

Department of Neurological Surgery

Pivoting the Future





Department of Neurological Surgery Specializations

Cerebrovascular/Neurointerventional Surgery

Chiari and Craniovertebral Junction Surgery

Epilepsy and Functional Neurosurgery

Neurosurgical Oncology

Pediatric Neurosurgery

Peripheral Nerve

Spine Surgery and Disease

70 Faculty Members



117,578 In-Person Visits



110 Advanced Practice Providers



5,956 Virtual Visits



16,875 Surgeries and Procedures





Data collected from 2015-2020

36 Residents & Fellows



Over **1,110** Peer-Reviewed Papers Published



Over **\$38,444,429** in NIH Funding



Top-Ranked Neurosurgery Program Six Years in a Row



The last six years have been a time of incredible change and growth for the Department of Neurological Surgery at Northwestern Medicine (NM). I would like to take this opportunity to highlight many of the accomplishments we have achieved.

First and foremost, we have consolidated our clinical enterprise into a single department across all of NM, the healthcare system that serves patients at over 200 sites across the Chicago metropolitan area and suburbs, including 11 hospitals. This has been a tremendous endeavor supported by NM leadership and has allowed us to establish a formidable physician workforce at one of the leading academic medical centers in the United States. Moreover, we now represent one of the largest departments of neurological surgery in the country, with over 50 faculty in total (35 MDs: 28 adult and 7 pediatric as of 2021, and 15 PhDs). 21 additional faculty have secondary appointments in our department, bringing the total to 71. Of note, the department is home to over 170 faculty, residents, nurses, administrators and professional staff. Our national reputation and ranking have consistently been ranked in the top 10 in the USA, according to the 2020 U.S. News & World Report.

THE FUTURE

As NM has emerged as one of the largest and premier healthcare systems in the nation, we have an amazing opportunity to champion neurosciences across the NM system. In 2021, we initiated the formation of a neuroscience service line across NM. The creation of a neuroscience service line offers us an unprecedented opportunity to enhance access for patients throughout the region and leverage our brand to provide the best and most expedient access to outstanding care, participation in clinical trials, and innovative treatments for neurological disorders. In partnership with Dimitri Krainc, MD, PhD, the Chair of Neurology at Northwestern, and the Department of Neurology, we are in the process of integrating several programs across NM including epilepsy, movement disorders, neuro-oncology and stroke. We have an amazing responsibility to implement a quality program throughout the system with objective metrics and data, allowing us to not only enhance our overall value to society, but also to further optimize clinical and research operations throughout NM.

The process of clinical integration anticipates a dynamic and growing system that is likely to evolve over the coming years. New hospitals and new clinical entities that join our dynamic healthcare system will create tremendous opportunities for integration of clinical care, as well as basic and clinical research. In 2021, Palos Health joined NM. With this expansion, as well as the merger with Centegra Health System in 2018, we plan to recruit additional neurosurgeons to support growth of our programs in these new geographies and ensure we are delivering the highest quality of care throughout the NM system.

While we continue to provide outstanding and integrated care, we will also innovate in our laboratories and develop new and cutting-edge therapies for both chronic and incurable diseases. Our faculty in the department have published over 1,100 peer-reviewed papers over 2015-2020. We have a unique responsibility to leverage the National Institutes of Health (NIH) support in order to make a difference in the lives of our patients and bring forth an agenda which allows patients access to therapies which are not available elsewhere and therefore unique to NM. Our robust clinical trials network provides unprecedented access to patients and opportunities to develop and secure new therapies; this endeavor must extend beyond neuro-oncology and we are committed

to investing in and developing our clinical trial portfolio in other areas within and relevant to our field. The recruitment of several talented faculty in these areas will help solidify our national and international position as a preeminent institution with regard to neurosurgical research.

Since medical student and resident education is at the heart of our program, we must continue to attract and recruit the best minds in the world to our program. Our clinical volume and acuity, our state of the art laboratories, and the patient centered culture of NM offer unique opportunities for talented people to leave a lasting mark on society. We aspire to create international leaders in neurosurgery who can take advantage of the unique offerings of our program and develop the capacity and competencies to change the world.

Finally, since our department is home to leading international faculty, it is imperative that we continue to further develop on our existing collaborations to reach patients in every part of the world. We are an international program that fosters the exchange of students and physicians from around the world, as we all benefit from educating one another and eradicating barriers which can sometimes occur in the setting of isolationism. We can offer patients from around the world access to the best of care and leverage collaborations to forward the latest scientific discoveries which will drive new and novel therapies.

The department is deeply thankful to administrative leadership which has been formed over the past six years and which tirelessly works each day to fulfill on our vision and mission of becoming the best department of neurosurgery in the country: Elizabeth Fankhanel, MBA, our Departmental Administrator; Dawn M. Rose, JD, CHHR, our Director of Planning & Human Capital; Mecca Johnson, MBA, our Regional Manager; and Antoine Curtis, MBA, our Practice Manager. Most importantly, we are indebted to all of our nurses, advanced practice providers, medical assistants, technicians, scientists, and other staff who help to ensure and implement the vision and mission of our department.

None of our work would be possible without the visionary leadership of our NM CEO, Dean M. Harrison and the Dean of the Feinberg School of Medicine, Eric G. Neilson, MD. The Department is deeply grateful for the support of the President of Northwestern Medical Group, Howard B. Chrisman, MD, MBA; the President of the Regional Medical Group, Patrick J. Towne, MD; the President of the North Region, Thomas J. McAfee; the Vice-President for Northwestern Medical Group, Patrick M. McCarthy, MD; and our Chief Financial Officer, John A. Orsini, CPA.



Maciej S. Lesniak, MD, MHCM,
Michael Marchese Professor, and Chair
Department of Neurological Surgery
Northwestern University Feinberg School of Medicine
Neurosurgeon-in-Chief
Northwestern Memorial Hospital



CEREBROVASCULAR PROGRAM



In 2015, Babak Jahromi, MD, PhD, and Matthew Potts, MD, were recruited as dual-trained open and endovascular neurosurgeons to rebuild the cerebrovascular neurosurgery program. As part of a multidisciplinary team of neurosurgeons, neurologists, and radiologists, they provide surgical/endovascular care for stroke patients at Northwestern Memorial Hospital (NMH), with emphasis on cross-departmental collaboration and shared decision-making. Over the past six years, this has led to >40 percent increase in minimally invasive neuro-endovascular procedures, >3-fold increase in thrombectomies for acute stroke, and nearly 100 open cerebrovascular procedures at NMH in 2020 alone, drawing patients with complex disorders from across Illinois and surrounding states. Importantly, in collaboration with Neurology and Radiology leadership, Dr. Jahromi successfully shepherded NMH's first-ever application (2016) and subsequent re-accreditation (2018) through Joint Commission certification as a Comprehensive Stroke Center, resulting in NMH being awarded the 2019 "Stroke Gold Plus" and "Honor Roll Elite Plus" by the American Heart Association (highest levels achievable in both categories). Drs. Jahromi and Potts work alongside our colleagues in Radiology, Ali Shaibani, MD, Sameer Ansari, MD, PhD, and D. Robinson Cantrell, MD, to provide neurovascular care.

Programmatic contributions of the division include (a) creation and leadership of a weekly system-wide neurovascular case conference where patients with complex stroke and cerebrovascular disorders are reviewed by faculty from NM and affiliated hospitals (including Ann & Robert H. Lurie Children's Hospital and Shirley Ryan AbilityLab) to reach consensus regarding diagnosis and management, (b) expansion of on-site vascular neurosurgery clinics to our regional locations in the West and North suburbs of Chicago, (c) development of an ongoing quarterly EMS education series, (d) organization of numerous regional physician stroke CME events, (e) national recognition of NMH as a site of excellence for brain hemorrhage care and clinical trials (highest enrollment in Illinois in MISTIE-3, currently highest enrolling center in the Midwest in MIND), (f) CAST accreditation of the Northwestern Neuro-endovascular Fellowship training program (2019) and graduation of its first accredited fellow (2020), as well as (g) more than **90 peer-reviewed publications**, numerous invited talks and mentorship of multiple research fellows by the NMH cerebrovascular and neurointerventional faculty over 2015-2020.



Babak S. Jahromi, MD, PhD,
Vice Chair, Regional Neurosurgery



Matthew B. Potts, MD



Northwestern Medicine
Stroke and
Cerebrovascular Care



Co-Directors of the
Northwestern Medicine
Center for Spine Health
Tyler R. Koski, MD, and
Alpesh A. Patel, MD, FACS



Nader Dahdaleh, MD,
Director, Neurosurgery
Residency Program

SPINE PROGRAM

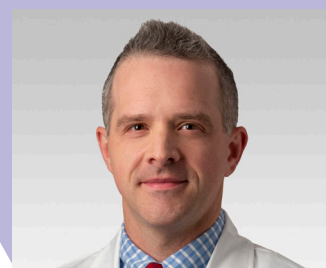
A fundamental part of neurosurgical practice is the evaluation and treatment of patients with spinal disorders. In the summer of 2021, under the direction of Tyler Koski, MD (Neurosurgery), and Alpesh Patel, MD, FACS (Orthopaedics), the Northwestern Medicine Center for Spine Health launched to combine efforts among neurosurgeons, orthopedic spine surgeons, physiatrists, physical therapists, radiologists, and pain specialists to offer patients a comprehensive, integrated service for spinal related disorders. The new center is housed in the Lavin Pavilion and is transforming the care of patients who suffer from one of the most common pathologies impacting people today.

Our spine program has been further expanded into areas previously under-served by NM. In 2017, we successfully recruited Jean-Paul Wolinsky, MD, a leading international authority in spinal oncology, as a Professor of Neurosurgery and Director of Spinal Oncology at NM. He was previously a Professor of Neurosurgery at Johns Hopkins Medicine and the clinical director of the institution's Neurosurgical Spine Center. Dr. Wolinsky has been an extraordinary physician-scientist, an eager and insightful researcher in the laboratory whose studies have led to the publication of over 200 peer-reviewed articles and patents pertaining to advances in spinal oncology and reconstruction. Since 2018, he has served as Vice Chair for Strategic Planning and Finance in the department and his presence has been transformative, not only with regard to exponential growth of the spinal oncology program, but also in departmental leadership.

Two new faculty members joined our practice in 2020. Geoffrey P. Stricsek, MD, who completed a residency in neurological surgery at Thomas Jefferson University in Philadelphia and subsequently two fellowships in complex spine surgery (one at Jefferson and the second at Emory), joined us to focus on complex degenerative spine surgery. Kevin Swong, MD, who completed his residency at Loyola University Medical Center and a fellowship in complex and minimally invasive spine surgery and peripheral nerve surgery at the University of Michigan, will focus a significant part of his practice on building and developing the peripheral nerve surgery program at NM. The scientific work performed by the spine group in neurosurgery has led to over **240 peer-reviewed publications.**



Aruna Ganju, MD



Geoffrey P. Stricsek, MD



Kevin Swong, MD



Jean-Paul Wolinsky, MD,
Vice Chair, Strategic
Planning and Finance



EPILEPSY PROGRAM

The epilepsy surgery program continues to expand both locally and internationally. In addition to Joshua Rosenow, MD, the department recruited S. Kathleen Bandt, MD, in 2017 from Yale University, where she completed a neurosurgical fellowship in epilepsy. As a result, since 2017 we have increased our surgical volume by 157 percent. NM is well positioned to be the leading surgical epilepsy program in the region and one of the leading surgical epilepsy programs in the United States, performing about 100 epilepsy related procedures per year.

Dr. Bandt has spearheaded the NM system's integration process for the epilepsy program, work which has not only expanded patient recruitment for surgery, but has also expanded epilepsy services to Central DuPage Hospital and Lake Forest Hospital, and facilitated cross-collaboration of patients throughout the NM system. In partnership with the Department of Neurology, the epilepsy program recently launched a "First Seizure Clinic" which will continue to support these expansion efforts, in addition to the development of new Epilepsy specialty clinic locations in the North, Northwest, and South suburbs. Additionally, new epilepsy specialty clinics across the system are being explored.

There have been two new physician recruits to the NM epilepsy team – Yara Mikhaeil-Demo, MD, who is working to build an adult ketogenic diet program, and Alexa King, MD, a current fellow who joined the team in 2021. Dr. King will expand NM's Women with Epilepsy Program into the West suburban hospitals and will work to develop a pediatric-to-adult transition clinic at both Central DuPage Hospital and NMH. We have also initiated the Epilepsy Second Opinion Program through the International Office to expand NM's epilepsy surgery offerings to patients around the world. We are working closely with epilepsy neurologists in Doha, Qatar and Abu Dhabi, UAE to provide expert second opinions. This second opinion initiative resulted in the completion of our first epilepsy surgery being performed on an international patient from Qatar, with two additional surgeries scheduled for 2021.

On the research front, Dr. Bandt has championed the introduction of advanced computational analysis of neuroimaging data for epilepsy care. Patients with cryptogenic epilepsy (i.e., those with a visually normal MRI) are some of the most challenging patients to treat. Her research in this area, supported by an NIH grant, has the potential to offer advanced computational algorithms to these patients and to redefine the care they receive.



Joshua M. Rosenow, MD, Director of Functional Neurosurgery, and S. Kathleen Bandt, MD



FUNCTIONAL & MOVEMENT DISORDERS PROGRAM

Under the leadership of Dr. Rosenow, the NM Functional Neurosurgery program continues to grow and solidify its place as the premier program in the Chicagoland area. The clinical integration project for epilepsy in 2020 saw new processes implemented that significantly improved patient access, enhanced the coordination of care, and reduced waiting times for both patient appointments and surgery dates. A similar process was initiated for the system-wide functional/movement disorders program which has resulted in harmonization of clinical data collection between NMH, Central DuPage Hospital, and Lake Forest Hospital; an expansion of research protocols already in place at NMH to Central DuPage Hospital; and development of a long term strategic plan for the health system which includes expansion of sub-specialty clinics and clinical trials and the development of system-level patient registry for Movement Disorders. NM continues to be the highest volume neurosurgical program in the region for deep brain stimulation surgery and neurostimulation for pain, attracting patients both nationally and internationally.

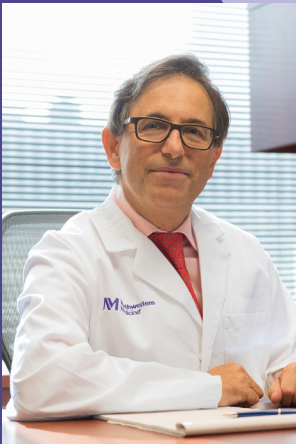
NM's reputation as a premier clinical and academic functional neurosurgery program has helped us attract innovative research trials. The restorative neurosurgery research program continues to expand with three new gene therapy trials beginning for Parkinson's Disease. NM is in line to be the first to complete a human implant of gene therapy treatment for Huntington's Disease; these trials required working with NMH, Northwestern Feinberg School of Medicine, and Central DuPage Hospital administrators to facilitate these studies at both campuses. This represents a major step forward for Central DuPage Hospital, the NM system and our research program overall. Other novel device trials are being implemented including a trial of a new vagus nerve stimulator for rheumatoid arthritis. In conjunction with the Shirley Ryan AbilityLab, we are working on trials of a minimally invasive cerebral cortical stimulator for stroke rehabilitation, spinal cord stimulation for spinal cord injury recovery, and a brain-computer interface for stroke rehabilitation. We continue our decade-plus funded program in transcranial magnetic stimulation for brain injury recovery and our collaborations in brain-computer interface for enhancement of function following spinal cord injury. The program continues to be involved in several ongoing device trials for neurostimulation for pain and Dr. Rosenow's collaborations with radiology on deep brain stimulation and magnetic resonance imaging have resulted in his co-PI positions on a newly-funded NIH grant.

The scientific work performed by Drs. Bandt and Rosenow in the areas of epilepsy and functional/movement disorders has led to over **50 peer-reviewed publications**.

NEURO-ONCOLOGY PROGRAM



James P. Chandler, MD,
Vice Chair, Clinical
Affairs



Roger Stupp, MD,
Director, Neuro-
Oncology Program



Amy B.
Heimberger, MD, FAANS,
Scientific Director

Our neuro-oncology program is widely considered one of the best in the country. In 2017, Roger Stupp, MD, was recruited from Switzerland. He is the world's leading authority on the treatment of malignant brain cancer. His addition to our team firmly established the leadership of our program under the guidance of a highly successful physician who has championed several therapeutic strategies to gain United States Food and Drug Administration (FDA) approval for the treatment of a deadly disease. Dr. Stupp was appointed the co-director of the Northwestern Medicine Lou and Jean Malnati Brain Tumor Institute of the Robert H. Lurie Comprehensive Cancer Center of Northwestern University at Northwestern Memorial Hospital as well as the Director for Strategic Initiatives at the Robert H. Lurie Cancer Center at Northwestern.

The establishment of the Malnati Brain Tumor Institute (MBTI) with a \$10 million gift by the Malnati family, as a result of their life-long relationship with James Chandler, MD, has transformed the care of neuro-oncology patients at NM. The gift, along with institutional support, has allowed us to develop a new state-of-the-art outpatient clinic in the Galter Pavilion dedicated to the care of patients with brain and spinal cord tumors. The expanded footprint of the new space allowed for significant expansion of clinical operations, resulting in a 42 percent increase in clinic volume and corresponding 33 percent increase in surgical volume. Furthermore, under the leadership of MBTI co-directors, Drs. Chandler and Stupp, the MBTI has become a national model of integrated care, where neurosurgeons, neuro-oncologists, radiologists, and radiation oncologists work side-by-side to provide one stop point-of-care, allowing patients to receive seamless and coordinated care without need for multiple appointments and visits to the system.

In 2017, the department recruited Adam Sonabend, MD, a neurosurgeon and scientist from Columbia University in New York. Since coming to NM, Dr. Sonabend has become a principal investigator on two active NIH Research Project Grants (R01). His innovative translational brain tumor research has led to his successful filing of an Investigational New Drug application to the FDA. He also serves as a principal investigator for a National Cancer Institute sponsored first-in-human clinical trial using a novel ultrasound-based blood-brain barrier opening device for brain tumor patients. In addition to his research, he has built a robust clinical practice, focusing on the surgical management of tumors of the brain and skull base.

As a native of Mexico City, Dr. Sonabend is dedicated to improving the quality of care within the Hispanic and Latin community. In 2018, under the leadership of Dr. Sonabend, the Department launched the Hispanic Brain and Spine Tumor Program at NMH, a multidisciplinary group of neurosurgeons, neuro-oncologists, radio-oncologists, clinical and administrative staff that work together to make brain and spine tumor care more accessible for the Hispanic and Latin populations by removing cultural and linguistic barriers and allowing patients to speak in their native language. From the moment a phone call is made to book an appointment to visits to the outpatient clinic and inpatient hospital setting, all interactions are completed in Spanish. We even perform intraoperative language mapping in Spanish for resection of brain tumors in awake patients to preserve eloquent brain regions that are specific for every language. In the first year since we initiated this program, the volume of

Under the leadership of Drs. Lesniak, Stupp, and James, the department secured a National Cancer Institute Specialized Program of Organized Research Excellence (SPORE) grant in 2018. This \$11.5 million NIH grant supports cutting-edge translational research with a focus on early phase clinical trials for patients with malignant brain cancer. It is one of the most prestigious of awards recognizing an outstanding team of physicians and scientists working together to advance the care of neuro-oncology patients. With it, NM joined the ranks of top facilities in the field as a premier place for neuro-oncology research.



Stephen Magill, MD, PhD



Adam M. Sonabend, MD



Matthew C. Tate, MD, PhD

Hispanic and Latin neuro-oncology patients increased by 20 percent, and the number of Hispanic and Latin patients Dr. Sonabend saw increased by 280 percent. This program is the first of its kind, and has received significant media attention. The program has been featured on TV interviews by NBC News and Telemundo highlighting the story and testimonial of an international patient that came to Chicago from Mexico for brain tumor surgery and management.

Under the leadership of Matthew C. Tate, MD, PhD, NM now performs the largest number of awake craniotomies for tumors in eloquent areas of the brain in the Chicagoland area. Dr. Tate has provided unprecedented opportunities to patients who are not deemed surgical candidates elsewhere due to the location of the tumor, by offering a sophisticated brain mapping technique which allows for safe and effective resection of tumors. He has masterfully combined his clinical practice with research, and co-principal investigator on a new NIH R01 grant (awarded in 2020) focusing on high-resolution infrared thermal imaging for simultaneous functional mapping of the entire craniotomy in awake patients.

In July 2021, the neurosurgical oncology group further expanded via the addition of Stephen Magill, MD, PhD. Dr. Magill is an impeccable physician-scientist who completed his training in neurological surgery at University of California San Francisco (UCSF) where he focused his training on skull base tumors. After completing his residency at UCSF, he became a fellow in minimally invasive cranial and skull base neurosurgery at The Ohio State University. His career goal is to build a busy clinical practice as a tumor and skull base surgeon and to continue to advance patient care through clinical and translational research. His clinical research has focused on surgical outcomes for recurrent aggressive meningiomas, culminating in the launch of a prospective meningioma patient registry and a 40-site, 953 subject, international retrospective outcomes study of tuberculum sellae meningiomas. Dr. Magill will continue working to determine the molecular pathways that drive meningioma proliferation and invasion with the goal of translating those findings into the development of novel therapeutics for recurrent meningioma.

The scientific work performed by the neuro-oncology group within neurosurgery has led to over **560 peer-reviewed publications** from 2015-2020, with total brain tumor funding across NM exceeding \$60 million in 2020.



Sandi Lam, MD,
Vice Chair, Pediatrics



The scientific work performed by pediatric neurosurgical faculty has led to over **170 peer-reviewed publications**.



PEDIATRIC PROGRAM

While the pediatric neurosurgery program is housed at the Ann and Robert H. Lurie Children's Hospital of Chicago (Lurie Children's), it is an integral and vital part of the department at NM. Our pediatric neurosurgical faculty are not only active clinicians, but also educators and scientists who are working to advance the care of pediatric patients affected by neurosurgical disorders.

It is worth highlighting several firsts. Robin Bowman, MD, has championed the fetal neurosurgery program at Lurie Children's and in the last six years has built one of the largest fetal neurosurgery programs in the United States. Our colleagues just celebrated 10 years of endonasal endoscopic pediatric skull base surgeries and, in 2020, were the first to champion endoscopic-assisted epilepsy surgery, laser ablation, and neurostimulation implants for epilepsy, as well as leading novel clinical trials focusing on pediatric brain-stem tumors.

In 2019, the divisional leadership underwent a transition, with our combined recruitment of Sandi Lam, MD, MBA, as the Chief of Pediatric Neurosurgery and Vice Chair of Pediatrics in the Department of Neurological Surgery at Northwestern University. Dr. Lam joined us from Texas Children's Hospital. She is an expert in pediatric vascular disease, though her clinical expertise extends to the treatment of epilepsy and primary brain tumors, as well. Throughout her career, she has championed outcomes-based research in neurological surgery and has obtained additional training in health policy and management as well as outcomes. As a member of the Center for Ethics and Healthy Policy at Baylor, she has written extensively on the topic. She has been funded by multiple organizations to examine patterns of care in pediatric epilepsy, as well as to define methodologies for comparative effectiveness of surgical treatments in pediatric hydrocephalus.

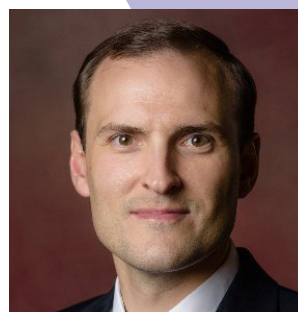
In 2021, our pediatric faculty has been further expanded with the addition of Michael DeCuyper, MD, PhD. Dr. DeCuyper came to us from his position at St. Jude's Children's Hospital and the University of Tennessee Health Science Center/Semmes-Murphy Neurologic and Spine Institute in Memphis, Tennessee. He completed his MD and PhD at University of Tennessee and continued on with his neurosurgery residency training there under the chairmanship of Frederick A. Boop, MD. He then traveled to Australia for a minimally invasive neurosurgery/



Tord D. Alden, MD



Robin Bowman, MD



Michael DeCuyper, MD, PhD



Arthur J. DiPatri, MD



Tadanori Tomita, MD

complex intracranial and skull base endoscopy fellowship with Charlie Teo, MD, prior to completing an additional pediatric neurosurgery fellowship at St. Jude's Children's Hospital in 2017. Dr. DeCuyper will be a dynamic complement to the department, leading clinical trials and translational research in pediatric neurosurgery at Lurie Children's as our pediatric neurosurgery faculty builds one of the best pediatric neuroscience programs in the country.

Lastly, we must not forget that the clinical program at Lurie Children's supports neurosurgical education not only at Northwestern but throughout Chicago. Residents from Rush Medical Center, University of Illinois, and Loyola University routinely rotate with our pediatric faculty to obtain sufficient knowledge and surgical exposure in the entire scope of pediatric neurosurgery. Our faculty, therefore, represent a unique and important resource in the Chicago metropolitan area, since the training of so many residents and the vitality of so many programs depend on our pediatric clinical and research enterprise.

REGIONAL PROGRAM

An amazing aspect of our healthcare system is that we provide neurosurgical services across multiple sites at NM. Although NM is anchored in the central region at our downtown Chicago campus, our neurosurgical practice spans across multiple hospitals in the western suburbs (Central DuPage Hospital, Delnor Hospital, Kishwaukee Hospital), northern suburbs (Lake Forest Hospital, Huntley Hospital, McHenry Hospital), and south suburbs (Palos Hospital). The level of care we provide is only matched by the sophistication offered through the availability of the intraoperative MRI and proton beam at Central DuPage Hospital. To help ensure smooth operation and communication across the system, Dr. Babak Jahromi was appointed in 2018 as the Vice Chair for Regional Neurosurgery, a position in which he has provided outstanding leadership and total commitment.

Our program in the western suburbs is anchored at Central DuPage Hospital. In 2016, the department recruited Osaama Khan, MD, MS, a fellowship-trained skull base neurosurgeon, to help provide cutting-edge care to patients in the western suburbs and beyond. Since then, Andrew Chenelle, MD, MS, was appointed as the Chief of Neurosurgery and thanks to his invaluable input, we have continued to grow our practice and optimize our clinical care. In addition to Drs. Khan and Chenelle, our providers in the western suburbs include John Brayton, MD, Sheri Dewan, MD, Peter Lee, MD, and Taras Masnyk, MD.

In the North Region, Michael T. Walsh, MD, was recruited in 2016 to develop a neurosurgical practice at Lake Forest Hospital. His addition has cemented our presence at the new hospital which opened in 2018. With the merger involving the Centegra System (Huntley, McHenry, and Woodstock Hospitals), we have realigned the northern suburbs to involve our neurosurgical practice at Lake Forest Hospital, Huntley Hospital, and McHenry Hospital. To help in this endeavor, Alex Jones, MD, was recruited from Loyola University and George DePhillips, MD, a 1991 graduate of the Northwestern Neurosurgery Residency program, will be joining our expanding neurosurgical efforts. Drs. DePhillips and Jones will join Dr. Walsh as we provide neurosurgical services at Lake Forest Hospital, McHenry Hospital, and Huntley Hospital.

In September 2021, Drew Spencer, MD, will be joining the program in the south suburbs at Palos Hospital. Roxanna Garcia, MD, MS, MPH, will join the program in September 2022 after completion of a critical care fellowship at University of Chicago. We continue to retain top talent to develop new programs across the Chicagoland area.

Importantly, NM and our physicians have developed a neuroscience program at Edward Hospital in Naperville. Along with our colleagues in neuro-radiology, we provide neurosurgical and stroke care at Edward Hospital. We currently have three neurosurgeons at Edward Hospital, including Kevin Jackson, MD, Michael Caron, MD, and William Schueler, MD, who have a long-standing relationship with Edward.





John Brayton, MD



Michael J. Caron, MD



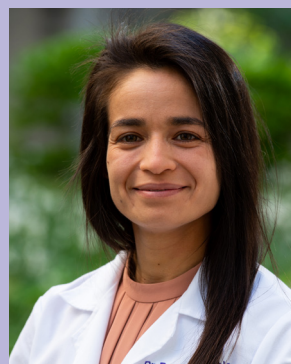
Andrew Chenelle, MD, MS



George DePhillips, MD



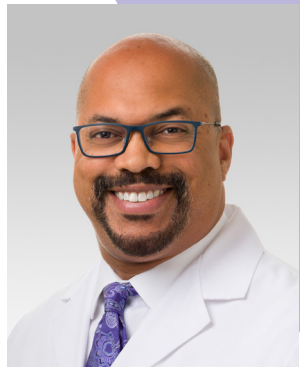
Sheri Dewan, MD



Roxanna Garcia, MD, MS, MPH



Osaama H Khan, MD, MS



Kevin M. Jackson, MD



Alexander Jones, MD



Peter Lee, MD



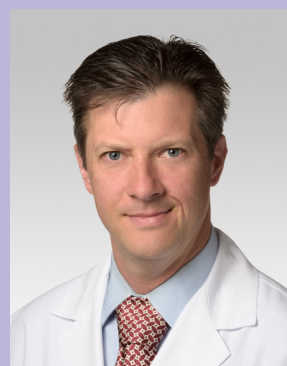
Taras Masnyk, MD



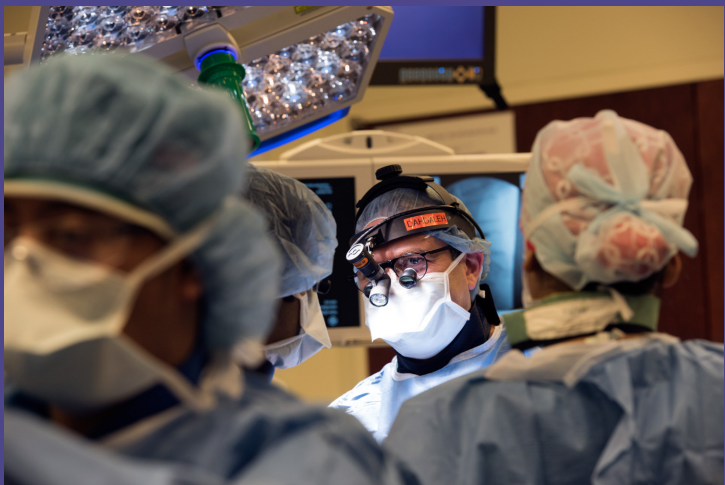
William Schueler, MD



Drew A. Spencer, MD



Michael T. Walsh, MD



Nader Dahdaleh, MD, Program Director



RESIDENCY PROGRAM

Since 2015, our residency program in neurological surgery has undergone a complete overhaul with a uniform, consistent, and single emphasis – to become the best resident experience in the country. As we worked to change the culture and the environment to focus on resident well-being and education, we have been fortunate to have had multiple leadership teams across time. Between 2015 and 2018, Dr. Lesniak was the Program Director, along with Dr. Nader Dahdaleh and Dr. George Cybulski as Assistant Program Directors. During that time, the internship year was reorganized to focus on passing American Board of Neurological Surgery requirements and the residency was restructured to focus on early operative experience during the junior years. We also initiated two years of elective time, allowing residents to focus on career building time, spanning additional clinical electives, clinical or basic science endeavors, additional graduate school experience, and elective time abroad. Some of our residents have chosen to obtain additional degrees, such as a Master of Business Administration (MBA), while others have engaged in NIH-funded research. For example, Roxanna Garcia, MD, MS, MPH, our co-chief resident in 2021, secured a Fogarty International Fellowship to pursue research pertaining to delivery of neurosurgical care in Peru. Our laboratories have also been home to other neurosurgery residents across the Midwest, such as Brandyn Castro, MD, from the University of Chicago, Ignacio Jusue-Torres, MD, and Miri Kim, MD, PhD, from Loyola University, and Jason Hsieh, MD, MS from Cleveland Clinic. The focus of our chief year has remained the same – to provide our graduating residents with a full spectrum of high volume experience and independence in order to prepare them for subsequent fellowships or job opportunities in the private sector or academics.

We have been fortunate to initiate an international clinical elective rotation at the Catholic University in Rome under the supervision of Alessandro Olivi, MD. Prior to becoming the Chair of Neurosurgery at the Catholic University in Rome, Dr. Olivi spent over two decades as a full professor at Johns Hopkins, where he mentored and developed a generation of physician-scientists. He has embraced our endeavors to allow our residents to experience neurosurgery abroad and since the initiation of the rotation, it has been a focal point of attracting new residents and exposing existing residents to clinical neurosurgery abroad.

In 2018, leadership of the residency program was transitioned to Dr. Dahdaleh. He, along with his Assistant Directors, Drs. S. Kathleen Bandt and Matthew Potts, have further built and strengthened our culture and educational foundations. In 2020, we implemented a new apprentice model of resident training, focusing on dedicated teams of residents and faculty working together for a specific period of time, to develop and enhance individual and surgical experience. This highly innovative step in surgical resident education has been met with overwhelming support from residents and faculty and has reinforced our dedication to training the next



generation of leaders in neurosurgery. At the same time, we have also started an elective rotation at Central DuPage Hospital, where our complement of neurosurgeons offers unprecedented opportunities for senior residents.

Throughout this time, we have received outstanding evaluations of the program by our residents in the annual Accreditation Council for Graduate Medical Education (ACGME) survey. We have also developed an annual resident retreat program organized by Dawn M. Rose in our department, which provides an opportunity for continuous program evaluation to support quality and process improvement, as well as engage residents and faculty in discussions focusing on topics which range from resident well-being, economics of developing a practice, and leadership.



MEDICAL STUDENT EDUCATION

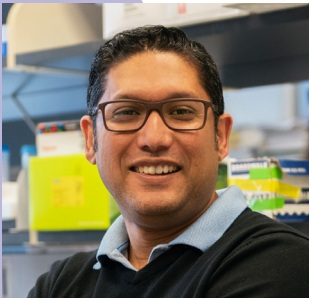
Dr. S. Kathleen Bandt was appointed as the Medical Student Clerkship Director in the department. Under her leadership, we have worked with the Departments of Neurology and Surgery to implement an outstanding experience. Dr. Matthew Potts was recognized for his efforts by receiving the John Z. Thomas Jr. Best Teachers of Feinberg Award during the 2020 Annual Feinberg Medical Education Day; the award highlights the work he completed in the medical school neuroanatomy curriculum in 2020.

All of these efforts have translated into matching top-quality candidates who are sought after at the most competitive programs in the country and who will further take advantage of our residency and ultimately change the field of neurosurgery.

RESEARCH BASIC SCIENCE & TRANSLATIONAL



Amy B.
Heimberger, MD,
FAANS,
Vice Chair Research,
Member of the National
Cancer Advisory Board



Atique U. Ahmed, PhD



Christina Amidei, PhD



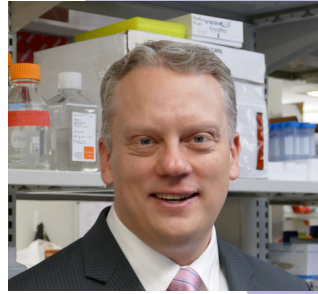
Irina V. Balyasnikova, PhD

Transformative research which enhances knowledge of neurological disorders has been a fundamental pillar of our departmental mission. With regards to basic science research, we have undergone a profound and transformational shift during the past six years. In 2015, the Department of Neurological Surgery ranked #24 in the nation in NIH funding, bringing in a total of \$559,970 per year. By the end of 2020, the Department ranked #5 in the nation, with \$7,818,873 per year of federal NIH funding (brimr.org). That is an astounding 1317 number in increase in NIH dollars over just 5 years. The following physicians and scientists are currently supported by NIH grants: Atique Ahmed (2-R01s), Irina Balyasnikova (2-R01, R33), S. Kathleen Bandt (R03), Peiwen Chen (K99/R00), Craig Horbinski (3-R01s), C. David James (R01), Maciej Lesniak (P50, R35, R01), Catalina Lee-Chang (R37), Jason Miska (R01), Adam Sonabend (DP5, 2-R01s), Matthew Tate (R01), and Derek Wainwright (R01, K02). Programmatically, we have secured an NIH SPORE (P50) which links many of our investigators under the umbrella of translational work in neuro-oncology. We have recruited during this time period the following new faculty: S. Kathleen Bandt, MD; Catalina Lee-Chang, PhD; Peiwen Chen, PhD; Jason Miska, PhD; Adam Sonabend, MD; Lijie Zhai, MD, PhD; and Peng Zhang, PhD, all of whom have contributed to our research endeavors. In 2020, total departmental funding was approximately \$38 million, with total brain tumor related funding across all of NM exceeding \$60 million. As a result of these efforts and with the support of our Dean, Dr. Eric Neilson, we have been able to consolidate all of our neurosurgical laboratories across campus and now work together on the sixth floor of the new, state-of-the art Simpson Querrey Biomedical Research Building. The research center is currently the largest new academic biomedical research facility in the country, and the building's modern aesthetic reflects the cutting-edge research occurring within.

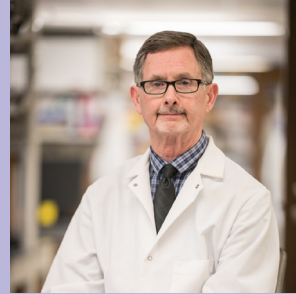
On the clinical side, Christina Amidei, PhD, along with her team, has been directing our clinical trial portfolio. Dr. Amidei was recruited to Northwestern to develop a comprehensive departmental program of clinical research that reflects the specialties in the department and meets the needs of the patient population we serve. Before her arrival, the research portfolio in Neurosurgery was approximately \$400,000 per year. Over the last three years, she has grown and managed a clinical trial portfolio of nearly \$14 million per year. It is worth noting that the department has launched a number of investigational new drug (IND) applications through the FDA, including Dr. Lesniak's neural stem cell based oncolytic virotherapy (IND 71365), as well as Drs. Stupp and Sonabend's ultrasound based disruption of the blood-brain barrier for delivery of chemotherapeutics to the brain (IND 146057). The IND program is the means by which a scientist obtains FDA permission to start a novel human clinical trial and highlights the ability of our department to support bench-to-bedside science.



Peiwen Chen, PhD



Craig Horbinski, MD, PhD



C. David James, PhD



Catalina Lee-Chang, PhD



Jason Miska, PhD



Derek Wainwright, PhD



Lijie Zhai, MD, PhD



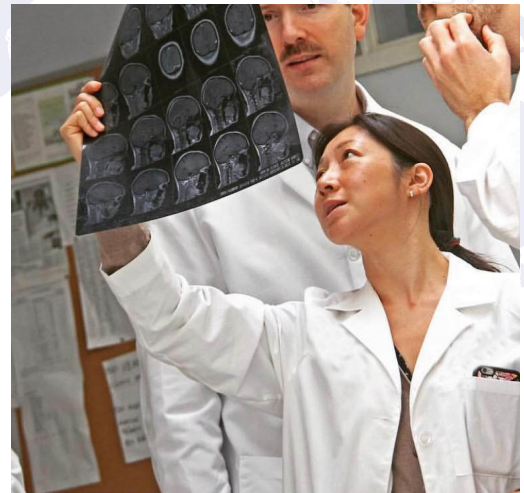
Peng Zhang, PhD

In 2021, our departmental research leadership underwent an exciting transition. As C. David James, PhD, stepped into the position of Professor Emeritus, a new leader was identified. After a nationwide search, Amy Heimberger, MD, FAAS, most recently Professor of Neurosurgery at MD Anderson, became the new Vice Chair for Research, the Jean Malnati Miller Professor of Brain Tumor Research, and Scientific Director of the MBTI. Dr. Heimberger is board-certified neurosurgeon, an internationally-recognized leader in the field of brain cancer, and the recipient of the Presidential Early Career Award for Scientists and Engineers (PECASE). In 2020, she received the prestigious Abhijit Guha Award which recognizes an accomplished physician-scientist who has made significant contributions in laboratory-based science and is awarded by the Society for Neuro-Oncology. She has served on many NIH study sections over the course of her academic career and is the past Chair of the Clinical Neuroimmunology and Brain Tumors Study Section (CNBT) at the NIH. She was also a member of the National Comprehensive Cancer Network, Central Nervous System Cancer Panel. She holds multiple NIH and foundation grants and was a project leader in both the Brain and Melanoma SPOREs at MD Anderson. She is a leader of the Glioblastoma Moon Shot™ initiative. The Cancer Moonshot is an important initiative of the National Cancer Institute, focusing on accelerating cancer research to make more therapies available to patients, authorized by Congress in 2016 to spend \$1.8 billion in funding over seven years. We are excited about the leadership she will bring to the department and becoming a leading center for translational neurotherapeutics in the country and the world.

INTERNATIONAL OUTREACH

The department has pursued international outreach and collaboration in a number of areas. For example, we initiated the epilepsy second opinion program through the International Office to expand NM's epilepsy surgery offerings to patients around the world. Currently, we have ongoing relationships with a number of neurologists in Qatar and the UAE and have recently completed our first epilepsy surgery on an international patient with two additional surgeries scheduled for 2021. Beyond the Gulf region, there are opportunities to expand these services to Latin America and Canada.

To expand the international academic exchange and collaboration with Mexico, Dr. Sonabend organized a neuro-oncology symposium with Northwestern Faculty and Mexican physicians in Mexico. This symposium was held at the National Neurological Institute and the American British Cowdray (ABC) Medical Center in Mexico City. The meeting was attended by more than 200 physicians from several regions of the country. This academic exchange and collaboration translated into the referral of several international patients that have flown to Chicago for surgery or oncology care. This event is part of an ongoing effort that Drs. Sonabend and Stupp lead in establishing international collaboration, education and patient care related to neuro-oncology. In 2019, Drs. Sonabend and Stupp performed a tour of the Arabic peninsula in which they visited, exchanged ideas, reviewed cases and lectured on brain tumors at medical centers in Doha Qatar, Abu Dhabi and Dubai in UAE, and Muscat in Oman. Dr. Sonabend has been a guest speaker for lectures on brain tumors in Toronto, Jiangsu China, and Mexico.





On the pediatric side, several of our colleagues have been actively involved in neurosurgical efforts abroad. Dr. Sandi Lam has a decade-long relationship in Kenya and Uganda and has been working to help develop a pediatric epilepsy/functional neurosurgery program in both countries. Most recently, she and her team have also entered into a relationship with the Beijing Children's Hospital network (14 hospitals) to enhance pediatric epilepsy collaboration. Dr. Art DiPatri has also been involved in taking care of patients in Bolivia, South America. As part of the Solidarity Bridge, he and his team lead a course which consists of mentored surgeries, lectures, and hands-on work stations. By training Bolivian neurosurgeons in pediatric neurosurgery, he and his team hope to make a difference in the lives of these children.

In 2018, with the generous support of the Chung Family, we have also established the Byong UK Chung Global Neurosurgical Lectureship. Our first inaugural speaker in 2019 was Jin Woo Chang, MD, PhD, previous president of the Korean Society of Neurological Surgeons and Professor of Neurosurgery at Yonsei University College of Medicine in Seoul, Korea.

Dr. Aruna Ganju has also been engaged in an international academic exchange program in which faculty and residents from abroad come and visit our department for a specific period of time and participate in an educational exchange forum.



EQUITY & INCLUSION

The Department of Neurosurgery at Northwestern strives to have a cohort of faculty, residents, and staff who are representative of the society at large. This has been one of the most important priorities and in some ways is reflected by the fact that our senior faculty leadership (Chair/Vice Chair) is composed of 66 percent non-white males and 33 percent women. Our administrative leadership consists of three women (60 percent), two Black/African-Americans (40 percent). At present, disclosure of disability, LGBTQ+, and veteran status are voluntary at NM.

Women account for only 12 percent of neurosurgeons across the U.S. and Canada, 17 percent of all neurosurgery residents, and fewer than 100 full-time female academic neurosurgeons¹. Moreover, as of 2018, only about 3.5 percent of all neurosurgeons in practice are Black/African-American, 4.9 percent are Hispanic, and 13.9 percent Asian².

In our department, we make an active and purposeful effort to recruit and retain female faculty and residents. During the last six years, we have successfully recruited additional female neurosurgical faculty, including Dr. S. Kathleen Bandt to build our epilepsy program; Dr. Sandi Lam, Vice Chair and Chief of Pediatrics and Dr. Amy Heimberger, Vice Chair for Research and Scientific Director of the MBTI. As of 2021, our department will have seven neurosurgical female faculty (20 percent), a total of 10 MD/PhD female faculty (20 percent) and 12 faculty (24 percent) who would identify as underrepresented in the field of neurosurgery. Similarly, our female residents now represent 23 percent of our resident pool and 36 percent of our residents self-identify as underrepresented in the field of neurosurgery.

In collaboration with the Department of Neurology, we have initiated a Committee on Health Equity, Diversity, and Inclusion in Neurosciences, headed by Dr. Joshua Rosenow from Neurosurgery and Dr. Stephen VanHaerents from Neurology. Our goal is to champion areas of education, community outreach, and recruitment and retention involving faculty, residents, and staff who are working together proactively to identify opportunities for growth.

¹ Yaeger KA; <http://www.neurosurgerywins.org/>

² Association of American Medical Colleges

Creating the Future



STATUS: MATCH



MEDICAL ANALYSIS

02-08-38 : MALE



DOCTOR



HS

HN

OH





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