Northwell Health: New York’s Destination for Quality, Comprehensive Care

In 2016, we continue our journey with a new name: Northwell Health. This new identity reflects our shared vision for the future, as we work together to discover extraordinary new ways to keep people healthy.

In the nearly two decades since the North Shore-LIJ Health System was formed, we have emerged as a national leader in patient care, scientific discovery, medical education and community involvement. Our commitment to guiding patients along a path of continued health and wellness is stronger than ever.

Northwell Health is the 14th largest health care system in the United States and the largest in New York State, looking after eight million people in the New York City metropolitan area. We care for our communities with a network of 21 hospitals, 6,600 hospital and long-term care beds, 450 ambulatory and physician practices and a staff of more than 15,000 highly skilled physicians and nurses with a range of specialties. The 61,000 dedicated professionals of Northwell Health are working together not only to meet your unique needs but to consistently exceed your expectations.

Here at Northwell Health, we help everyone equally and with dignity. Our staff comes from all over the world, allowing us to provide access to the very best care with language and culture in mind. By respecting and cherishing each individual’s identity, our provider-patient connection grows stronger and we can overcome barriers together.
“Patients come first” isn’t a slogan here; it’s a promise and everyday practice. We’ve received national recognition for our focus on patient safety and outcomes, but the greatest honor is helping our communities stay healthy with the highest quality care. Our achievements would not be possible without the future-focused work of The Feinstein Institute for Medical Research and the Hofstra Northwell School of Medicine. Both institutions are transforming medical education and biomedical research. At the Feinstein Institute, scientists and researchers are engaging in awe-inspiring studies — like investigating the frontier of bioelectric medicine or exploring the use of 3D printers for prosthetics. Our groundbreaking clinical trials test the next generation of promising therapies for conditions from Alzheimer’s to heart disease. Similarly, the Hofstra Northwell School of Medicine offers a refreshing take on medical education with a patient-centered focus. Students begin interacting with patients within the first semester, and become EMTs within the first nine weeks. This forward-looking approach creates the next generation of physicians and scientists — a diverse and driven community of students, residents and fellows who connect with patients from all corners of the globe.

We are many things, but every day we are one thing: dedicated to the community. We are Northwell Health — more than a health system.
Dear Colleagues,

We at Northwell Health are pleased to present this Clinical Innovations and Outcomes Report covering the year 2014 at Northwell Health’s Neuroscience Institute. In this, our inaugural issue, we offer a comprehensive overview of one of the nation’s premier programs in neurology and neurosurgery.

As one of the New York metropolitan area’s largest providers of neurological care, Northwell Health’s Neuroscience Institute has a vast repertoire of diagnostic, clinical and research expertise to treat patients with neurological conditions. These range from relatively common disorders to rare pathologies and include brain aneurysms, brain tumors, traumatic brain injury, migraine, Alzheimer’s disease, spinal disorders, Moyamoya disease and Huntington’s disease.

While Northwell’s mission has long focused on providing the best available care to patients, we are now even better positioned as a Neuroscience Institute to offer state-of-the-art diagnostics and treatments. For example, our Neurosurgery Department has grown to one of the largest in the country, with physicians providing care at our hospitals throughout the New York metropolitan area.

High patient volumes and a full array of treatment options at our Brain Aneurysm Center and Brain Tumor Center illustrate our commitment to excellence and to improving patient outcomes. Northwell Health is also home to an adult Level 4 Epilepsy Center, the highest rating designated by the National Association of Epilepsy Centers, and has the first American College of Surgeons—verified level 1 trauma center in the downstate region. Additionally, in 2015 North Shore University Hospital was the first hospital on Long Island and one of four in New York State to receive advanced certification as a Comprehensive Stroke Center (CSC), earning the Joint Commission’s Gold Seal of Approval® and the American Heart Association/American Stroke Association’s Heart-Check mark in recognition of its ability to receive and treat the most complex stroke cases.

In conjunction with the Feinstein Institute for Medical Research, we seek to maximize research opportunities and patient access to clinical trials, and train and develop future clinicians and scientists, allowing our patients to receive the most advanced treatments.

Northwell Health’s substantial reach and vast team of highly regarded academic clinicians allow our research programs to be woven into the Neuroscience Institute’s daily operations. Collaboration with the Hofstra Northwell School of Medicine further enhances this culture, as do studies being conducted at the Feinstein Institute that address brain tumors, spinal injuries, spinal disc regeneration, movement disorders and traumatic brain injury among many others.

Moreover, our physicians play a leadership role in training future clinicians through our work with the Hofstra Northwell School of Medicine and our residency and fellowship programs. Our continuing education and public education initiatives also illustrate our dedication to sharing our knowledge and expertise.

Several of our physicians have leadership roles in national professional organizations and help shape the future of our specialties.

We hope that you find this enclosed report informative. We appreciate your interest in our work and look forward to partnering with you in the care of the communities that we serve.
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Northwell Health’s Neuroscience Institute provides patient-centered, compassionate, state-of-the-art care for a full array of neurological conditions at our network of hospitals and ambulatory facilities throughout Long Island and the New York metropolitan area.
Northwell Health’s Neuroscience Institute

Personalized, Multidisciplinary Care
Northwell Health’s Neuroscience Institute provides patient-centered, compassionate, state-of-the-art care for a full array of neurological conditions at our network of hospitals and ambulatory facilities throughout Long Island and the New York metropolitan area.

Our physicians specialize in creating personalized treatment plans using evidence-based medicine and have access to numerous cutting-edge therapies and technologies through our clinical trials program, helping to ensure the best possible outcomes. Creating a treatment plan that reflects our dedication to quality, safety and efficacy is of the utmost importance to our physicians.

Our multidisciplinary team of neurosurgeons, neurologists, neurointensivists, psychiatrists, neuropsychologists and psychologists are world-renowned within their respective subspecialties and treat the gamut of neurological and neurosurgical conditions. This publication will discuss the following within the Neuroscience Institute:

- Brain Aneurysm and Stroke Centers
- Brain Tumor Center
- Chiari Institute
- Epilepsy Center
- General Neurology Program
- Headache Center
- Hypothalamic Hamartoma Center
- Memory Disorders Center
- Movement Disorders Center
- Multiple Sclerosis Center
- Neurocritical Care Center
- Normal Pressure Hydrocephalus Center
- Pain Center
- Spine Center
- Skull Base Center
- Traumatic Brain Injury Center
We collaborate with otolaryngologists and head and neck surgeons, radiation medicine physicians, medical oncologists, endocrinologists, neuroradiologists and neuropathologists to develop the best treatment plan for patients and closely work with neurorehabilitation specialists to help patients regain and maintain mobility, cognitive function and the highest quality of life.

**A Commitment to Education**

We train the future neurologists and neurosurgeons of the region, the nation and the world in our highly competitive residency and fellowship programs. Furthermore, we are actively engaged in the teaching of our medical students at the Hofstra Northwell School of Medicine. Our continuing education programs address topics ranging from neurovascular care to brain tumors to neurotrauma. For more information about the contributions to education, see A Focus on Education page 60.

Our neurologists and neurosurgeons have been invited speakers at a number of national and regional conferences for organizations such as the American Association of Neurological Surgeons and the Congress of Neurological Surgeons and have published in prestigious peer-reviewed publications such as the *Journal of Neurosurgery, Neurosurgery, World Neurosurgery and Clinical Neurology* and *Neurosurgery*.

Public education continues to be a vital part of neurological care. As part of Stroke Awareness Month, Northwell Health held a system-wide stroke awareness campaign “Think F.A.S.T” — to educate the public about the signs and symptoms of stroke. To help increase the community’s knowledge of brain aneurysms, we also hold an annual Brain Aneurysm Awareness Walk in conjunction with the Brain Aneurysm Foundation.
Basic and clinical research are integral to what we do, ensuring that our patients receive the latest treatments through multi-institutional studies and industry- or government-sponsored trials.

Center Achievements

In 2014, North Shore University Hospital became the first American College of Surgeons-verified level 1 trauma center in the downstate region and the second such center in the state of New York. This designation was achieved through a multidisciplinary effort by our neurosurgeons, trauma surgeons and orthopaedists.

For the last several years, North Shore University Hospital has been recognized as a Level 4 Epilepsy Center by the National Association of Epilepsy Centers (NAEC) — the organization’s highest rating.

In 2014-2015, U.S. News & World Report ranked North Shore University Hospital among the top 50 hospitals in the U.S. for neurology and neurosurgery. Just three percent of the nearly 5,000 hospitals analyzed for the “Best Hospitals 2014-2015” issue earned national ranking in even one specialty. Results are based on an extensive analysis of hospital volume, technology, reputation for developing and sustaining a high-quality care system and outcomes data, among other criteria. Also for 2014-2015, Lenox Hill Hospital was ranked by U.S. News & World Report as high performing in neurology and neurosurgery.

Another notable achievement is our American Heart Association/American Stroke Association’s Get With The Guidelines® – Stroke Quality Achievement Awards, given to Northwell Health hospitals for recognition of their commitment and success in implementing a higher standard of care by ensuring that stroke patients receive treatment according to nationally accepted guidelines.
Pursuing New Technologies
As part of ensuring that our patients receive the most up-to-date approaches to care, our center continues to pioneer new treatment technologies.

In 2014, we became the only center in the New York metropolitan area that offers all available platforms for radiosurgery and radiotherapy, including one of the most effective tools known, the Gamma Knife® Perfexion™, allowing us to treat brain tumors with unparalleled accuracy.

Physicians at our Epilepsy Center were also among the first on Long Island to use NeuroPace®, a responsive neurostimulator that detects abnormal electrical activity in the brain and administers electrical stimulation to normalize brain activity before the patient experiences seizures. Additionally, we were the first in the area to use the AspireSR® generator, the only therapy that provides responsive vagus nerve stimulation after detecting a spike in heart rate indicating a seizure may be imminent.
In 2014, the Feinstein Institute also received U.S. patent approval for a new device, the smart sensor, that in future will help physicians better monitor severe traumatic brain injuries, such as those suffered in combat.

The device, which measures brain oxygen levels, brain glucose, blood flow, temperature, electrical activity and other aspects of brain chemistry, is currently in the developmental phase. It is expected to be ready for clinical use in approximately three to four years.
Brain Tumor Center

State-of-the-Art, Multidisciplinary Medicine
The Brain Tumor Center at Northwell Health provides state-of-the-art treatment for benign and malignant tumors of the brain, from preoperative evaluations through postoperative in-hospital management. Astrocytoma, brainstem glioma, ependymoma, glioblastoma multiforme, medulloblastoma, oligodendroglioma and metastatic brain malignancies are some of many tumor types that our specialists diagnose and treat.

Each week, our internationally recognized team of neuropathologists, neurosurgeons, neuro-oncologists, radiation oncologists, medical oncologists, neuroradiologists, neuropathologists, neuropsychologists and rehabilitation specialists hold a tumor board to collaboratively discuss and reach a consensus on the best course of patient care. Overall, more than 20 experts meet to discuss individual cases and to develop personalized treatment plans.

Illustrating the expertise of our specialists, our brain tumor volume has gradually increased during the last three years, while our outpatient volume has more than quadrupled. Our hospital readmission rates and mortality index have also remained low, demonstrating the quality of care that our patients receive.

Diagnosis and Treatment Planning
We offer the latest diagnostic imaging technologies, including traditional MRI and MRI spectroscopy, the latter which measures biochemical changes in the brain, helping to identify tumors. Additionally, functional MRI and diffusion tensor imaging, which are both used to identify areas of the brain that control important functions such as language and speech, are used to help plan surgery. Stereotactic biopsy, a minimally invasive, image-guided procedure, may be used in some patients to help identify the specific type of brain tumor present with a much smaller incision than is required for surgical biopsy.
The Latest Treatment Options

To remove tumors of the brain or skull base, our neurosurgeons may use traditional open surgery (craniotomy) or minimally invasive endoscopic procedures. In collaboration with our cerebrovascular surgeons, they also specialize in using advanced techniques to perform cerebral bypass surgery, a procedure used to reroute blood around a blocked vessel to revascularize brain tissue in people with complex brain tumors. These surgeries are performed with intraoperative MRI brain mapping, which improves surgical accuracy and helps to preserve critical areas of the brain.

Stereotactic radiosurgery, highly targeted radiation therapy given in one to five treatment sessions to destroy small tumors deep within the brain while sparing healthy tissue, and stereotactic radiotherapy, which uses the same approach over more treatment sessions, are minimally invasive treatment options available at our center.

In 2014, we became the only center in the New York metropolitan area that offers all available platforms for radiosurgery and radiotherapy, including one of the most effective tools known, the Gamma Knife® Perfexion™, allowing us to treat brain tumors with unparalleled accuracy.

Other treatment approaches include Visualase® laser interstitial thermal therapy (LITT), which uses fiber optics to transmit laser energy directly to the tumor and the GliaSite brachytherapy system, which can deliver a high dose of radiation to tissue that surrounds a tumor that has been removed, reducing risk of recurrence. Carefully selected patients may be candidates for chemotherapy.
Patient Support

In addition to the latest in treatments, our center has the ongoing, full-time support of Northwell Health’s Department of Physical Medicine and Rehabilitation to help patients with their recovery. After an evaluation, our physiatrists can develop an inpatient rehabilitation plan or prescribe outpatient physical or occupational therapy at one of our many area facilities or with home-based care.

Our Brain Tumor Center also offers ongoing educational support to help adults with brain tumors learn about testing and treatment options that may improve their quality of life.

Pursuing Cutting-Edge Research and Education

In 2014, the Feinstein Institute launched the world’s first and only dedicated Brain Tumor Biotech Center, which serves as a collaborative hub for scientists, clinicians and biotech companies to translate basic research into the accelerated delivery of novel drugs and other treatment approaches to the bedside of patients living with brain tumors.

Our research scientists carry out in vitro and in vivo studies using state-of-the-art tools and methodologies, including models for glioblastoma and medulloblastoma. Experienced medical and investment advisory boards offer both early- and late-stage industry insight into developing commercial products. As a result, the Brain Tumor Biotech Center represents an ideal partner for biotechnology companies as they complete preclinical testing, navigate the regulatory landscape and bring clinical development initiatives to the marketplace.
The Brain Tumor Biotech Center also sponsors a summit that brings together the nation’s top cancer specialists and the investment community to promote innovative new therapies for brain tumors. The meeting gives researchers, oncologists, surgeons, CEOs, hedge fund managers, venture capitalists and leaders in the biotech and pharmaceutical industries an opportunity to network and to obtain the latest updates on clinical trials, research labs and cancer treatments across the nation.

In addition to studies conducted at the Brain Tumor Biotech Center, our researchers participate in NCI-supported multicenter clinical trials and investigator-initiated trials for both primary and secondary brain tumors. Some of our many trials include evaluation of functional and intraoperative imaging and approaches to stereotactic radiosurgery. Additionally, our investigators have established a substantial collection of malignant and benign tumor samples available for research purposes.

A neurosurgery residency program and a fellowship in neurosurgical oncology at Northwell Health also offer trainees a variety of research opportunities and demonstrate our dedication to the education of physicians entering the field.
Brain Aneurysm and Stroke Centers

Team-Based, Comprehensive Care

At Northwell Health’s Brain Aneurysm and Stroke Centers, our neurosurgeons, interventional neuroradiologists, neurologists, endovascular surgeons and neurointensivists work together to provide patients with the highest level of neurovascular care.

Our physicians specialize in treatment of patients with ischemic and hemorrhagic stroke, carotid disease, brain aneurysms and arteriovenous malformations (AVMs) of the brain and spine.

We have a close relationship with Northwell Health’s Department of Emergency Medicine, the Center for Emergency Medical Services, voluntary ambulances and emergency rooms throughout the New York metropolitan area. Maintaining good communication with emergency services ensures that cerebrovascular patients receive rapid diagnosis treatment as soon as possible, the key to good outcomes.

Our neurointensive care units are an integral component of ensuring that patients receive the best possible care. Together, our services are available 24 hours a day, seven days a week.

In addition to stroke and other cerebrovascular disease, our centers work closely with a variety of specialists across our organization to provide cutting-edge treatments for aggressive brain cancers and complex head and neck tumors.

Reflecting both the breadth of our services and the expertise of our team of physicians, our center’s inpatient and outpatient volumes have increased during the last several years. Moreover, our readmission rates and mortality index have declined, indicative of the outstanding quality of our care.

Maintaining good communication with emergency services ensures that cerebrovascular patients receive diagnosis and treatment as soon as possible, the key to good outcomes.
The Latest Diagnostics

Our Brain Aneurysm and Stroke Centers offer a full range of the latest diagnostic techniques, including brain computed tomography (CT) and magnetic resonance imaging (MRI).

One novel technology is noninvasive optimal vessel analysis (NOVA), an MRI technique that permits the measurement of blood flow in the brain and allows for precise and accurate planning of surgical treatment of stroke and brain revascularization. Our specialists may also conduct 3D CT or MR angiographies or use transcranial Doppler ultrasonography to examine intracranial blood vessels and blood flow.

Advanced Surgical Techniques

Our neurosurgeons specialize in using advanced techniques to perform cerebral bypass surgery, a procedure used to reroute blood around a blocked vessel to revascularize brain tissue in people at risk of stroke.

The procedure is also used to treat Moyamoya disease, a rare but progressive disease caused by blocked arteries at the brain’s base. In addition, cerebral bypass is used as an adjunct in the management of some aggressive malignant skull base tumors and complex brain aneurysms. Notably, a novel type of cerebral bypass called the Lenox Bypass™ was developed within Northwell Health.

Our neurosurgeons have extensive experience in aneurysm clipping to treat both ruptured and unruptured aneurysms, having clipped 80 brain aneurysms in 2014.

Together, neurosurgeons and interventional neuroradiologists, neurologists and endovascular surgeons also treat brain and spinal cord AVMs using endovascular embolization followed by microsurgical resection or radiation therapy for a cure.

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Northwell Health

**Stroke/Cerebrovascular Readmission Index**

2012-2014

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2012 2013 2014

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2015 CLINICAL INNOVATIONS AND OUTCOMES — NEUROSCIENCES 17
Minimally Invasive Interventions

Approaches to managing stroke may include medication such as tissue plasminogen activator (tPA), a thrombolytic agent that needs to be administered three hours from the onset of symptoms after a careful assessment by our specialists.

Our physicians also have expertise in minimally invasive endovascular treatments such as microcatheter delivery of intra-arterial tPA and suction aspiration using the Penumbra System®.

Another minimally invasive technique for managing stroke utilizes newly introduced “stent triever” devices such as the Trevo® XP or Solitaire™ FR. These devices are deployed and guided to the site of the offending clot and are designed to integrate and retrieve as much of the clot as possible, restoring blood flow.

We are also proficient at performing carotid endarterectomy, carotid angioplasty and stenting to help prevent stroke in patients with extracranial carotid disease. Our team selects the most appropriate treatment based on the patient’s age, vascular anatomy and symptomatology guided by national guidelines and the latest literature.

We also specialize in endovascular coiling, which involves the delivery of soft platinum coils to the site of the aneurysm via a catheter. In 2014, 99 patients with aneurysms were treated using minimally invasive endovascular coiling with real-time X-ray guidance.

Our physicians also utilize next-generation intracranial stents to divert flow from the aneurysm. These flow diverters, such as the Pipeline™ Embolization Device (PED) and the Flow Re-Direction Endoluminal Device (FRED™), which are flexible, braided wire mesh tubes, are placed within the internal carotid artery in the brain, blocking large or wide-neck aneurysms.

Northwell Health
Stroke/CBV Mortality Index
2012-2014

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<td>2017</td>
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2012 2013 2014
Clinical Trials and Education

In collaboration with the Feinstein Institute, our specialists also provide intra-arterial infusion of chemotherapy for brain cancer and head and neck cancer in the clinical trial setting. For this procedure, our surgeons navigate a catheter through an artery that supplies blood to the area of the tumor, allowing them to circumvent the blood-brain barrier to apply chemotherapy directly to the cancer. Notably, our specialists perform more than 50 of these procedures each year for glioblastoma multiforme and are actively investigating applying this technique to certain types of breast and head and neck cancers.

Our physicians are also conducting a clinical trial using a Flow Re-Direction Endoluminal Device (FRED™) to treat large, complex brain aneurysms that are difficult to manage with coiling or clipping techniques.

FRED™ is a small, metallic mesh tube that is placed in the patent artery to divert and contain blood flow away from an aneurysm. The procedure causes the aneurysm to eventually lose blood supply and close.

As part of an ongoing dedication to expanding medical knowledge of stroke and cerebrovascular conditions, Northwell Health offers a fellowship in vascular neurology. Neurosurgery fellows also have the opportunity to rotate within the center, and residents will be able to rotate starting in 2016.

Our experts frequently are invited to present their clinical research and share their surgical and endovascular expertise at national and international meetings.
Patient Support, Education and Outreach

Our cerebrovascular patients may be referred to physical medicine and rehabilitation services at Northwell Health. Our goal is to help individuals return to independent living through a comprehensive treatment plan developed by physiatrists, rehabilitation nurses, physical therapists, occupational therapists, speech-language therapists, social workers, neuropsychologists and recreation therapists.

Our center has also developed a robust digital communication system that helps patients and their family members to better understand their diagnosis, treatment and follow-up care. Our physicians create videos of appointments that include screen captures of pathology reports, radiologic images, discharge instructions and physician contact information. These videos are then sent to patients to view on their computers or mobile devices, with the goal of reducing follow-up calls and readmissions.

To help increase knowledge of brain aneurysms in the communities we serve, our center organizes an annual Brain Aneurysm Awareness Walk in conjunction with the Brain Aneurysm Foundation. To further advocate for our patients, we have joined the Brain Aneurysm Foundation in lobbying on Capitol Hill to promote brain aneurysm awareness and early detection. The purpose of these visits is to meet with members of Congress to raise awareness about the importance of early detection and the need for further research funding. Our specialists have also made patient and public education about primary and secondary stroke risk factors and prevention a priority.
Our center has developed a robust digital communication system that helps patients and their family members to better understand their diagnosis, treatment and follow-up care.
Neurocritical Care Center

Evidence-Based, State-of-the-Art Medicine

The mission of our Neurocritical Care Center is to provide patients with around-the-clock access to neurointensivists and other neurocritical care specialists who use evidence-based, patient-centered protocols to treat neurological injuries.

Our 16-bed, dedicated neuroscience ICU uses state-of-the-art technology such as intracranial pressure monitoring, brain oxygen monitoring and ultrasound imaging techniques to provide critically ill patients with specialty care services for conditions such as complicated stroke, ruptured brain aneurysm, intracerebral hemorrhage, traumatic brain injury and acute spinal cord injury.

Team-Based Model Ensures Continuity and Quality

A team-based model of care ensures that, upon admission, patients are followed by the same neurointensivists, critical care nurses, social workers and other health providers throughout their length of stay. This continuity ensures coordinated, seamless care, and excellent communication between the medical team and patients and their families. Overall, this approach increases quality of care and patient satisfaction. In addition, we regularly evaluate patient length of stay, readmission and mortality rates.
Our daily teaching rounds include not only physicians in training but also nurses, physical and occupational therapists, respiratory therapists, nutritionists and social workers, reflecting our comprehensive approach to ensuring that patients receive the best care possible.

Clinical Pathways, Research and Education

Our specialists are using their expertise to develop clinical pathways for treating brain hemorrhage and brain aneurysm, as well as guidelines for intravenous sedation and anticoagulant prophylaxis for deep vein thrombosis.

Our center is also actively involved in domestic and international research trials. We are currently part of a multicenter clinical trial, MISTIE (Minimally Invasive Surgery Plus Rt-PA for ICH Evacuation) which uses a thrombolytic or CT-guided endoscope to treat intracerebral hemorrhage as quickly as possible. This approach may reduce mortality and improve neurological functioning and quality of life in our patients.

In addition to cutting-edge research, our center offers a fellowship program in neurocritical care. Anesthesiology residents and emergency medicine residents also rotate through our center. Our daily teaching rounds include not only physicians in training but also nurses, physical and occupational therapists, respiratory therapists, nutritionists and social workers, reflecting our comprehensive approach to ensuring that patients receive the best care possible.
State-of-the-Art, Level 4 Care
Specialists at our Epilepsy Center provide a full gamut of state-of-the-art diagnostics, monitoring technologies and treatment options for all types of epileptic seizure disorders.

For the last several years, North Shore University Hospital has been recognized as a Level 4 Epilepsy Center by the National Association of Epilepsy Centers (NAEC) – the organization’s highest rating. Level 4 centers provide complex and intensive neurodiagnostic monitoring, in addition to extensive medical, neuropsychological and psychosocial treatment options. Fourth-level centers also offer comprehensive evaluations for epilepsy and a broad range of surgical procedures to treat the condition.

With our high caliber of medical care, our Epilepsy Center has seen steady inpatient volume over the last several years, while outpatient volume has continued to grow. Our readmission index has remained below 1 percent.

Comprehensive Evaluations
Our epilepsy specialists provide comprehensive evaluations for individuals who may lack clarity about the extent of their condition or who are experiencing symptoms of epilepsy but have not been officially diagnosed.

Video electroencephalography (EEG) monitoring is used for differential diagnosis and to accurately diagnose the type of epileptic syndrome the patient has. EEG monitoring also enables our neurologists to develop tailored treatment plans for epilepsy that may include selection of appropriate antiepileptic medications and identification of potential surgical options for patient with drug-resistant epilepsy.

Advanced imaging technologies our neurologists may use to assess the brain include 3-Tesla magnetic resonance imaging (MRI) using special protocols for epilepsy, functional MRI, positron emission tomography (PET) and single-photon emission computed tomography (SPECT).
If surgery is a potential treatment option, our interventional neurologists may perform an intracarotid sodium amobarbital procedure (ISAP), otherwise known as a Wada test, to determine how each side of the brain functions, ensuring patient safety.

Diagnostic surgery involving the placement of electrodes on the brain surface to identify the precise location where seizures are occurring, and stereoelectroencephalography, a minimally invasive procedure in which electrodes are placed through small pinholes to record brain activity, are also available.

Extensive Knowledge of Medical Therapies

Approximately two-thirds of patients we treat respond to medication. With more than two dozen antiseizure medications on the market, and new drugs being introduced nearly every year, patients require the expertise of our epilepsy specialists who are closely involved with epilepsy clinical trials and the latest drug developments.

A Full Range of Cutting-Edge Surgical Procedures

About one-third of patients with epilepsy do not respond to medication and are candidates for surgical intervention. Neurosurgeons at our center perform 50 to 100 epilepsy surgeries every year with excellent surgical outcomes.

Our center offers a full range of surgical approaches to treat epilepsy, including resective brain surgery to remove an epileptic focus and disconnection surgery to disrupt neurological pathways contributing to seizures.
Minimally invasive approaches are used whenever possible. For example, our neurosurgeons may use laser ablation with real-time MRI guidance to treat a small epileptic focus when applicable. Notably, our center has one of the largest experiences in the world performing laser ablation.

Another option is vagus nerve stimulation, a low-risk outpatient procedure that can prevent seizures in some patients. A new approach, the AspireSR® generator, is the first and only therapy that provides responsive vagus nerve stimulation once the device detects the sudden spike in heart rate that often predicts oncoming seizures. In 2014, we were the first center on Long Island to offer this treatment, which involves implanting the device in the chest and connecting it via a flexible wire to the vagus nerve.

Physicians at our Epilepsy Center were also among the first on Long Island to use NeuroPace®, a responsive neurostimulator that detects abnormal electrical activity in the brain and administers electrical stimulation to normalize brain activity before the patient experiences seizures. The device is surgically implanted on the brain surface. The treatment is available to patients with intractable epilepsy and when other surgical approaches are not an option, for example, those with more than one seizure focus or who have a focus that is too difficult to resect.

**Dedicated Support Services**

In addition to the latest treatment options, our Epilepsy Center has dedicated social workers who focus on educating patients and their families about how to contend with any challenges that may arise with an epilepsy diagnosis and how to manage seizures.

Our neuropsychologists focus on evaluating patients for cognitive problems and ensure that they receive appropriate counseling and any needed neurorehabilitation.
A full-time research staff helps us to translate research advances into clinical practice, making the latest knowledge about the condition the foundation of patient care.

Northwell Health
Epilepsy Inpatient/Outpatient Volume
2012-2014

- Inpatient
- Outpatient

A Foundation of Research and Education

Our researchers at the Laboratory for Multimodal Human Brain Mapping, part of the Feinstein Institute, focus on epilepsy surgery outcomes, brain mapping and the neurophysiology underlying brain function and seizures. A full-time research staff helps us to translate research advances into clinical practice, making the latest knowledge about the condition the foundation of patient care.

We are currently evaluating the mechanisms of how seizures start and spread and how the brain processes information from the environment. Researchers are also studying the contribution of brain inflammation and activation of microglia (brain cells that regulate immunity) and astroglia (the most abundant brain cells, which normally provide support and protection for neurons, contribute to blood-brain barrier integrity, and positively influence cognitive function) to drug-resistant epilepsy.

Additionally, clinical neurophysiology/epilepsy fellows, residents in neurology and medical students rotate through our center with close supervision, helping to ensure physicians-in-training receive the most up-to-date education on approaches to care.
Spine Center

The Latest Scientifically Based Treatment

The Neuroscience Institute Spine Center provides state-of-the-art evaluation and comprehensive treatment for patients suffering from pain syndromes secondary to degenerative changes in the spine such as stenosis, herniated discs and instabilities. We also provide the latest treatments for spinal cord tumors, vascular lesions and spinal deformities.

Because our center is part of an academic institution, our physicians are both clinicians and research scientists, giving patients access to the latest scientifically based approaches to treatment, which may include surgery, neuromodulation and other approaches to pain management, in addition to physical therapy. Our fellowship-trained spinal neurosurgeons collaborate with Northwell Health functional and pain medicine physicians and rehabilitative specialists to ensure that patients receive the best possible therapies.

The outstanding quality of our care is reflected in our spine readmission and spine mortality indices, which both declined from 2012 to 2014. Our large volume of inpatients and outpatients also illustrates our center’s overall experience. To ensure the highest level of care, we are evaluating our Spine Center’s surgical outcomes through the American Association of Neurological Surgeons quantifiable outcomes study.

Northwell Health
Spine Readmission Index
2012-2014

![Spine Readmission Index Chart]

- 2012
- 2013
- 2014

NORTHWELL HEALTH
A Variety of Approaches for A Full Range of Spinal Conditions

Our center offers a full range of surgical procedures for a variety of spinal conditions, using the latest neuronavigational techniques to ensure patient safety and treatment efficacy. Our neurosurgeons use minimally invasive surgical techniques whenever possible.

When indicated, minimally invasive approaches are used for microlumbar discectomy in patients with herniated lumbar discs and anterior cervical discectomy and fusion for individuals with herniated cervical discs.

Our neurosurgeons also use minimally invasive procedures to perform lumbar spinal fusions for intractable lower back pain.

For patients with spinal stenosis, neurosurgeons may perform a minimally invasive laminectomy to remove part or all of the lamina, which provides spinal decompression and alleviates pain.

Pain relief for vertical compression fracture due to osteoporosis or metastatic cancer is available with kyphoplasty, which uses a balloon tamp to restore the height and shape of the vertebral body, followed by application of bone cement to strengthen the vertebra.

Spinal cord stimulation, or neuromodulation, is also available when an anatomical source of pain cannot be determined or treated surgically. This approach involves surgically implanting a device that administers a mild current to replace the feeling of pain with a sensation similar to running water. Intrathecal pain pumps are placed in appropriately trialed patients for intractable pain who are not suitable for spinal stimulation or structural surgery.
In addition to treating pain caused by degenerative conditions of the spine, our neurosurgeons have extensive experience in performing surgery of primary and metastatic spine and spinal cord tumors. Patients with these tumors may also be candidates for radiosurgery, in which highly targeted radiation therapy is given in a single treatment session to destroy small tumors while sparing healthy surrounding tissue. Our neurosurgeons collaborate with radiation oncologists and neuro-oncologists when deciding upon the appropriate course of treatment for patients with spinal tumors.

Using the latest surgical approaches, our neurosurgeons also work with our neurovascular surgeons to resect vascular malformations of the spine. Surgery for spinal deformity, including adult degenerative scoliosis, is also performed at our center.
As the foundation of patient care, our physicians conduct numerous translational and clinical research studies of the spine.

Research and Education Integral to Care
As the foundation of patient care, our physicians conduct numerous translational and clinical research studies of the spine.

Many of our translational studies related to the inflammatory mechanisms and biomarkers of degenerative intervertebral disc disease are conducted at our world-renowned Bioengineering-Biomechanics Laboratory at the Feinstein Institute. This laboratory also conducts research on stem cell behavior in the disc environment in healthy and diseased states. Another avenue of spine research is to unravel the process of nerve cell regeneration after spinal cord injury.

Also in collaboration with the Feinstein Institute, we are conducting a pilot study of systemic biomarkers in patients undergoing epidural steroid injections for low back pain to determine whether these markers predict treatment response. If researchers can identify specific biomarkers related to chronic pain, they can further develop targeted therapies.

Researchers are also conducting clinical studies of new spine-based technologies to treat phantom limb pain.

In addition to research, our Spine Center physicians are actively involved in training neurosurgery residents and fellows on the latest diagnostics and treatments for spinal conditions. We hold monthly academic spine meetings where we present and discuss the outcomes of our most complex cases, helping us to continually achieve the highest level of patient care.
Chiari Institute

Specialized Care for Congenital Conditions
Northwell Health’s Chiari Institute is the world’s first comprehensive, multidisciplinary center established for diagnosing and treating Chiari malformation and other congenital conditions affecting the nervous system, including malformations of the spine and hydrocephalus. Patients from across the United States and around the world come to our institute for our comprehensive consultations and personalized medical care.

Our center’s physicians specialize in treating patients who are transitioning from childhood to adulthood, a period when symptoms associated with congenital defects of the nervous system can emerge and become especially problematic. This particular population is often medically underserved because of a lack of qualified specialists knowledgeable in this neuroscience subspecialty.

Physicians at our high-volume institute treat about 2,000 patients each year, the majority of whom have Chiari malformation — a structural defect in which the posterior fossa is too small, causing the cerebellum to protrude into the foramen magnum and spinal column, compressing the brain. Depending on the subtype of Chiari malformation, the condition can present with intractable pain and syringomyelia, a fluid-filled cyst, or syrinx, on the spinal cord obstructing cerebrospinal fluid circulatory pathways and leading to paralysis. The condition can also be associated with a tethered spinal cord, which leads to an inability to control bowel and bladder function. Other symptoms may include headaches, difficulty swallowing, neurological defects in the arms and legs and problems with balance.
Personalized Treatment

After taking a comprehensive medical history — which includes an extensive assessment of any signs and symptoms of Chiari malformation or other congenital nervous system conditions — and conducting a thorough evaluation of MRI scans, our neurosurgeons, neurologists and radiologists collaboratively discuss each patient and decide whether surgery may be an effective treatment option.

Sometimes an MRI may indicate a Chiari malformation is present but the patient may not be experiencing any significant symptoms, making surgical intervention unwarranted. If surgery is an option, our specialists create an individualized approach based on the subtype of Chiari malformation and extensive preoperative imaging tests.

Chiari-related surgeries are performed daily at our institute, making our neurosurgeons leading experts in anatomical variants of the condition. Some of the surgeries we routinely perform include posterior fossa decompression to create more room for the cerebellum and to relieve pressure on the spinal column, craniocervical fusion to create more stability at the craniocervical junction and syringomyelia surgery to reduce the size of the syrinx.

Surgical approaches are available to treat other nervous system conditions such as congenital malformations of the spine and congenital hydrocephalus.
Dedication to Research, Discovery and Support

Chiari Institute physicians were the first to discover the link between a subtype of Chiari malformation and Ehlers-Danlos syndrome, a disorder that affects connective tissue, in some individuals. They also discovered the relationship between this syndrome and functional cranial settling and defined the link between tonsillar herniation through the foramen magnum and occult spinal cord tethering in some patients.

Most recently, our detailed assessment of patients led our physicians to discover that some individuals with Chiari malformation experience abnormal squeezing, instability and movement where the skull and spine join, resulting in dysautonomia. Patients with this type of malformation display a variety of symptoms, including uncontrolled blood pressure, pulse and body temperature, extreme fatigue, the inability to stand up, abdominal pain and problems with the movement of food through the gut.

Geneticists, immunologists and rheumatologists are now working with specialists at our institute to learn more about what causes Chiari malformation with dysautonomia and which surgical approaches might be the most effective. For example, surgery that fuses the skull and spine into proper alignment can provide some patients with good outcomes.
Our neurosurgeons are also planning to follow all patients who undergo surgery at our institute for up to a year to better understand the benefits and drawbacks of various approaches to surgery.

To help patients and their families contend with a diagnosis of Chiari malformation, our institute also offers support groups where our physicians provide education about the condition and answer any questions. Ongoing emotional and psychological support is often an important part of ensuring that our patients receive the best possible care.
Hypothalamic Hamartoma Center

A World-Renowned Program
Northwell Health’s Hypothalamic Hamartoma Center offers all available treatment options to patients with this benign but severely disruptive congenital mass of tissue that develops in the third ventricle at the base of the skull.

Because this mass interferes with hypothalamus function, classic symptoms include involuntary seizure disorders, such as gelastic epilepsy, that often do not respond to medication; precocious puberty; behavioral issues with episodes of severe rage, aggression and irritability; and cognitive dysfunction, all of which can be overwhelming to children and their families.

Personalized Treatment Approaches
Until the late 1990s, when physicians discovered that surgically removing the malformation could provide patients with a good quality of life, no highly effective treatment options were available for hypothalamic hamartoma.

Since the establishment of the Hypothalamic Hamartoma Center in 2011 at Northwell Health, our team of physicians, which includes neuroradiologists, neurosurgeons, epileptologists, neuropsychologists, neurophysiologists and radiation medicine specialists, have been diagnosing this congenital defect and creating individualized, multidisciplinary treatment plans for removing these masses.

Because hypothalamic hamartomas are located in the dense center of the brain, procedures can be extremely complex. However, using a personalized approach to treatment helps our neurosurgeons provide safe and effective care, keeping our readmission and mortality rates low.

Moreover, as a dedicated Hypothalamic Hamartoma Center, we treat a large volume of patients.

Leading the Way in Innovative Care
While in the past, therapy for hypothalamic hamartoma included anti-epileptic drugs for seizures and hormonal maintenance to manage any hormonal imbalances, removal of these tumors is usually necessary to improve quality of life.

As a dedicated Hypothalamic Hamartoma Center, we treat a large volume of patients.
For smaller hypothalamic hamartomas, our neurosurgeons specialize in providing minimally invasive treatments, which are often effective in destroying these masses, helping to eradicate the patient’s symptoms while preserving critical surrounding brain tissue.

One such approach is laser ablation, in which a laser fiber is placed in the center of the mass under the guidance of magnetic resonance imaging. This is one of the safest treatments for patients, who are often able to go home the day of or day after the procedure. Our physicians, who are known internationally for providing this innovative treatment, have seen laser ablation help children become free of seizures and other symptoms, allowing them to attend school.

Open surgery is also available at our center for hypothalamic hamartomas that are greater than four centimeters in diameter. Because of their size, these masses often push into the middle of the brain, making them especially challenging to remove. However, our neurosurgeons recently developed a staged surgical technique in which they use pterional and orbitozygomatic approaches to first access the tumor from underneath the brain and then complete the surgery from above. This enables them to perform a more complete resection of a large tumor with little to no complications and excellent outcomes. Our surgeons may also use neuroendoscopy after surgical resection to remove any remaining mass.

Because Gamma Knife® radiosurgery — a noninvasive, highly targeted radiation therapy — takes as long as 18 months to two years to fully destroy a hypothalamic hamartoma, the treatment may sometimes be an option for patients who have small masses that cause relatively few symptoms. Gamma Knife® may also be used in patients who have some residual hypothalamic hamartoma after a major surgical resection.

Whatever the approach, our physicians provide ongoing follow-up to assess the ongoing efficacy of our treatment plans and to ensure that patients are experiencing an improved quality of life.
Personalized Treatment for All Levels of Injury

Our physicians at the Traumatic Brain Injury Center are available 24 hours a day, seven days a week, to provide patients with the latest multimodality treatments for head injuries ranging from mild to severe. We address both the immediate medical and long-term rehabilitative needs of our patients.

Our expert team of neurosurgeons and neurologists design a personalized traumatic brain injury treatment program, depending on the extent of the condition, to ensure maximum recovery from sudden brain trauma.

Approaches to traumatic brain injury can range from rest and observation to medical management with ongoing intracranial pressure and brain oxygen monitoring, to performing decompression surgery for pressure relief. Electroencephalography may also be used to ensure that the patient is not experiencing any seizures.

Comprehensive evaluations for memory loss and other cognitive problems are crucial to determining what sort of follow-up care may be needed. Our physicians also work with patients who are unable to speak due to their injury to establish alternate methods of communication, such as using eye contact and other nonverbal cues. Ensuring that the patient can communicate is key to neurorehabilitation.

Trauma and Neurocritical Care

Our traumatic brain injury specialists work closely with physicians in our American College of Surgeons–certified level I trauma center to treat patients with polytrauma. The adult trauma center, located at North Shore University Hospital, is equipped to address all levels of medical and traumatic emergencies and sees approximately 90,000 patients a year. Southside Hospital, also part of Northwell Health, is a level II trauma center. Children are treated at Cohen Children’s Medical Center, the first regional pediatric trauma center in the downstate/Long Island region and one of only three such centers in all of New York State to receive this designation.

The addition of North Shore University Hospital’s air medical transport program in conjunction with Yale-New Haven Health System (SkyHealth) further enables our Trauma Center to treat the most critically ill patients, including those with traumatic brain injury.

Moreover, our neuroscience ICU plays an important role in providing around-the-clock monitoring of changes in our patients’ brain function and in postsurgery management.
Our experienced team of specialists can help patients contend with the psychological and social challenges of their injury and can improve cognition, communication, mobility, and the ability to perform daily household activities.

Neurorehabilitation
Through Northwell Health’s inpatient and outpatient neurorehabilitation programs, patients with traumatic brain injury receive comprehensive care from physiatrists, physical and occupational therapists, speech-language pathologists, neuropsychiatrists and neuropsychologists. Our experienced team of specialists can help patients contend with the psychological and social challenges of their injury and can improve cognition, communication, mobility and the ability to perform daily household activities. Our goal is for patients to regain a sense of normalcy in their lives.

Expanding Knowledge and Services
Our specialists are actively involved in educating our neurosurgery residents about traumatic brain injury. The large number of residents that rotate through our centers helps to ensure that patients are closely monitored. Our neurosurgeons and neurointensivists have also been involved in research related to intracranial pressure monitoring for patients who have sustained traumatic brain injury.

To enhance our overall services, we are developing a multidisciplinary concussion center in collaboration with other departments within Northwell Health, in which patients with mild traumatic brain injury can be seen by various subspecialists, including neurologists, neurosurgeons, rehabilitation specialists, neuropsychologists and ear, nose and throat physicians. Public education aimed at concussion recognition and prevention is an important part of this program.
The Latest National and International Protocols
Neurosurgeons and neurologists at our Normal Pressure Hydrocephalus (NPH) Center use the latest validated clinical protocols and collaborate with neuroradiologists, neuropsychologists and rehabilitation specialists to ensure that our patients receive the best possible care in a clinical center of excellence.

A Comprehensive Diagnostic Work-up
Our NPH Center offers patients an extensive work-up of this often difficult to diagnose condition in which there is a build-up of cerebrospinal fluid (CSF) on the brain that exceeds normal levels. Because symptoms of NPH, which can include gait disturbance, urinary incontinence and cognitive problems, often overlap with other neurological disorders of the elderly, we work closely with our Movement Disorders Center, Memory Disorder Center and the Chiari Institute to make an accurate diagnosis.

Our specialists conduct a thorough patient history and neurologic evaluation followed by the appropriate diagnostic procedures, including computerized tomography, magnetic resonance imaging, gait testing, neuropsychological testing, lumbar puncture, lumbar CSF drainage and occasionally intracranial pressure monitoring.

Improvements observed during temporary CSF drainage helps to predict whether a patient is likely to improve with a permanent cerebrospinal fluid shunt, also known as a ventriculo-peritoneal or VP shunt. In this way we try and avoid placing a permanent shunt into patients who are not likely to be helped.
Experts in the Treatment of Choice

Our neurosurgeons have extensive experience in performing the treatment of choice for NPH, which is the surgical placement of a ventriculo-peritoneal shunt to drain the cerebrospinal fluid into the abdomen. The fluid is absorbed in the abdominal cavity, alleviating pressure. The drainage rate can be adjusted by a valve on the shunt and helps our specialists to adjust the amount of drainage to the individual patient. When used in patients who have responded well to CSF drainage, most patients who receive the permanent VP shunt treatment show improvement in their gait and cognition, as well as urinary control.

Rehabilitation

Patients who are not candidates for shunting, or are still experiencing some symptoms after surgery, are referred to Northwell Health physical therapists, who can help them with their mobility and gait. Neuropsychologists are available to help patients manage and adjust to cognitive decline.

Research Interests

We are members of the International Hydrocephalus Imaging Working Group (IHIWG), an organization that advances the study of hydrocephalus, using a wide range of imaging modalities. Our physicians have presented at IHIWG on cerebrospinal fluid physiology and modeling.
Pain Center

Relieving Pain, Returning Function
The goal of our multidisciplinary, comprehensive Pain Center program is to help manage patients’ chronic pain and restore their functional capabilities.

To decide on the best course of treatment, our neurologists, neurosurgeons, physiatrists and neuropsychologists conduct a thorough patient evaluation. This entails identification of the mechanisms of pain, its intensity and duration, and assessments of functional ability and quality of life. This is followed by a thorough physical examination along with any needed imaging, including X-rays or MRIs.

A Broad Approach to Pain Relief
Through a wide array of treatment options, ranging from conventional to alternative modalities, our physicians regularly manage chronic migraine, painful diabetic peripheral neuropathy, trigeminal neuralgia, complex regional pain syndrome, chronic low back pain, chronic neck pain and fibromyalgia.

Our comprehensive approach to care and our active research program distinguish us from other area functional/pain management programs. With such a wide range of services, we’ve seen our outpatient volume increase during the last several years.

Traditional approaches to pain relief may include oral medication and injections, including epidural steroids, trigger points, nerve blocks and botulinum toxin.

If patients are experiencing intractable pain or if they have a progressive neurological deficit, they may undergo a surgical evaluation for the implantation of either a pain pump or spinal cord stimulator. Surgical approaches are also available for treating patients with trigeminal neuralgia who do not respond to medication.

Complementary pain management strategies that our program offers include relaxation techniques, hypnosis, biofeedback and acupuncture.
Physical therapy can also provide relief for patients with chronic pain and can help to improve physical function and overall conditioning. Neuropsychology is also available and is key to pain management strategies. In addition, psychological counseling is offered to help with any depression and anxiety associated with chronic pain.

**Research and Education**

Our physicians are conducting clinical trials of medications for various chronic pain conditions. For example, they are investigating Botox outside of the setting of migraine for post-traumatic neuralgia, trigeminal neuralgia and chronic lower back pain.

In collaboration with the Feinstein Institute, we are also conducting a pilot study of systemic biomarkers in patients undergoing epidural steroid injections and whether these markers are a predictor of response to injections. If researchers can identify specific biomarkers related to chronic pain, targeted therapies can be further developed.

As part of our commitment to expanding physician knowledge of chronic pain and its treatments, neurology, physiatry, and psychiatry residents rotate with our program’s physicians, as do medical students from the Hofstra Northwell School of Medicine. Our physicians’ involvement with the New York State Pain Society has enabled the organization to offer a CME lecture series on chronic pain management in upstate New York State.
Collaborative Care for Primary and Secondary Headaches

Our Headache Center offers an interdisciplinary approach to diagnosing and treating a wide range of primary and secondary headaches. Neuroimaging specialists may use CT and MRI scans to help determine the cause of headache, while our neurologists, psychiatrists, neuropsychologists and health psychologists develop personalized headache treatment plans that may consist of medications and other interventions such as nerve blocks, trigger point injections and acupuncture.

As part of an overall treatment plan, our team also provides referrals to other subspecialists within our organization, including physical therapists, occupational therapists and neurosurgeons.

Together, we provide the care needed to manage both primary headaches — for example, migraine, tension-type headaches, cluster headaches and other autonomic cephalalgias and facial pain — and secondary headaches, including those associated with brain tumors, strokes, aneurysms and traumatic brain injury.

Demonstrating the effectiveness and quality of our care, our overall readmission rate from 2012 to 2014 is less than 1 percent, with no reported mortality.
Our physicians often treat headaches with abortive medical therapy, meaning the administration of acute medication at the first sign of headache to stop it from progressing. Medications may include anti-inflammatories, analgesics, migraine-specific drugs and antiemetics.

Transitional therapy may be used when patients have a more prolonged headache or are acutely overusing medications. Common treatments include steroid tapers, concurrent anti-inflammatory and motion sickness medications, antiemetics or other drug combinations. Intravenous administration of these drugs may be necessary.

Our center also offers prophylactic treatments for headache that may include nerve block or trigger point injections of steroids or other medications and chemodenervation with botulinum toxin. Acupuncture may also help to reduce headache in patients.

Some patients who have relapses of headache pain may need state-of-the-art treatments such as occipital nerve stimulation, which requires our neurosurgeons to implant a device that sends electrical impulses to the occipital nerve, or transcranial magnetic stimulation, a noninvasive procedure using magnetic fields to stimulate nerve cells, helping to treat chronic headache pain.
Inpatient and Outpatient Services

Outpatient treatment at the Headache Center includes education about headache disorders, proper identification and avoidance of headache triggers and the development of a comprehensive headache treatment plan. We have an outpatient infusion suite where we provide intravenous medications for patients so they can avoid hospitalization.

Our inpatient treatment program also offers intravenous medications to break severe headache cycles. Inpatient care provides relief from the disability caused by headache and can help individuals acclimate to complex headache treatment regimens. The program is also available to patients who need to undergo medication detoxification and provides monitoring for individuals with serious underlying medical conditions.

Our high patient volume for both our inpatient and outpatient programs has remained steady during the last three years, reflecting our experience.
Actively Involved in Research and Education

Our Headache Center, in collaboration with the Feinstein Institute, is involved in several research studies of novel medications and other interventions for headache, as well as epidemiological studies of the condition.

To educate and train the next generation of physicians about headache, medical students and neurology residents rotate through our center. Our attending physicians are working on initiatives to prevent and treat headaches in collaboration with national medical associations such as the American Headache Society and the American Academy of Neurology.
Multiple Sclerosis Center

A Comprehensive, Personalized Approach

Northwell Health’s Multiple Sclerosis Center employs an interdisciplinary model of individualized care that focuses on the treatment and rehabilitation of patients with multiple sclerosis.

New patients undergo an extensive evaluation to diagnose and determine the most effective treatment options. Patients are provided access to a multidisciplinary team of neurophysiologists, neuro-ophthalmologists, urologists, physical, occupational and vocational therapists, speech and language pathologists, psychiatrists, neuropsychologists, social workers and nurses.

Our growing patient volume reflects our physician expertise, as well as our commitment to improving the functional ability, independence and quality of life of individuals affected by this chronic, immune-mediated, demyelinating disease of the central nervous system.

Personalized Medical Therapy

A variety of oral, injectable and infusion drugs are available to modify the course of multiple sclerosis to reduce disease relapses. Our physicians specialize in creating a tailored regimen for each patient depending on his or her needs.

Drugs used to modify the disease course include interferon beta-1a, peginterferon beta-1a, teriflunomide, dimethyl fumarate and alemtuzumab. Corticosteroids such as methylprednisolone and prednisone may also be used to manage inflammation associated with MS relapses.

Our physicians may prescribe medications to help alleviate many of the accompanying symptoms of MS, including bladder and bowel dysfunction, depression, pain, fatigue, sexual problems, spasticity and infection, among others.

Comprehensive Rehabilitation

Northwell Health’s comprehensive rehabilitation program can help patients address many of the functional challenges of living with multiple sclerosis.

We work closely with physical and occupational therapists to manage patient needs, including joint weakness, gait instability, splinting and bracing to improve daily activities.

Vocational rehabilitation is also available to help individuals address challenges in the workplace or to assist them in exploring new employment opportunities.

Helping patients adapt to their assistive devices and wheeled mobility options can be another essential part of rehabilitation. Wheelchair positioning is especially important for reducing pressure points on the body, which preserves skin integrity and prevents ulcers and infections.

Speech and language therapists are also available to patients who are having problems with dysarthria, nasal speech and dysphagia. They can also help patients with adapting to assistive speech devices.
Patient Education and Support
With education and psychosocial support as our foundation, the Multiple Sclerosis Center offers patients and their families the necessary tools to manage this condition. Contending with a diagnosis of multiple sclerosis can be overwhelming for patients and their caregivers, which is why our center provides referrals to individual education and counseling sessions, professional and peer-led support groups and family support conferences and also referrals to visiting nurse services and the many community resources of the National Multiple Sclerosis Society.

Expanding Knowledge
As part of our commitment to research, scientists at the Feinstein Institute are mapping phenotypes in families that make some individuals more likely than others to develop autoimmune diseases such as rheumatoid arthritis, systemic lupus erythematosus and multiple sclerosis. Additionally, researchers are studying autoantibodies in neuromyelitis optica, an autoimmune condition that is often mistaken for multiple sclerosis. Our neurologists actively participate in Northwell Health’s residency program in neurology, which offers a multiple sclerosis rotation focusing on the most up-to-date treatment protocols for this disease.
Compassionate Care for an Array of Disorders

Our Memory Disorders Center provides patients with comprehensive diagnostic evaluations, treatments and psychosocial support for an array of memory disorders.

Our behavioral neurologists and neuropsychologists collaborate with neurophysiologists, neuropsychopharmacologists and geriatric psychiatrists to manage Alzheimer’s disease (AD), vascular dementia, dementia with Lewy bodies, frontotemporal dementia (which includes Pick’s disease), primary progressive aphasia, posterior cortical atrophy and mixed dementia. Patients with transient global amnesia, individuals with mild cognitive impairments and those who have concerns about their memory also receive care through our program.

Whatever the diagnosis, our objective is to provide all patients and families with expert treatment with the utmost compassion, sensitivity and respect. Illustrating our vast experience and our full range of treatment and support services, our patient volume has increased by nearly 50 percent from 2012 to 2014.

A Full Spectrum of Services

Sophisticated imaging tests such as brain MRI, CT and PET scans and comprehensive neuropsychological and functional assessments can help us diagnose and monitor the progression of various memory disorders.

Memory loss treatment focuses on the physical, emotional and social well-being of our patients. Our program provides a full spectrum of services to help every individual manage his or her condition.

Treatments can include FDA-approved pharmacotherapies and access to novel medications through clinical trials. Therapies for memory loss can also include managing changes in routine, keeping records of daily activities and cognitive rehabilitation. Psychological counseling and caregiver support are also important components of our program.
Clinical Trials and Education

Our researchers are trying to identify factors that may indicate increased risk of developing cognitive decline in people who visit our center because of concerns about their memory. We are currently assessing biomarkers in the blood and spinal fluid and evaluating MRI imaging modalities to identify potential structural and functional indicators of increased risk.

In collaboration with the Feinstein Institute, our researchers are studying genes that put people at risk for Alzheimer’s disease so they can better understand how to anticipate and prevent the disease. They are also conducting experimental drug trials and learning about the disease through brain imaging, neurocognitive testing and basic research on the pathological hallmarks of Alzheimer’s disease.

Our investigators have conducted studies that establish the gene CALHM1 as a potentially important molecular target for antiamyloid medications for Alzheimer’s disease. Additionally, physicians have conducted research suggesting that people in the process of developing Alzheimer’s disease may actually have problems early on in processing semantic or knowledge-based information.

Demonstrating our commitment to education, Hofstra Northwell School of Medicine students rotate with our behavioral neurologists, as do trainees from our neurology residency program, psychiatric residency program, geriatric psychiatry fellowship and clinical neuropsychology track of a predoctoral internship program in clinical psychology.
General Neurology Program

Personalized Treatment Plans for All Conditions
Northwell Health’s General Neurology Program consists of a multidisciplinary team of compassionate and experienced physicians who utilize state-of-the-art diagnostics and therapeutics for a wide range of neurologic conditions that can affect the central, peripheral and autonomic nervous systems.

We prioritize creating personalized treatment plans for the patient’s specific neurological disorder, using the broad array of medical and support services available across Northwell Health’s Neuroscience Institute.

Subspecialty Training and Programs
Our general neurologists have training in diagnosing and treating patients who are experiencing neurological symptoms such as pain, weakness, numbness, seizures, headaches, memory loss, poor motor control and visual disturbances.

When further neurological assessment is required, our physicians make referrals and collaborate with the appropriate subspecialists within the institute for conditions such as multiple sclerosis, autoimmune disorders of the central nervous system, stroke, aneurysm, headache, chronic pain, epilepsy and seizure disorder, neurodegenerative disorders and movement disorders such as Parkinson’s disease, Huntington’s disease and Alzheimer’s disease. We also evaluate and refer within the institution for normal pressure hydrocephalus, disorders of the spine and spinal cord and brain and skull base tumors.
A Full Range of the Latest Treatments

With the extensive experience of our subspecialists, we offer the full complement of treatments for patients with neurological disorders, which can include the latest available medications, referrals to neurosurgery for open and minimally invasive surgeries using neuronavigation and neuromonitoring, and novel therapies and technologies. Neurorehabilitation, including physical and occupational therapy, in addition to psychological and social support, may also be included as part of the overall care plan.

Increasing Patient Volume

Demonstrating our experience and our dedication to meeting the neurological care needs of patients in the New York metropolitan area, outpatient volume in the General Neurology Program more than doubled from 2012 to 2014.
Skull Base Center

Interdisciplinary Care for a Full Range of Conditions

Our Skull Base Center specialists diagnose and treat a wide range of skull base conditions, including malignant and benign tumors, vascular lesions and other neurological disorders affecting this complex and sensitive anatomic region.

Our multidisciplinary group of physicians includes fellowship-trained skull base neurosurgeons as well as head and neck surgeons, reconstructive surgeons, neuro-oncologists, otolaryngologists, neuroradiologists, interventional radiologists, radiation oncologists and endocrinologists. Together, we diagnose and create individual treatment plans for patients with vestibular schwannomas, meningiomas, chordomas, pituitary tumors and other masses occurring at the skull base.

Our specialists also collaborate with our functional/pain medicine physicians to diagnose and treat trigeminal neuralgia, and work closely with neurovascular neurosurgeons to manage vascular lesions such as aneurysms and arteriovenous malformations.

Our dedicated neuroanesthesiologists, nurses, nurse practitioners, physician assistants and rehabilitation specialists are an integral part of our team.

With our center’s full breadth of skills, we create safe and effective treatment plans for patients, providing them with the best possible outcomes. We are a high-volume center, with low patient mortality and readmission indices.
State-of-the-Art Diagnostics and Treatments

Our neuroradiologists use the latest MRI and CT technologies to image skull base conditions. Our interventional radiologists can perform angiograms to help surgeons better navigate complex tumor anatomy and are available to perform petrosal sinus sampling in select types of pituitary tumors. Audiology, neuro-ophthalmology and endocrinology evaluations may also be necessary when evaluating patients with skull base conditions.

Our team’s extensive training and experience enable us to offer the full gamut of surgical approaches to treat skull base conditions, including both endoscopic and open surgical procedures. Our use of state-of-the-art neuronavigation and neuromonitoring helps to ensure exceptional outcomes.

Minimally invasive, endoscopic transsphenoidal surgery has become our preferred approach for the removal of pituitary tumors; it is also available for select meningiomas, and other tumors that sit directly behind the nasal cavity.
Stereotactic radiosurgery may also be an option for treating skull base tumors, depending on their type and size, as well as the patient’s age and medical history. In addition, radiosurgery is a valuable tool in the treatment of residual tumors that could not be safely resected at the time of surgery.

Our specialists have extensive experience in the surgical treatment of trigeminal neuralgia that does not respond to medication. Our techniques include inpatient microvascular decompression, minimally invasive outpatient percutaneous stereotactic rhizotomy and stereotactic radiosurgery, which provides highly targeted radiation delivered in a one-day session.

Additionally, our interventional neuroradiologists can perform tumor embolization to treat vascular tumors of the skull base.
Expanding Medical Knowledge

Our physicians continually evaluate their skull base surgical outcomes and publish their findings in top peer-reviewed medical journals. Additionally, our surgeons are members of prestigious national medical organizations such as the American Association of Neurological Surgeons, the Congress of Neurological Surgery and the North American Skull Base Society. Our team members are regularly invited as speakers and instructors to teach other neurosurgeons the skull base techniques that they have refined over years of experience.

As part of our educational initiative, neurosurgery residents rotate through our center, and we offer a skull base surgery fellowship. At our fully equipped Bioskills dissection laboratory, our attending surgeons and physicians-in-training perform complex skull base cadaveric procedures to continually refine their surgical skills.

Northwell Health
Skull Base Inpatient Volume
2012-2014

Inpatient

Northwell Health
Skull Base Inpatient Volume
2012-2014

0 50 100 150 200
2012 2013 2014

200 150 100 50 0
2012 2013 2014
An Academic, Research-Driven Facility

Our Movement Disorders Center is an academic, research-driven facility where our fellowship-trained physicians diagnose and treat an array of these conditions.

While the majority of patients we see have Parkinson’s disease, our physicians also specialize in treating atypical parkinsonian syndromes, Huntington’s disease, dystonia, essential tremor, tremor, Tourette’s syndrome, hemifacial spasm, ataxia and gait disorders.

Treatments for movement disorders can range from tried and true medications to newly approved drugs to surgical procedures to novel therapies only available in clinical trials.

Specifically, for patients with Parkinson’s disease, we offer gold standard medications — for example, oral levodopa — and newly approved agents, including oral extended-release carbidopa combined with levodopa, and Duopa®, a gel formulation of levodopa delivered through an intestinal feeding tube. Our physicians were involved in the clinical trials that helped lead to the recent FDA approval of Duopa®.

Other standard medical therapies we commonly provide include botulinum toxin injections for dystonia and tetrabenazine, the only FDA-approved agent for suppressing involuntary movements associated with Huntington’s disease.

Deep brain stimulation — a surgical procedure that allows physicians to send electrical impulses to select areas of the brain to block neurons and improve movement control — is another treatment offered at our center for patients with Parkinson’s disease, essential tremor or dystonia. This procedure may be an option when these disorders do not respond to medication.

Physical and occupational therapists can also help our patients manage symptoms and restore functional ability so they can better participate in work and other daily activities.

A Leading Research Center

Our numerous research initiatives inform our overall approach to care and give our patients ready access to the latest treatment options.

In collaboration with the Feinstein Institute, our physicians received a prestigious grant from the National Institute of Neurological Disorders and Stroke (NINDS) to establish the Morris K. Udall Center of Excellence for
Our numerous research initiatives inform our overall approach to care and give our patients ready access to the latest treatment options.

Parkinson’s Disease Research. We are one of only nine Udall Centers in the United States and the only such center in the New York metropolitan area.

The Udall Center at the Feinstein Institute offers a unique, patient-oriented approach to developing solutions to challenges associated with the diagnosis and management of Parkinson’s disease.

With full access to state-of-the-art imaging and computational, laboratory and logistical resources, we focus on exploring how validated, functional brain networks, derived from computational analyses of PET and MRI scans, can lead to novel approaches to treating and perhaps preventing the disease.

Our researchers have also participated in numerous industry-sponsored clinical trials of investigational drugs for Parkinson’s disease. Additionally, Northwell Health has acted as the coordinating center in a multicenter trial of a novel gene therapy for the condition.

Moreover, our researchers are interested in better understanding Huntington’s disease and assessing new medications in the clinical trial setting. We have held leadership roles in two multicenter trials, one national and one international, for novel treatments of this genetic movement disorder.

Professional and Public Education

Our specialists teach a steady flow of medical students, neurology residents and movement disorders fellows and provide them with numerous opportunities for clinical training and patient interaction.

In addition to professional training, we value public education and outreach. In April 2014, our center held a public meeting on Huntington’s disease at the Feinstein Institute at which patients and their families spoke of the personal challenges of living with the condition and clinicians discussed what ongoing research reveals about the disorder.
A Focus on Education

Northwell Health offers 115 residency and fellowship programs with more than 1,500 clinicians in training. Our many neuroscience training programs invest in the next generation of physicians by offering a wide range of high-level educational and training opportunities. Additionally, our residents and fellows are expected to conduct neuroscience research and quality improvement projects that translate existing research findings into clinical practice, a process that ultimately benefits our patients.

Neurology Residency
The Northwell Health residency training program in neurology provides a broad clinical and didactic curriculum that meets training requirements set by the Accreditation Council for Graduate Medical Education (ACGME) and the American Board of Psychiatry and Neurology. Through this program, our residents attain the experience, skills and knowledge necessary for the independent practice of neurology. This program offers significant individualized attention to trainees as well as a diverse exposure to acute and chronic, and common and rare neurological conditions. Clinical experiences are enhanced by an extremely dedicated teaching staff, with areas of sub-specialization in stroke, epilepsy, neuromuscular diseases, neuro-rehabilitation, movement disorders, behavioral neurology, pain and headache, neuro-oncology and multiple sclerosis.

Neurosurgery Residency
The Northwell Health neurosurgery residency program is an academic program with a significant research component. Trainees are exposed to a diverse caseload and given an intense and rewarding educational experience. The ongoing development of Neurosurgery at Northwell Health and the recent unprecedented expansion of our program promise continued advancement in training from both the clinical and research standpoints.

Several years ago, our neurosurgery residency program was the first in New York State to receive accreditation by the ACGME in nearly 30 years, reflecting the expertise of our faculty and their commitment to training the next generation of neurosurgeons.

Our Department of Neurosurgery has a large full-time faculty representing a wide range of interests and backgrounds. These include state-of-the-art clinical care as well as translational and basic research programs. We consider the training of academic neurosurgeons a responsibility and our contribution to the vitality and advancement of our discipline.
Neurocritical Care Fellowship

Our neurocritical care fellowship program is accredited by the United Council for Neurologic Subspecialties and features training from a multidisciplinary neurocritical care team. Trainees learn from board-certified neurointensivists in a closed-model, dedicated 16-bed neurointensive care unit at North Shore University Hospital, which has an American College of Surgeons–accredited level 1 trauma and primary stroke center. The neurocritical care unit features excellent nursing and physician assistant staffing, and advanced neuroimaging, neurosonology and multimodal neuromonitoring.

The clinical and research emphases are on clinical acumen, critical care ultrasound, transcranial Doppler with pulsatility index and optic nerve sheath diameter assessments, perfusion and permeability imaging, parenchymal cerebroximetry and quantitative electroencephalography for tailored management of severe acute brain injury. Robust mentorship is available for early career development with publishing and grant writing.

Vascular Neurology Fellowship

Our ACGME-accredited vascular neurology fellowship seeks to train leaders through rotations in vascular neurology, neuroradiology and neurorehabilitation medicine, which are required for vascular neurology board eligibility.

Northwell Health provides high-quality clinical care to patients with stroke, including diagnostic evaluation, acute treatment, stroke prevention, management of complications, endovascular stroke therapy, counseling and social intervention. Fellows acquire first-hand experience in the clinical management of complex stroke patients and complete training in stroke inpatient and emergency care, outpatient stroke care, neurosonology and interventional neuroradiology and neurorehabilitation.

In addition to clinical rotations in the neurointensive care unit and stroke unit, didactic lectures and opportunities to conduct research round out the educational experience.
Movement Disorders Fellowship
Our fellowship in movement disorders provides training in a broad range of conditions, including Parkinson’s disease, dystonia, essential tremor, ataxia and Huntington’s disease, and fosters the development of excellent clinical and scholarly research skills. Fellows actively participate in clinical evaluations and care. They are encouraged to help structure patient management and learn interventional therapies, including pharmacotherapy, local injections of botulinum toxin and management of deep brain stimulation.
Fellows also have an opportunity to focus on specific areas of interest, participate in clinical trials and develop a mentored research project. Courses in clinical trial design, statistics and related topics can also be pursued.

Clinical Neurophysiology Fellowship
Northwell Health offers an ACGME-approved clinical neurophysiology program to study neurologic disorders involving the central, peripheral and autonomic nervous systems through electrophysiologic testing. This includes all neurophysiologic techniques consisting of electroencephalography, electromyography and nerve conduction studies. The program provides fellows with extensive training and expertise in the core competencies of patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism and system-based practice.
The program includes two tracks: electroencephalogram and epilepsy; and electromyography and neuromuscular disorders. Trainees are also exposed to sleep medicine, pediatric clinical neurophysiology and intra-operative methods.
Cerebrovascular Neurosurgery Fellowship

Our cerebrovascular neurosurgery fellowship is a 12-month program, providing enhanced knowledge of all aspects of cerebrovascular micro-neurosurgery, including case formulation, diagnosis, radiographic review, microsurgical technique, intra-operative decision-making and postoperative care.

Surgical Neuro-Oncology Fellowship

Our surgical neuro-oncology fellowship allows fellows to participate in patient management and surgery on patients with brain and/or spine tumors. Training includes participation in stereotactic radiosurgery in an outpatient facility.

Continuing Medical Education

In addition to comprehensive residency and fellowship training programs, our Neuroscience Institute offers continuing medical education opportunities to neurosurgeons, neurologists, neuroradiologists, orthopaedic spine surgeons and other specialists. Recent CME events have focused on state-of-the-art treatment of spine injury and degeneration, neurovascular disorders, trauma and brain tumors. Overall, our CME events provide participants with best-practice analysis and current research regarding neurological and neurosurgical treatments, management and aftercare. Evidence-based protocols, new technology and multimodality treatments for both neurosurgical emergencies and chronic conditions are addressed.