediatric Neurosurgery ImmunoOncology Laboratory
The Pediatric Neurosurgery ImmunoOncology Laboratory (PNIO) at the University of Pittsburgh, under the direction of Gary Kohanbash, PhD, seeks to develop novel immuno-oncology approaches to treat deadly pediatric central nervous system tumors. With over a decade of experience in translational brain tumor immunology and involvement in numerous clinical trials, the laboratory has a specific focus on high-grade and low-grade gliomas, and diffuse intrinsic pontine glioma (DIPG).

It is now known that immune cells can traffic into the central nervous system (CNS) and mediate anti-tumor responses. However, owing to its immune-privileged status and delicate brain structures, safety and efficacy must be considered in a different manner than tumors occurring outside of the CNS. With significant developments in next-generation sequencing, novel targets targeting pediatric CNS tumors are being identified.

The PNIO seeks to bridge the gaps between bioinformatics, non-invasive PET imaging, theranostics, preclinical studies, and patient care. Specific emphasis in the PNIO involve improving peptide vaccine immunotherapy through the following projects:

• Identification of novel targetable tumor antigens and neoantigens.
• Employing novel combination therapies with peptide vaccine immunotherapy.
• Identification of biomarkers for CNS immuno-oncology clinical trials.
• Development of non-invasive immunoPET imaging of activated T-cells to predict response or resistance to immunotherapy.
• Theranostic targeting and monitoring of tumor-associated myeloid cells (TAMCs) including MDSCs and TAMs in brain tumors.
• Single-cell RNA-sequencing to identify immune-cell and tumor cross-talk as well as T-cell clonal expansion.
• Development of T-cell receptor engineered T-cell (TCR-T) adoptive cell therapies.
National TBI Biospecimens Repository

A national repository of biological samples from patients who have sustained traumatic brain injuries (TBIs) has been established in the Department of Neurological Surgery at the University of Pittsburgh. This biorepository supports the Transforming Research and Clinical Knowledge in Traumatic Brain Injury (TRACK-TBI) study, a multi-center initiative funded by the National Institutes of Health (NIH) that is intended to revolutionize clinical care for brain-injured patients. A central goal of the TRACK-TBI biorepository is to identify blood-based biomarkers that can assist hospital-based clinicians in diagnosing TBIs and allow industry partners in the laboratory to identify new, effective treatments. Three thousand participants who have sustained a TBI have been recruited into the TRACK-TBI study, and a large, high-quality database of clinical, imaging, biomarker, and outcome data has been generated and is actively curating and publishing results.

In collaboration with the TRACK-TBI coordinating center at the University of California San Francisco (led by Geoff Manley, MD, PhD) and our 17 U.S. partner sites, David Okonkwo, MD, PhD, and Ava Puccio, RN, PhD, at the University of Pittsburgh received a large supplemental award from the U.S. Department of Defense to establish the TRACK-TBI biorepository. Following laboratory renovations and certification in February 2016, the Department of Neurological Surgery at the University of Pittsburgh became the official new home of the TRACK-TBI biospecimens repository.

The TRACK-TBI biorepository is 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-funded studies have recognized the expertise of the biorepository and are utilizing the biorepository efforts.

• “Front-Runner” Biomarkers for Diagnoses/Ongoing Abbott Laboratories Pivotal Trial

The partnership with the TRACK-TBI effort has already borne fruit, with an early indication from the pilot work on a biomarker of interest, glial fibrillary acidic protein (GFAP), a brain-specific protein released into serum as a pathophysiological response to TBI. Based on the initial TRACK-TBI sample set (215 patients), the measurement of GFAP in blood has been shown to be effective in identifying patients with a high likelihood of having abnormal pathology seen on a CT scan, and was validated in a larger sample set. GFAP and UCH-L1 were recently approved by the FDA for clinical use in identifying patients unlikely to have lesions on head CT when measured in serum in the acute phase after injury. Abbott Laboratories received FDA clearance for their rapid handheld TBI blood test in January of 2021. The Neurotrauma Clinical Trials Center (NCTC), under the direction of David O. Okonkwo, MD, PhD and Ava M. Puccio, RN, PhD, are currently researching this blood test in an acute TBI population under a FDA pivotal trial.

Cerebral Aneurysm Research Lab

Cerebral aneurysms are common vascular lesions seen in up to five percent of the population, that, when ruptured, can lead to catastrophic consequences with up to 50 percent mortality and morbidity. The cerebral aneurysm research lab aims to further the understanding of molecular pathways underlying cerebral aneurysm formation in order to induce repair and prevent rupture. Current research efforts are directed by resident Kamil W. Nowicki, MD,
PhD, under the joint mentorship of Robert M. Friedlander, MD, and Bradley Gross, MD. Techniques and models used in the lab depend heavily on molecular cell biology, animal surgeries and biomedical engineering to study immune cell behavior in response to chemokines and their interactions with hemodynamic shear stress. Current projects include:

- **Role of Platelets in Cerebral Aneurysm Formation and Healing**
  This project is actively exploring the role of platelets and inflammatory cytokines released by platelets in cerebral aneurysm formation. Current efforts are directed on using small molecule inhibitors in preventing aneurysm formation.


  Recently, the research team was selected to participate in the **Pitt Ventures: First Gear 2021** program to explore the road towards commercialization.

- **Role of Hemodynamic Shear Stress in Cerebral Aneurysm Formation**
  This study utilizes a novel in vitro model that simulates flow conditions within human aneurysms to induce inflammation and secretory chemokine response. Previous work showed that hemodynamic shear stress induces aneurysm formation via interleukin-8 and CXCL-1 mediated neutrophil inflammatory response. That work resulted in a patent application UFTINV-200015 T17844 "Drug therapy to prevent formation or enlargement or rupture of aneurysms." A follow-up paper was able to show that this inflammatory response results in M1/M2 macrophage imbalance, driving aneurysm formation. More recently, efforts have been shifted towards a more advanced design of in vitro devices to allow for more detailed future studies of inflammation in aneurysm formation.

- **Biomarker Discovery and Platform Development – Cerebral Aneurysm Detection**
  Ongoing study focusing on biomarker discovery to arrive at a blood test for cerebral aneurysm formation. Currently in animal model and human retrospective study stage with future efforts directed at a prospective IRB-approved study. This project was also selected to participate in the **Pitt Ventures: First Gear 2022** program to explore the road towards commercialization and resulted in a patent application: Pitt ID-05734 "Methods of detecting cerebral aneurysms." U.S. Provisional Application #63/306,530 (University of Pittsburgh/UPMC, submitted July 19, 2021).

- **Biomarker Discovery and Platform Development – Cerebral Vasospasm Detection**
  New study being led by University of Pittsburgh medical student Adi Mittal. This project will attempt to fuse clinical data and inflammatory biomarkers to arrive at a blood test to detect and/or predict cerebral vasospasm after subarachnoid hemorrhage.

- **Novel Endovascular Medical Devices**
  New ongoing collaboration with Seungil Kim, PhD, and William Wagner, PhD, from the University of Pittsburgh Department of Biomedical Engineering that is moving from in vitro to in vivo phase. This project is exploring novel pH-responsive embolic agents and designer alloys for endovascular treatment of cerebral aneurysms. Recently, it resulted in a patent application: Pitt ID-05854 "Bioabsorbable metallic alloy coils coated with a polyurethane-based on fatty amide functional groups for treating intracranial aneurysms (IA) and Renal artery aneurysms (RAAs)." U.S. Provisional Patent Application #63/288,847 (University of Pittsburgh/UPMC, submitted October 25, 2021).
Research

**Spinal Cord Stimulation Laboratory**
The Spinal Cord Stimulation Laboratory, under the direction of Marco Capogrosso, PhD, and part of the University of Pittsburgh Rehab and Neural Engineering Labs, broadly studies the interactions between electrical stimulation and spinal cord circuits. Specifically, laboratory activities are focused on three areas of interest.

- **Area 1: Biophysics of spinal cord stimulation.**
  We use computer simulations, Finite Element Methods and modern AI strategies to decipher the computational principles underlying the interaction of artificial electrical stimulation and the neural dynamics of spinal circuits. Specifically, we aim to understand how artificial inputs can be transformed into coordinated movements by the spinal cord.

- **Area 2: Electrophysiology of spinal circuits and mechanisms of neuromodulation.**
  We perform electrophysiology in animal models such as rats, and monkeys to understand how the spinal cord and the brain integrate electrical stimulation within ongoing neural dynamics. We aim to combine results from computer models to experimental data to optimize neurostimulation technologies and design new effective therapies to motor paralysis.

- **Area 3: Clinical applications of spinal cord stimulation in motor disorders.**
  We apply the results of our basic studies in translational clinical trials in patients that suffer from motor disorders such as stroke, spinal cord injury and motoneuron diseases. Specifically, we aim to test new implantable technologies to improve motor and sensory functions in people with arm and hand paralysis.

**Cortical Systems Laboratory**
The Cortical Systems Lab, under the direction of Jorge A. González-Martínez, MD, PhD, is a neuroscience laboratory studying brain electrophysiology, cognition and language in patients undergoing epilepsy and movement disorder surgery. The overreaching goal of our work is to better understand the neurobiology of cortical-subcortical interactions in the normal and pathological human brain. The lab aims to develop new methods for brain mapping and therapeutic options for patients with medically refractory epilepsy and movement disorders, including neuromodulatory and resective procedures. The laboratory is highly integrated with the University of Pittsburgh Epilepsy Center and the Carnegie Mellon University Department of Biomedical Engineering.

- **Epilepsy Monitoring Unit (EMU)**
The laboratory clinical arm is the epilepsy monitoring unit, part of the University of Pittsburgh Epilepsy Center. The epilepsy center at the University of Pittsburgh is one of the leading epilepsy surgery programs in the world, with more than 5,000 adult patient-visit annually. The program offers the opportunity for comprehensive evaluation in a self-contained, eight-bed, adult epilepsy monitoring unit (EMU). The EMU features the latest technology including state-of-the-art, all digital video EEG equipment in private rooms. Operating around the clock, seven days a week, the unit is staffed by a dedicated team of nurses and EEG technologists specializing in epilepsy and overseen by staff epileptologists. The unit is part of the Comprehensive Epilepsy Center, a multi-disciplinary group of neurosurgeons, neurologists neuroradiologist, neuropsychologist, nurses, residents, and fellows who coordinate the care and research related topics for patients with medically refractory epilepsy. Patient Management Conference Meetings (PMCs) are performed weekly, on Mondays, where all aspects of patient care are discussed in an academic and teaching environment. Approximately 50 to 60 invasive monitoring procedures (SEEG) are performed per year in our center.
**Molecular Tumor Biology and Personalized Precision Therapy Lab**

The Molecular Tumor Biology and Personalized Precision Therapy Lab, under the direction of Pascal Zinn, MD, PhD, focuses on patient-centered care for brain and spinal tumors. Every patient is unique and so is every tumor; therefore, a personalized precision approach is fundamental to the treatment of tumors. Utilizing humanoid brain disease avatars or so-called brain organoid models, Dr. Zinn replicates the patient’s condition in the laboratory and thus studies how tumors form and how tumors can be treated using tumor genetics precision approaches. Furthermore, Dr. Zinn is developing personalized biologically-adaptable and patient-tailored, virus-based therapies for brain cancer.

**Translational Neuro Oncology Laboratory**

The Laboratory for Translational Neuro Oncology at the UPMC Hillman Cancer Center, under the direction of Kalil Abdullah, MD, is focused on developing novel clinical models of glioma and identifying druggable targets to facilitate early phase clinical trials.

Gliomas are intensely heterogenous tumors that not only contain numerous cell types, but also demonstrate the ability to transition between different phenotypic states. This complexity has made developing model systems that recapitulate human tumor biology both difficult and essential. Traditionally, models of gliomas are 2-dimensional cell lines and only represent certain subtypes of the highest-grade glioma, glioblastoma. This is because the unique biology of lower grade gliomas has prevented them from being studied either outside of the lab or in animals. Ex-vivo culture systems have been created allowing researchers to investigate critical aspects of the tumor microenvironment, immune response, and discover targets for therapy. Translational Neuro Oncology Lab researchers have previously shown the ability to establish lower grade glioma organoids in vitro, maintain those cultures for extended periods of time, hibernate, and then reanimate tumor tissue without loss of either genetic or phenotypic fidelity. This work also includes extensive and sophisticated live-cell imaging analysis that allows for longitudinal, non-invasive assessment of organoid response to treatment.

The organoid model systems, in addition to glioma stem cell and mouse models, allows researchers to perform highly sophisticated assessments of drug response across platforms, and identify rare but critical druggable targets in gliomas. These analyses include complex metabolic tracing and immune cell response assessment. Despite the fundamental principles of genomics, immunology, and cellular cancer biology that underlie this work, the Translational Neuro Oncology lab group focuses on projects that have high potential for immediate clinical translation. To that end, they maintain active collaboration with other laboratories and pharmaceutical companies worldwide. Because of the nature of their research, a close interplay between the neurosurgical operating room and the laboratory is paramount. As such, they have an expansive team of highly motivated scientists and clinical research coordinators that facilitate tissue acquisition, processing and analysis.

Over the past year, the lab has demonstrated several key findings. Researchers have demonstrated the first known ex vivo models of low-grade glioma that could be reliably reproduced and demonstrated faithful reproduction of the glioma microenvironment when compared to matched parental tumors (Abdullah et al, *Neuro Oncology*, 2021). Then, to develop a method to assess these surgically explanted organoids (SXOs), they used rapid live-cell microscopy to noninvasively assess tissue response to treatment which rivaled traditional immunohistochemical methods (Buehler et al, *Cancer Informatics*, 2021). Finally, with collaborators from Duke University, Translational Neuro Oncology Lab researchers have evaluated an exciting preclinical compound that induces telomeric damage in high grade gliomas that is being developed for use in clinical trials (Yu et al, *Clinical Cancer Research*, 2021).
Alba Tull Center for Neuro Imaging and Therapeutics

Impactful healthcare innovation results from an idea that progresses through the stages of clinical need identification, solution conception, prototyping, and commercialization. Additional progression through patent filing, FDA submission and approval, and partnering with industry may be necessary.

A center focused on fostering healthcare innovation provides the means to achieve this progression, either in the form of funding, informational resources, or expertise in a certain field, such as law or business, to assist with intellectual property disclosure or business development. Prior to reaching this stage, however, there is prerequisite prototyping, preliminary proof-of-concept work, validation of initial work, and team building.

The Alba Tull Center for Neuro Imaging and Therapeutics provides unmet needs in certain key areas not addressed in the current innovation ecosystem at Pitt. The center will occupy a unique niche that combines all the following characteristics:

1. A multidisciplinary community with an integrated physical and digital space. This is the key aspect of the AT Center, as it will serve as the initial starting point for innovators to gather. This can be a clinician with an unmet clinical need who otherwise does not have the time or expertise to prototype a solution. This can also be health science students who have strong interests in medical innovation and wish to get more involved but are unsure where to start or are overwhelmed by the current landscape of innovation at Pitt. This can be a law student with an interest in medical patenting but without formal access to such learning in their school, even though their expertise would be desperately needed by those in the health sciences who wish to start a company and patent their product. In addition, the creation of an online community and robust digital infrastructure, discussed in more detail below, is paramount to the success of this center in the modern era.

2. An inter-institutional community. Pittsburgh has a rich community with over nine different colleges in the area, yet there are very few ways to formally link students and faculty. Especially with CMU as our closest and most resource-rich neighbor, current connections exist informally and are disjointed. As will be discussed below, a symbiotic relationship specifically in the realm of medical innovation will be established, serving as a catalyst for extending the reach of the AT Center to the entire Pittsburgh area.

3. A focus on extended reality and artificial intelligence/machine learning (AI/ML). These so-called “exponential technologies” are widely utilized in the modern tech industry and business, while medicine has lagged in applying these technologies. Reasons for this include a culture reticent to adopt new technology, especially if current methods are acceptably accomplishing the job; a need to robustly validate emerging technology that can impact human lives; and overall lack of knowledge about new technological trends. This center will support technological development by taking advantage of our expertise in extended reality and AI/ML applications in medicine. The AT Center will help make these technologies more accessible to everyone.

4. A robust digital infrastructure that has embedded discussion feeds, project repository, and users. In the modern age and with increased remote work, this has become more crucial than ever. Creation of an online community allows discussion to happen anywhere and with anyone, minimizing barriers to entry for those with interest in medical innovation but would otherwise have no access to this community. A project repository serves as a database of all available and ongoing projects, allowing any user to introduce new ideas or explore existing projects while other users can join ongoing projects based on their skillset or interests.
This is the heart of the AT Center’s operations, serving as a “digital meeting space” for all members and acting as a platform to recruit new innovators.

5. **An ability to rapidly prototype, demo, and test a clinical solution.** Many makerspaces, machine shops, or labs exist throughout the Pitt community. Our space exists as an initial starting point that offers basic prototyping capabilities for those innovators/innovation teams who are starting. We can then redirect those members who require more extensive prototyping capabilities to our partnered innovation spaces across campus, or to the larger innovation institutes around Pitt. In the case of the latter, we will assist with grant applications for funding. This space is meant to invite in anyone with an innovative solution to a clinical problem, no matter where that idea is on its path to implementation and nurture its growth.

6. **Accessibility due to its physical proximity to clinicians and members of the health sciences community.** At the core of all medical innovation, need, effectiveness, and minimal disruption in clinical flow (at least in the adoption stage) drive the outcome and success of an idea. Ideas tend to originate in the clinic and validation tends to occur in the clinic. Therefore, having proximity to both clinicians and their clinics is integral for success and growth. This will increase the AT Center’s chances of capturing clinicians with an innovative idea since the space is physically easy to visit and is digitally accessible. This should reduce risk of ‘idea launch failure’, which may in turn increase innovation output from the health science that we can direct the surrounding innovation community.

7. **Biomedical focus.** Many makerspaces and innovation centers exist on campus, but this will be the first all encompassing, “one-stop-shop” for all biomedical specific innovation and entrepreneurial activities on campus. This center serves to integrate established innovation institutes by creating a coherent, immersive, collaborative medical innovation community.