Charles Barrow knew that there was more behind the successful removal of his wife’s brain tumor than the skilled hands of Dr. John Green. A successful businessman, he recognized the value of teamwork. He was impressed with the way in which staff at St. Joseph’s Hospital worked together in the pursuit of excellence in clinical care on a quest to extend the boundaries of knowledge in the neurosciences.

It was this spirit of collaboration and the vision that Dr. John Green shared of creating an institute in the Arizona desert dedicated to the advancement of the neurosciences that led Charles Barrow to invest in the potential of a fledgling program. Nearly half a century later, Barrow Neurological Institute® at St. Joseph’s has become an international leader in the neurosciences. Working as a team, these two nationally recognized institutions have helped each other become what they are today.

It’s not the state-of-the-art technology, world-class staff or unparalleled services that set St. Joseph’s and Barrow apart from other hospitals. It is the unique synergy between our organizations that allows us to grow both individually and together. One would not be as successful without the other.

St. Joseph’s other tertiary service lines – for example, thoracic surgery and oncology – benefit from the neurological expertise that Barrow offers. On the other hand, these service lines allow Barrow to offer, and excel in, specialized services that aren’t found anywhere else in the world. At Barrow, neurological subspecialties are both the specialty – and the norm.

As we enter into this the next half century, Barrow’s continues its’ march to raise the bar of knowledge in the neurosciences. Teamwork remains the common thread reflected in every program and service described on the following pages. Our newest clinical and research initiatives reflect the same team approach that has allowed us to solve some of the mysteries of this vast and challenging field as we continue to forge ahead into realms yet unexplored. Working together, we’ve advanced patient care and raised the bar of knowledge in the neurosciences – not just in our community, but throughout the world.

Sincerely,

Linda Hunt
President, St. Joseph’s Hospital and Medical Center

Robert F. Spetzler, M.D.
Director,
Barrow Neurological Institute
In just five decades, Barrow Neurological Institute at St. Joseph’s Hospital and Medical Center has grown from a community neurological center to a worldwide leader in the neurosciences. Consistently recognized by *U.S. News & World Report* as being one of the top 10 centers for the quality of its neurological and neurosurgical care, Barrow reaches milestones that impact not only its patients but also the way healthcare is practiced around the world. In its quest to unlock the mysteries of the brain, Barrow has done much to advance the neurosciences. Scientists have made groundbreaking discoveries in areas such as neurogenetics, neuroradiology and neurobiology, and neurosurgeons have pioneered techniques now used throughout the world – techniques that include hypothermic cardiac arrest, thoracoscopic spine surgery, craniofacial and skull base surgery. Barrow attracts patients, students and medical staff from more than 100 countries.

Barrow is located on the campus of St. Joseph’s and the two organizations share a unique symbiotic relationship that has allowed each to flourish. St. Joseph’s is the largest – and one of the first – teaching hospitals in Arizona, offering the state’s first Level 1 Trauma Center with verification from the American College of Surgeons, and exceptional programs in thoracic surgery, oncology and high risk women’s services.

As our nation prepares to embrace new approaches to manage and deliver care, Barrow will be at the forefront in terms of managing both the process and the outcomes of care not just within the hospital walls but across the entire continuum of care, engaging community partners to ensure patients who come to us for care achieve the best overall quality of life.

Through innovative clinical care, intensive post-graduate medical education and pioneering research, Barrow is continually raising the bar of knowledge in the neurosciences.
Barrow is one of the largest full-service neuroscience centers in the nation, providing complete neurological and neurosurgical care for adults and children. Barrow offers acclaimed centers for stroke, spine, brain tumors, epilepsy, skull base tumors, movement disorders and other conditions, and additional centers of excellence are planned for the future. In 2006, Barrow greatly enhanced its standards of patient care with the addition of the country’s largest dedicated neuroscience inpatient tower. The state-of-the-art Barrow Neuroscience Tower, a 430,000-square-foot facility on the north end of the St. Joseph’s campus, features:

- 64 intensive-care beds and 80 acute-care beds (including a 10 bed epilepsy monitoring unit), all dedicated to neurological and neurosurgical care (another 48 acute care beds are to be added in 2013)
- 52 bed neuro rehabilitation unit (a 20 bed expansion is planned for 2013)
- 11 state-of-the-art surgical suites specifically dedicated to neurosurgery
- 2 endovascular neurosurgery suites
- the first 3-Tesla Intraoperative MRI machine to be installed in a hospital, and two additional dedicated MRIs for advanced neuro imaging studies

Dedicated patient care units – which include neuro intensive care, and spine, stroke and epilepsy monitoring units – are designed to meet the specific needs of neurological and neurosurgical patients. In addition, Barrow offers complete neuro-rehabilitation services and specialized neurological care for many diseases and disorders through extensive outpatient clinics.
Under the leadership of Robert F. Spetzler, MD, Director, Barrow’s staff has received international acclaim for its expertise in a variety of specialties. Attracting talented professionals who are committed to helping people and who are working to find answers to common and complex neurological disorders, Barrow has more certified neuroscience registered nurses (CNRN) than any other hospital in the United States. Innovation is a way of life at Barrow. A combination of state-of-the-art technology and medical expertise has allowed the institute to master not only the basics, but also a number of subspecialties—some of which are not offered anywhere else in the world. For example, the Hypothalamic Hamartoma Program, a subspecialty within the Barrow Skull Base Center, provides multidisciplinary evaluation, diagnosis and treatment for children and adults with congenital tumors deep within the brain. Left untreated, these rare brain tumors can cause increasingly severe seizures, rages and cognitive decline, beginning in childhood. Barrow neurosurgeons helped develop a new surgical approach to removing this difficult lesion and are among the only surgeons in the world to offer this effective, cutting-edge procedure.

The numbers tell Barrow’s story:

- Nearly 10,000 patients come to Barrow each year for a wide variety of specialized services.
- Barrow neurosurgeons perform over 5,000 procedures a year, perhaps more than any other facility in the world.
- Robert Spetzler, MD, has performed nearly 6,000 aneurysm surgeries, more than any other cerebrovascular neurosurgeon in the world.
- Barrow radiosurgery specialists have treated more than 4,000 patients with CyberKnife and the new Perfexion Gamma Knife, using these non-invasive tools to destroy brain lesions with submillimeter precision.
- Barrow’s team of epileptologists has cared for more than 1,600 patients in the Epilepsy Monitoring Unit (EMU) over the last five years. Barrow’s EMU is one of the largest units in the U.S.
- The neurophysiology staff provides more than 4,500 inpatient and outpatient EEGs and evoked potential tests annually, and monitors more than 200 surgical cases in real time each month, making it one of the busiest programs in the nation.
- Each year, Barrow endovascular neurosurgeons conduct nearly 1,000 catheter based procedures, using advanced techniques to stop the blood flow to growing tumors and vascular anomalies, to open clogged arteries or to prevent aneurysms from rupturing.
- The Barrow TeleStroke network allows patients in rural areas within an hour’s flight time of Phoenix to get the same high level of care in their community from Barrow stroke specialists via telemedicine as if they lived down the street from Barrow.
Barrow's Neurosurgery Department is perhaps the most technologically advanced in the world.

Barrow is known across the globe for its neurosurgical expertise. More neurosurgeries are performed at Barrow each year than at any other neurological institution. These surgeries include a wide range of advanced brain and spine procedures — some of which were developed at Barrow and are not offered anywhere else. The department houses 11 spacious operating suites, including one that can be super cooled to 55 degrees in just three minutes and another that offers radio frequency (RF) shielding for cases involving deep brain stimulation.

The Eller TelePresence conference suite is a sophisticated, interactive, immersive televideo education system that allows observers in a conference room to watch live surgery and talk with the surgical team. The system also allows physicians and patients in remote locations to consult with Barrow's neuro specialists. The operating rooms are equipped with Image Stream Medical's state-of-the-art digital video and image management program, which includes total system integration of all video sources, real-time digital viewing of ORs, and archiving of digital video, still images and procedure information. For more information, visit thebarrow.org/neurosurgery.

Cerebrovascular Neurosurgery

Many cerebrovascular diseases — such as aneurysms, arteriovenous malformations (AVMs) and cavernous malformations — require the expertise of an experienced neurovascular team to provide a comprehensive review of treatment options. A leader in cerebrovascular neurosurgery, Barrow's internationally recognized team includes neuroradiologists, neurologists and cerebrovascular and endovascular neurosurgeons who specialize in microsurgery, endovascular surgery, and stereotactic radiosurgery.

Cerebrovascular surgical procedures pioneered at Barrow have been applied as lifesaving measures for patients here and elsewhere. For example, the hypothermic cardiac arrest, or the cardiac standstill, is used to repair difficult aneurysms by lowering the patient’s body temperature, draining the blood from the body, and stopping the heart so that the aneurysm can be clipped without bleeding. In less than an hour, the patient returns from this state of suspended animation when the heart is restarted and the body is warmed to normal temperature. Various skull base and bypass techniques that have revolutionized the treatment of complex cerebrovascular lesions and deep-seated tumors have also been advanced by neurosurgeons at Barrow. In addition, numerous clinical trials evaluating the treatment of aneurysms, carotid artery stenosis, intracranial stenosis and cerebral vasospasm are ongoing. For more information, visit thebarrow.org/cerebrovascular.
Endovascular Neurosurgery

Endovascular neurosurgery is used to treat a variety of cerebrovascular diseases including stroke, aneurysms, tumors and arteriovenous malformations. Often when these diseases are untreatable through conventional surgery, they can be treated using endovascular techniques. Endovascular neurosurgery utilizes a thin catheter to open blocked blood vessels in the brain to stop bleeding or to prevent vessels from rupturing while using x-ray guidance. The surgeries are performed in two angiography suites using the latest bi-plane angiography equipment. In some scenarios, surgeons can administer special glues or embolic agents to a vessel that feeds an abnormal growth in the brain, thereby reducing blood loss during the subsequent surgical removal of the mass. Our endovascular specialists work closely with medical device manufacturers to develop innovative interventional devices to effectively treat those complex problems. For more information, visit thebarrow.org/endovascular.

Skull Base Center

Surgery in the skull base region is amongst the most complex neurosurgical operations due to the tumors’ proximity to the brainstem, and the cranial nerves that control vision, hearing and the most basic bodily functions. The Barrow Skull Base Center continues to be a leader in the development of new surgical techniques to gain access to these tumors with minimal post-operative side deficits. A multidisciplinary team provides evaluation, diagnosis and treatment for patients with a wide range of skull base tumors and disorders. Each patient seen at Barrow receives an individualized treatment plan based on the tumor location, type and size and the patient’s overall health. A full spectrum of diagnostic and treatment services are available including surgery, embolization, radiosurgery, and chemotherapy if necessary. Free consultations are available through the center. For more information, visit thebarrow.org/skullbase.

Neurotrauma Program

The Neurotrauma Program is an integral part of the first American College of Surgeons (ACS)-verified Level I Trauma service in the State of Arizona. Approximately 5,000 serious injuries are evaluated and treated each year. The hospital has a supportive team of surgeons, critical care and internal medicine physicians, specialized nurses and therapists, and rehabilitation professionals and services to provide the highest level of care for this population. The program serves as a tertiary destination for complicated cases involving brain, spine and spinal cord injury which includes diagnosis, surgical intervention and comprehensive rehabilitation with a goal of maximizing recovery in individuals who have suffered trauma. Ongoing research related to state of the art techniques for the treatment of traumatic brain and spinal cord injury are ongoing and have led to improvements in the care of these patients. Community outreach is robust and includes one of the busiest chapters of ThinkFirst, a national brain and spinal cord injury program. For more information, visit thebarrow.org/neurotrauma.

BRAINS Clinic

The Barrow Resource for Acquired Injuries to the Nervous System (BRAINS) is one of the first multi-disciplinary clinics in the U.S. to offer medical AND educational services to individuals who have suffered from a traumatic brain injury (TBI). A team consisting of neurologists, neuropsychiatrists, physiatrists, educational specialists, therapists and neurosurgeons are all available to help assess and devise individual treatment plans for individuals who have suffered from a TBI. This comprehensive team allows rapid intervention to help patients and their families cope with and recover from these injuries. There is a robust educational campaign which has led to the formation of Brainbook* (insert site) which has become the model for providing education to high school athletes in Arizona as well as providing an opportunity to study individuals who have suffered a TBI in order to improve the care of these patients. For more information, visit thebarrow.org/brains.
Stereotactic Radiosurgery (SRS) is sometimes referred to as “knife-less” neurosurgery. For selected patients, stereotactic radiosurgery gives the neurosurgeon a minimally invasive option for treating problems that previously may have required open surgery or even to have been considered untreatable using traditional neurosurgical techniques. The procedures are performed by a team that includes a neurosurgeon, a radiation oncologist and a medical physicist. Complementing conventional neurosurgery, stereotactic radiosurgery can now be used with great success to treat certain types of tumors, arteriovenous malformations, and conditions such as trigeminal neuralgia. There are two major classes of radiosurgery tools. Barrow has both.

**Gamma Knife** is one of the safest, well-established, and most effective alternatives to surgery for brain disorders. It can be used to treat benign tumors, malignant tumors, vascular abnormalities, and functional disorders. Gamma Knife® radiosurgery manages these conditions noninvasively, allowing patients to go home the same day without the pain and the possibility of complications associated with traditional surgery. The unit is the newest Gamma Knife® radiosurgery model, Perfexion®, which offers much more flexibility in treating intracranial and cervical lesions by focusing 192 beams of cobalt-60 radiation tightly on a precisely defined target while avoiding surrounding healthy tissue. It is a treatment option for patients who are unable to undergo conventional neurosurgery or who need additional treatment in conjunction with chemotherapy, radiation therapy, or brain surgery.

**CyberKnife** is a painless stereotactic radiosurgery system, similar to the Gamma Knife®, with the exception that this system can be used to treat lesions anywhere in the body. CyberKnife® uses beams of radiation precisely and accurately targeted to “paint” the affected area with the appropriate dose to shrink or eliminate the problem. This differs from conventional radiotherapy in that the beam is much more tightly aimed at the target. It is used to treat vascular abnormalities, malignant and benign tumors, and cancers in the brain, spine, lung, liver, pancreas, prostate and kidney. New protocols to treat other locations in the body are constantly being developed. Treatment consists of one to five outpatient sessions, typically less than two hours long, and usually completed in a week to 10 days. CyberKnife® expands Barrow’s suite of radiosurgery and radiation therapy technologies and allows clinicians greater flexibility in customizing the optimal treatment plan for each patient.

**Intensity Modulated Radiation Therapy (IMRT)** is a revolutionary way of delivering radiation therapy safely and effectively. The system delivers a radiation-dose distribution that tightly conforms to the size and shape of a specified target, while minimizing radiation to surrounding healthy tissues. IMRT may be used in combination with or as an alternative to stereotactic radiosurgery devices like the Gamma Knife® or CyberKnife® to treat various tumors, particularly metastatic disease.

In most cases, exact treatment modality is determined in a group or conference setting involving neurosurgeons, radiation oncologists, and oncologists. For more information, visit the barrow.org/radiosurgery.
NEUROSURGERY CENTERS

Pituitary Center

The Barrow Pituitary Center evaluates and treats patients who are suffering from neuroendocrine disorders and pituitary tumors such as adenomas, prolactinomas, Cushing’s disease, acromegaly and gigantism. Patients are treated through a multidisciplinary approach that draws on the expertise of specialists in many disciplines, including endocrinologists, neurologists, neurosurgeons and radiation oncologists. Surgeons at the center specialize in minimally invasive approaches for treatment of pituitary and other anterior skull base tumors. Experience is key to the successful evaluation and treatment of neuroendocrine disorders, and Barrow’s staff has more experience with treating patients with pituitary disorders than any other facility in the Southwest, performing more than 150 pituitary surgeries every year. For more information, visit thebarrow.org/pituitary.

Spine Center

Spinal Surgery at Barrow encompasses the most advanced techniques to correct surgical disorders of the spine and spinal cord. A diverse faculty consists of world-renowned spine neurosurgeons, radiation therapists, endovascular neurosurgeons, neuroradiologists and rehabilitation specialists. The entire spectrum of spinal disease processes are addressed through both traditional and minimally invasive surgical treatment options. Degenerative disorders, trauma, tumors and vascular diseases are treated through a team approach. Radiosurgical options to address tumors or vascular lesions near the spinal cord that require no surgical incisions are also available.

A new Spine Assessment Center (SAC) provides patients with a timely and accurate diagnosis of spine related problems. The SAC refers/tracks patients who require extended medical management to other affiliated physiatrists, physical therapists, neurologist and pain management specialist as needed, while appropriately directing those patients who are candidates for surgery to be seen by Barrow’s spine surgeons.

In addition to advanced research into the biomechanics of devices and instrumentation to treat spinal diseases, researchers at Barrow are heavily involved in the latest research in spinal cord injury and rehabilitation. Such research offers the hope of future breakthroughs to those afflicted with severe spinal cord injury. For more information, visit thebarrow.org/spine.

Acoustic Neuroma Center

The Barrow Acoustic Neuroma Center is designed to provide comprehensive evaluation, diagnostic testing, and treatment to patients with acoustic neuromas and temporal bone disorders. This skull base sub-specialty team conducts patient care conferences, supports collaboration between clinical and research specialists and facilitates educational programs to advance the diagnosis and treatment of temporal bone disorders. The center also offers treatment options to include the auditory brain stem implant for patients suffering from neurofibromatosis, type 2 (bilateral acoustic neuromas), a procedure that is only offered at a handful of centers in the country. For more information, visit thebarrow.org/BANC.

Stereotactic radiosurgery gives the neurosurgeon a minimally invasive option for treating problems that previously may have required surgery.
ADULT NEUROLOGY

The adult neurologists in the Barrow Neurology Clinics offer comprehensive diagnosis, treatment and education for patients with diseases and injuries of the nervous system, such as epilepsy, Alzheimer’s disease, brain tumors, multiple sclerosis (MS) and stroke. Each patient receives care from a neurology subspecialist.

Barrow’s team of neurologists provide inpatient and outpatient care, second opinions and the opportunity for patients to participate in clinical trials of promising new medications and innovative treatment approaches. Our neurologists work collaboratively with patients and their physicians to develop the best plan of care for each individual. What makes the neurology program at Barrow unique is that every neurologist subspecializes in a particular field within neurology, meaning that patients with complex neurological problems receive the latest treatment approaches from the most knowledgeable physicians in that specialty. For more information, visit thebarrow.org/neurology.

Cognitive Disorders

More than 4.5 million people in the US suffer from Alzheimer’s disease. Even more people, especially in middle age or above, are worried about their memory. Barrow’s Cognitive Neurology team has the knowledge and access to technology that allows us to decide how significant a memory complaint is; and, if the diagnosis is Alzheimer’s disease or some other memory-affecting neurological disease, the expertise to provide treatment and management that will help patients and family members cope with these serious problems. We also offer clinical trials of new drugs for Alzheimers and related disorders to selected patients. For more information, visit thebarrow.org/cognitive.

Epilepsy

Barrow’s Epilepsy Program, one of the largest in the region, is dedicated to the diagnosis and treatment of individuals with epilepsy and other seizure disorders. Effective treatment begins with an accurate diagnosis. The program offers a wide range of diagnostic tests, including monitoring of brain activity and seizures in the Epilepsy Monitoring Unit, and specialized neurodiagnostic and neuropsychological testing. Treatment options range from medical management to participation in clinical trials to surgery. Our specialists also provide counseling and referrals to community resources. For more information, visit thebarrow.org/epilepsy.

Electroneurodiagnostic Services

The Electroneurodiagnostic Lab at Barrow provides a complete array of clinical neurophysiological services, that support the Epilepsy Monitoring Unit, as well as providing advanced intraoperative physiological monitoring services that give detailed information about electrical activity during surgery. This
information can be used to prevent unnecessary injury to the brain and nervous system. In addition, the lab provides basic and advanced diagnostic EMG services by Barrow’s board certified neurophysiologists for all nerve and muscle disorders. The staff of highly trained technologists also provides EEG and evoked potential diagnostic inpatient and outpatient services. For more information, visit thebarrow.org/END.

Sleep Center

Barrow sleep specialists in partnership with Comprehensive Sleep in Phoenix, provide diagnosis and treatment for patients with sleep problems. Care is provided on an outpatient basis and may involve a sleep-trained neurologist and pulmonologist. The center is a particularly valuable clinical program since sleep disorders are often linked with a variety of other neurological, including stroke, epilepsy, neuromuscular and movement disorders. In addition, the sleep center offers treatment for common sleep disorders such as sleep apnea, restless leg syndrome or uncommon sleep disorders such as narcolepsy. For more information, visit thebarrow.org/sleep.

Inpatient Neurology

The Neurology Hospitalist Program ensures that patients who have been admitted to the hospital for care receive consistent and reliable inpatient care from a small group of inpatient neurology specialists. The neurology hospitalists coordinate the daily plan of care working closely with the neurology specialists who provides oversight to the entire process. The effect is shorter stays in the hospital and better clinical outcomes.

Muhammad Ali Parkinson Center and Movement Disorders

The Muhammad Ali Parkinson Center and Movement Disorders Clinic at Barrow focuses on the diagnosis and treatment of tremors, Parkinson’s disease, dystonia, Huntington’s disease, ataxia, gait and balance disorders, as well as Tourette’s, tics and other movement-related disorders. The medical team also works with patients who may be candidates for deep-brain stimulation or medical botulinum toxin injections as treatment options. Barrow neurologists are involved in clinical trials and basic-science research designed to improve the knowledge of and treatments for movement disorders. The Muhammad Ali Parkinson Center serves as a resource for Parkinson’s patients and their families, offering extensive community outreach, education programs, an interdisciplinary assessment clinic and support groups. For more information, visit thebarrow.org/MAPC.

Neuroimmunology/Multiple Sclerosis

Neuroimmunology experts at the Barrow Neurology Clinics offer medical care, support services and referral to community resources to individuals with multiple sclerosis (MS), myasthenia gravis, Guillain-Barre, lupus and other inflammatory and demyelinating disorders. Multiple sclerosis is a special focus of the program. Barrow
neurologists work to alleviate symptoms and educate patients about the course of their illness. Research into new ways to treat, and possibly cure MS is also an area of emphasis. For more information, visit thebarrow.org/MS.

Neuromuscular

The neuromuscular program at Barrow is supported by neuromuscular specialists who provide diagnostic and treatment services to people with ALS, muscular dystrophies, inflammatory myopathies and neuropathies, myasthenia gravis, inherited peripheral nerve diseases, myotonic disorders, CIDP and other related diseases. Barrow’s neuromuscular specialists are board certified in Neurology and Neuromuscular Medicine with specialized training and expertise in EMG. The MDA/ALS Center at Barrow is one of only a few centers designated by the Muscular Dystrophy Association nationally. The MDA/ALS Center offers a multidisciplinary clinic that includes occupational therapists, physical therapists, respiratory therapists, speech pathologists and social workers who can assist in the care of these very complex neuromuscular disorders. The program also offers a Myasthenia Gravis & Neuromuscular Junction Disorders Clinic and a Neuropathy Clinic. The Electromyography and Nerve Conduction Lab allows the neuromuscular specialists to more accurately diagnose neuromuscular disorders. For more information, visit thebarrow.org/neuromuscular or thebarrow.org/MDA.

LEGACY PROGRAMS

Barrow Center for Neuromodulation
Barrow Brain Tumor Research Center

As we continue to “raise the bar of knowledge in the neurosciences,” the fields of neuromodulation and brain tumor research seem to be the most promising new areas. Given Barrow’s volume of patients afflicted with these neurological disorders we believe we can have a significant impact on improving the management of these diseases worldwide.

Technological advances including confocal microscopy, intraoperative fluorescent tumor agents, new radiological and oncological functional imaging technology, electrode and generator developments, as well as alternative approaches to modulate brain activity using low frequency ultrasound and optogenetics that involve special light waves to selectively stimulate specific cells have set the stage for brain tumor management. These breakthroughs will give hope to patients afflicted with maladies ranging from severe depression to Alzheimer’s disease.

Over the past 25 years Dr. Spetzler and his colleagues have contributed to the advances in the fields of cerebrovascular and spine surgery. We now look forward to a new generation of talented physician-scientists to advance the treatment of brain tumors and to take the lead in the evolving field of neuromodulation.
Barrow Center for Neuromodulation

Barrow’s Center for Neuromodulation was launched in 2011 and supported in part by a major donation from philanthropist Marian H. Rochelle. The center combines cutting-edge clinical and research programs to advance the care for a wide-range of brain disorders including depression, obsessive compulsive disorder (OCD), autism, dementia, chronic pain, Alzheimer’s disease, obesity and acquired brain injuries that have been unresponsive to traditional forms of therapy.

The new center brings together the talents of neurosurgeons, neurologists, psychiatrists, bioengineers, clinical researchers, and basic scientists to explore treatment approaches using a variety of neuromodulation techniques including deep brain stimulation, low frequency ultrasound and optogenetics that uses special light to stimulate specific neural cells. These technological innovations could significantly transform the face of neurosurgery and neurology by ushering in a new frontier of therapeutic solutions that effectively address the most serious and devastating medical conditions.

The Barrow Center for Neuromodulation will engage physicians in the furthest reaches of the nation to screen their patients for treatment. The center will conduct clinical research trials to evaluate new technologies and drug protocols, basic research to investigate neural pathways and anatomical targets associated with specific neurological conditions, and the most effective modulation technologies to treat the conditions. For more information, visit thebarrow.org/neuromodulation.

Barrow Brain Tumor Research Center

More than 60,000 people are diagnosed with primary brain tumors every year in the U.S., with over a third being malignant tumors for which there is currently no cure. The launch of the Barrow Brain Tumor Research Center (BBTRC) led by a team of clinical and scientific experts in neuro oncology has set aggressive goals to stimulate scientific discovery, improve interdisciplinary collaboration, and serve as a national center for brain tumor clinical trials.

Recent advances in our understanding of the cellular origin of this disease have led to a paradigm shift in brain tumor biology. Discoveries have emerged to link neural stem cells with a variety of brain tumors, including gliomas, suggesting that such tumors may be formed through the aberrant transformation of neural stem cells.

The center consists of several independent laboratories, investigating distinct yet interrelated factors in brain tumor biology. Scientists will work alongside neurosurgeons, neuro-oncologists, and neuropathologists to unify basic science, translational and clinical research elements into novel strategies targeting brain tumor diagnostics, therapy and monitoring. For more information, visit thebarrow.org/braintumor.
Specific innovations in the BBTRC include:
- Advances in magnetic resonance imaging (MRI) technology that measure changes in blood flow accompanying brain activity, determining the functionality of brain regions and identifying potential risks when planning neurosurgical treatment.
- High field-strength intraoperative MRI to monitor the extent of tumor removal during surgery.
- Multimodal radiation therapy (such as three-dimensional conformal therapy, stereotactic radiotherapy, and intensity-modulated radiotherapy) to target brain tumor tissue more precisely and without exposure to surrounding normal tissue.
- Multidisciplinary tumor board conferences open to live or web-based participation of referring providers.
- An unmatched capacity for patient recruitment to clinical trials, enabling Phase I and II trials to be conducted more rapidly, and candidates for large, multi-center Phase III studies to be identified more efficiently.
- Neuroscientists exploring less conventional approaches to the treatment of brain tumors including personalized medicine, targeted therapy, gene therapy, immunotherapy, and glioma vaccine therapy.

The Barrow Brain Tumor Research Center team anticipates doubling its clinical trials involvement in five years, enabling every brain tumor patient at least one experimental therapeutic option in addition to standard therapy.

Specialized services for brain tumor patients include:
- Patient Navigator Program, in collaboration with the American Cancer Society
- Nutritional support
- Pain management
- Rehabilitation services
- Genetic counseling services by a certified genetic counselor
- Brain Tumor Support Group

For more information, visit thebarrow.org/braintumor.

**Neuro-oncology**

Patients with brain and spine tumors receive care from oncology specialists. Neuro-oncologists, neurologists, neurosurgeons, neuropathologists, neuroradiologists and radiation oncologists work together to provide a treatment plan designed for each patient’s particular case. Care is available in an outpatient clinic and in an inpatient unit specially designed and staffed for patients with malignant and benign tumors. The neuro-oncology program also conducts clinical trials and bench research of the brain and spine.

**Neurovascular/Stroke**

Barrow’s Robbs Stroke Center and Noren Stroke Unit provide care for more stroke victims than any other center in the Southwest. Our stroke center was the first in Arizona to receive both formal recognition by the AHA/ASA and accreditation by the Joint Commission on Accreditation of Health Care Organizations. Patients with signs of a stroke are evaluated and treated to prevent a life-altering stroke. Follow-up care, rehabilitation and education
help stroke patients achieve the best recovery and quality of life possible. Our neurodiagnostic technology used to assess stroke patients includes CT angiography and perfusion scanning, as well as MRI and digital subtraction angiography. The Barrow Stroke Center networks with hospitals across the state using a combination of telephonic, image-sharing, and virtual presence technologies to provide emergency consultation for patients with acute stroke. Graduates of our neurology residency program undertake advanced “fellowship” training in stroke and stroke-related fields, such as neurointervention and neurocritical care. The center also conducts more clinical stroke treatment and prevention research trials than any other hospital in the region. For more information, visit thebarrow.org/stroke.

Craniofacial Center

The Barrow Cleft and Craniofacial Center (BCCC) brings together the expertise of a wide variety of sub specialties including; craniofacial plastic surgery, pediatric neurosurgery, otolaryngology, genetics, craniofacial orthodontics, craniofacial speech pathology, dentistry, oral surgery, ophthalmology, oculoplastic surgery, pediatrics, audiology, psychology, and physical therapy to care for children and adults with clefts and complex congenital or acquired craniofacial disorders. The center, approved by the American Cleft Palate and Craniofacial Association, provides comprehensive clinical, diagnostic, surgical, educational, genetic and support services. Inpatient surgery for children under the age of 15 is performed at the Barrow Neurological Institute at Phoenix Children’s Hospital. BCCC is the only approved craniofacial team in Arizona and the only approved cleft team in the greater Phoenix area. This renowned craniofacial team has worked together for more than two decades, treating and evaluating thousands of patients from around the world. For more information, visit thebarrow.org/craniofacial.

Normal Pressure Hydrocephalus Center

The Normal Pressure Hydrocephalus (NPH) Center utilizes a multidisciplinary team approach. The NPH Screening Clinic is designed to provide comprehensive evaluation to determine if patients have NPH as a cause of their symptoms. For those felt likely to have NPH, diagnostic testing and treatment is available. The team supports collaboration between clinical and research specialists and facilitates professional and patient educational programs to advance the diagnosis and treatment of the disease process. Dedicated to the continuity of care of each individual, the NPH Center is made up of specialists in neurology, neuropathology, neuro-rehabilitation, neuroscience research, neurosurgery, physical therapy, neuroradiology, nursing and neuropsychology. Through team review of medical records, radiographic tests, and other diagnostic examinations, a treatment plan is fashioned to meet each patient’s specific needs. For more information, visit thebarrow.org/NPH.
Barrow has long been recognized worldwide as a leader in the diagnosis and treatment of complex neurological problems of infants and children. Thanks to the affiliation between St. Joseph’s Hospital and Phoenix Children’s Hospital, parents whose children suffer from complicated and rare neurological disorders will continue to have access to the best pediatric neurologists, neurosurgeons, neuropsychologists and rehabilitation specialists in the Southwest. The Barrow Neurological Institute at Phoenix Children’s Hospital offers a wide array of specialized, multidisciplinary clinical services as well as access to cutting edge clinical and translational research studies. The addition of Barrow’s technological advancements and research with Phoenix Children’s Hospital’s more than 25-year history of caring for children brings a whole new level of comprehensive, state-of-the-art care to these children.

Barrow pediatric physicians from a wide-range of specialties – pediatric neurosurgery, child neurology, developmental pediatrics, pediatric neuroradiology, craniofacial surgery, pediatric neuropsychology, pediatric physical medicine and rehabilitation—can diagnose and treat the most complex congenital and acquired neurological diseases affecting children. Specialists also participate in basic science and translational research in molecular genetics, epilepsy, neurogenetics, cerebrospinal fluid dynamics, neural injury, cerebral protection and cerebral plasticity. Clinical studies involving traumatic brain injury from mild concussions to severe injuries, congenital and traumatic spinal problems, seizure disorders and epilepsy, brain tumors, spina bifida, cerebral palsy, hydrocephalus, developmental delay and autism are also underway.

In addition, Barrow Neurological Institute at Phoenix Children’s Hospital offers fully accredited medical residency training programs in child neurology, as well as fellowships in pediatric neurophysiology, neuroradiology, and pediatric neurosurgery. The program is actively involved in the education of medical students, residents and fellows from multiple disciplines with our community partners.
Outpatient neurology, neurosurgery, neuropsychology and neuroradiology services as well as many multidisciplinary clinics are provided on the Phoenix Children’s Hospital campus less than two miles from St. Joseph’s Barrow Neurological Institute. In addition, Phoenix Children’s Hospital offers regional satellite clinics in the East and West Valley around Phoenix and will be expanding to surrounding communities in Arizona.

The combination of Barrow Neurological Institute and Phoenix Children’s Hospital brings together the best possible expertise in the Southwest for the optimal clinical care and innovative research and education for children with neurological disorders.

The faculty and staff at Barrow Neurological Institute and Phoenix Children’s Hospital have the same dedication to excellence in patient care, education and research as does the rest of Barrow’s clinical team. The team of pediatric neurological specialists evaluates and treats infants, and children up to age 18 for a wide-range of neurological and neurodevelopmental disorders, including attention deficit disorder, autism, developmental delay, epilepsy, headaches/migraines, neonatal neurology, neurogenetic conditions, neuromuscular diseases and spasticity. For more information, visit phoenixchildrens.com/bni.

**PEDIATRIC NEUROLOGY**

**Pediatric Epilepsy**

The Comprehensive Pediatric Epilepsy Program at Phoenix Children’s Hospital provides comprehensive care for infants, children, and adolescents with seizures and epilepsy. Barrow is a nationally recognized multidisciplinary center for epilepsy diagnosis and treatment. The faculty is active in clinical, translational, and basic science research relating to epilepsy, and in professional training of residents and fellows.

The new tower at Phoenix Children’s Hospital includes a dedicated 8-bed Pediatric Epilepsy Monitoring Unit (PEMU). Video-EEG seizure recordings in the PEMU allow Barrow to provide the correct diagnosis for seizures and other spells, and to localize the region of seizure onset for those patients who may require epilepsy surgery. Additional testing may include high-resolution MRI, Positron Emission Tomography (PET), and Single-Photon Emission Computed Tomography (SPECT). Treatment options include conventional and investigational anti-epileptic medications, various types of epilepsy surgery, the ketogenic diet, and vagus nerve stimulation (VNS). For more information, visit phoenixchildrens.com/epilepsy.
Hypothalamic Hamartoma Program

Barrow is recognized world-wide for its Hypothalamic Hamartoma (HH) Program, and is still the only multidisciplinary program in the United States dedicated to the care of patients with this uncommon but often devastating illness, which includes refractory epilepsy and disturbance of normal development. Children and adolescents with HH are treated at Barrow at Phoenix Children’s Hospital. Since 2003, Barrow has treated more than 160 children with HH, and has been the most active program in the world for HH research. For more information, visit phoenixchildrens.com/hh.

PEDIATRIC NEUROPSYCHOLOGY

Neurological and behavioral issues are often closely interrelated. The pediatric neuropsychologists of Barrow at Phoenix Children’s use their knowledge of brain-behavior relationships to evaluate and diagnose children who may have traumatic brain injury, autism spectrum disorder, epilepsy, concussion, cerebral palsy or other central nervous system dysfunctions.

Barrow at Phoenix Children’s offers the largest pediatric neuropsychology program in the state, with the top specialists, who work closely with their Barrow colleagues to optimize care. Early diagnosis and treatment is essential – young brains can retrain and regain function to achieve the highest possible level of development.

PEDIATRIC NEUROSURGERY

The pediatric neurosurgeons at Barrow Neurological Institute at Phoenix Children’s Hospital handle the most difficult pediatric brain and spinal cord disorders, including spina bifida, hydrocephalus, cerebral palsy, craniofacial abnormalities, brain tumors, and severe head and spine trauma. The pediatric neurosurgery program benefits from pediatric and neurosurgery residency programs that provide in-house physician coverage 24 hours a day, Child Life Specialists that address patients’ psychosocial and developmental needs, and a 48-bed pediatric intensive care unit at Phoenix Children’s Hospital ensures kids get round the clock specialized care by highly-trained pediatric intensive care specialists.

Barrow Neurological Institute at Phoenix Children’s Hospital offers a wide array of specialized, multidisciplinary clinical services as well as access to cutting edge clinical and translational research studies.
The Division of Neuroradiology at Barrow is nationally recognized as a leader in clinical neuroimaging and imaging research. The division has contributed to improvements in diagnostic methods and significant advancements in surgical accuracy when combined with surgical navigation systems. A wide range of diagnostic tools is available, including:

- Computerized tomography (CT) scanning offers rapid evaluation of stroke, trauma and subarachnoid hemorrhage. Newly developed methods of CT perfusion make possible the rapid evaluation of brain blood flow without the need of inhaled gasses.
- CT angiography produces images of the blood vessels in and around the brain with minimal risk to the patient.
- Cerebral angiography produces detailed images of minute peripheral vessels in the blood supply to the brain. To produce these images, the surgeon guides a catheter into the arteries of the neck and injects small amounts of contrast material.
- Advanced biplane digital subtraction angiography determines the exact location of abnormalities while minimizing contrast injections and risk for the patient.
- Advanced rotational angiographic methods produce three-dimensional images of blood vessel pathology. This technique improves pre-surgical planning and makes possible catheterization of the smallest vessels for the treatment of vascular lesions.
- Magnetic resonance imaging (MRI) uses weak radio frequency signals from the brain to create detailed images of tissue structure in the brain.
- Magnetic resonance angiography (MRA) allows imaging of the brain’s blood supply without risk to the patient. This technique often replaces cerebral angiography in the diagnosis and follow-up of blood vessel pathology.
- Magnetic Resonance Spectroscopy (MRS) is a cutting-edge advanced application that analyzes the body's chemical composition.
- Other extensions of MRI have made possible sensitive imaging of early stroke based on alterations of water diffusion within the brain as well as accurate images of cerebral perfusion.
- Barrow is one of the few institutions in the U.S. to offer intraoperative MRI using a high field strength 3 Tesla magnet. For more information, visit thebarrow.org/neuroradiology.
Acute Neurorehabilitation

For patients needing rehabilitation, Barrow’s Bruce and Deborah Downey Neuro Rehabilitation Center offers the most comprehensive program in Arizona. The center houses 52 patient beds with dedicated areas for patients with stroke, traumatic brain injuries, brain tumors, neurological disorders and spinal cord injuries. The center specializes in high-quality medical and nursing care, with physical, speech, and occupational therapies, as well as therapeutic recreation in one centralized setting. Other unit amenities include a secure brain injury unit, three gyms, internet access for patients, ceiling lifts to assist in the movement of immobilized patients, and voice activated environmental control units in select rooms. Barrow’s Neuro Rehabilitation Center is the only rehabilitation unit in Arizona that’s been awarded accreditation for its brain, stroke, comprehensive and spinal cord injury programs from the Commission on Accreditation of Rehabilitation Facilities (CARF). For more information, visit thebarrow.org/neurorehab.

Outpatient Neurorehabilitation

The Outpatient Rehabilitation and Adult Neurological and Spinal Cord Injury Programs at Barrow are accredited by the Commission on Accreditation of Rehabilitation Facilities. The programs utilize an integrated approach to rehabilitation and life reintegration. The approach features team/patient driven goals supplemented by family conferences, physician rounds, weekly interdisciplinary team conferences, and individualized treatment planning. Specific admission criteria are utilized to identify patients appropriate for this type of program. Patients and families work with the treatment team of
professionals, who include master social workers, physical therapists, occupational therapists, speech pathologists, a certified rehab nurse, and their referring physician. The programs are designed to focus on each client’s goals and lifestyle, and may include treatment in both clinical and community settings. St. Joseph’s Outpatient Rehabilitation is a hospital-based clinic that offers many other programs and services.

**Center for Transitional NeuroRehabilitation**

An intensive and holistic outpatient program, the Center for Transitional NeuroRehabilitation (CTN) at Barrow provides supportive rehabilitative services and education to patients with brain injuries. The goal is to help patients become more independent in the home and community and return to work or school. Since 1986, the center has helped hundreds of individuals with brain injuries resume a productive lifestyle.

Patients are encouraged to re-build their lives through a comprehensive treatment program that addresses their cognitive, language, physical, and psychological needs. Individual and group therapies are provided, and family support and education are also emphasized. After discharge, the center’s patients, graduates and their families are invited to attend support groups.

The CTN team is comprised of neuropsychologists, speech-language pathologists, physical, occupational and recreational therapists, a neurorehabilitation technician, psychiatrist, and dietician. For more information visit thebarrow.org/CTN.

**Rehab Aquatics Center**

The Ashlyn Dyer Aquatics Center, opening August 2012, will provide water-based rehabilitation for neurological and patients with other rehabilitation needs. Aquatic rehabilitation provides a gravity-free medium for patients with a variety of rehabilitation needs and disabilities that facilitates a more rapid recovery.

Neuro Rehab houses 52 patient beds with dedicated areas for patients with stroke, traumatic brain injuries, brain tumors, neurological disorders and spinal cord injuries.
NEUROPSYCHOLOGY

Since 1985, Barrow’s Department of Clinical Neuropsychology – a specialty that deals with the relationship between the brain and behavior – has worked with more than 23,500 patients to assist in their diagnostic assessment and facilitate recovery from brain disorders such as traumatic brain injury and stroke. At Barrow, neuropsychology is considered an integral component of recovery. Neuropsychology services include highly specialized assessments to help determine a diagnosis and treatment plan, rehabilitation to improve cognitive function and psychotherapy to help develop coping strategies. For more information, visit thebarrow.org/neuropsych.

Pediatric Neuropsychology

Barrow’s Department of Clinical Neuropsychology established the Children’s Center for Neuropsychological Rehabilitation (CCNR) to specifically address the neuropsychological and psychosocial needs of children with brain disorders. The CCNR provides a year-round clinic to evaluate and rehabilitate children, as well as providing an intense summer treatment program with parent and teacher involvement. For more information, visit thebarrow.org/CNNR.

NEUROANESTHESIA

Patients undergoing neurosurgical procedures require specialized anesthetic techniques to ensure safety and achieve successful outcomes. At Barrow Neurological Institute, this is accomplished through the expertise of highly trained, board-certified anesthesiologists. All of the neuroanesthesiologists at Barrow have been trained at prestigious academic medical institutions throughout the United States. Their skills enable complex cerebral and spinal cord procedures to be performed using various anesthetic techniques that assist intraoperative neurophysiologic monitoring, hypothermic extracorporeal circulation, intraoperative MRI, brain protection, and awake craniotomies. Fellowship trained pediatric anesthesiologists are available to assist with complex pediatric neurosurgical procedures.

Barrow neuroanesthesiologists work closely with the Post Anesthesia Care Unit (PACU) and the Neurological Intensive Care Unit (NICU) staff to manage pain and medical issues occurring during the immediate postoperative period. They also provide anesthesia care for patients undergoing diagnostic testing, Gamma Knife®, CyberKnife® and interventional neuroradiological procedures.

NEUROPATHOLOGY

The Division of Neuropathology provides diagnostic and analytic support for the clinical and research programs at Barrow. An accurate diagnosis is essential for proper patient management and for the evaluation of new treatments. Tissue from the brain, spinal cord, peripheral nerves, muscles and spine are analyzed microscopically using histochemistry stains, immunohistochemistry molecular markers and electron microscopy. The division maintains a tissue bank of paraffin-embedded and frozen tissue to promote the study of neurosurgical, neurological and neuromuscular diseases.

Research in the division focuses primarily on molecular markers of prognosis in gliomas, meningiomas and pituitary adenomas. Recognized as experts in brain tumor pathology, Barrow’s neuropathologists are involved with national studies of glioma pathology and treatment. Characterization of hypothalamic hamartomas in relation to epileptogenesis is another major research area. Teaching is also a significant focus and residents in neurosurgery, neurology and pathology rotate through neuropathology as part of their training. The Barrow Neuropathology Fellowship program provides further training to the next generation of neuropathologists. For more information, visit thebarrow.org/neuropath.
Laboratory research at Barrow Neurological Institute at St. Joseph’s involves 25 laboratories and more than 100 scientists dedicated to basic research related to the entire range of neurological and psychiatric disorders. These investigators work in the fields of molecular and cellular neurobiology, genetics, neurochemistry and neuropharmacology, neuropsychology, neuro-immunology, neuroanatomy and neurophysiology. Most of these activities are conducted in the Marion Rochelle Neuroscience Research Center, but laboratories and facilities also are present on the Phoenix downtown biomedical campus and in other parts of St. Joseph’s.

Barrow investigators actively contribute toward the diagnosis, prevention and treatment of brain, nerve and spinal cord diseases and injuries. These include neurocognitive disorders (e.g., Alzheimer's disease), movement disorders (e.g., Parkinson's disease), nervous system tumors (e.g., neuro-oncology), pain, visual system disorders, brain and spinal cord trauma, epilepsy, neuroimmunological diseases (e.g., multiple sclerosis), neurodevelopmental disorders (e.g., neurofibromatosis, Rett syndrome, tuberosclerosis), neurovascular disorders (e.g., stroke, vascular malformations) and psychiatric diseases (e.g., depression, attention deficit disorder, schizophrenia). Other research efforts are devoted to facilitating recovery through a neurorehabilitation program, and support groups and community outreach activities help patients and loved ones understand and deal with the disease, treatment and recovery processes. Basic laboratory research findings are translated to medical treatments and provide the foundation for the breakthroughs that lead to improvements in clinical care. In addition, a robust program providing more immediate advances in defining and treating neuropsychiatric disorders exist.

Examples of some of the basic and clinical research studies underway at Barrow include:

**Neurosurgery Research:**
- Studies on immunotherapy for malignant brain tumors using novel peptides
- Studies on meningiomas using metabolic imaging correlated to molecular profiling
- Development of brain stimulator and electrode technology
- Development of new, image-guided technology and endoscopic techniques
- Spinal cord sparing and regeneration using novel, self-forming scaffold biomaterials
- Application of novel biomaterials for bone fusion
- Use of new liquid biomaterials for endovascular embolization of aneurysms and arteriovenous malformations
- Neuro-dissection anatomy laboratory exploring clinical questions with an anatomic basis
- State-of-the-art facilities for preclinical neurosciences and medical technology development, testing and training
- Defining distinctive pathways for transmission of temperature, itch, touch and pain sensations
- Delineating how sensory inputs converge with fight-or-flight stimuli in brain regions involved in emotional responses, brain and body maintenance, and consciousness
- Studying genetics, biomarkers, and microRNA profiling of patients suffering subarachnoid hemorrhage at risk for vasospasm
- Application of fluorescent probes and contrast agents for intraoperative pathological diagnosis of brain tumors
- Molecular profiling on glial tumors—a collaboration with Stanford

**Neurology Research:**

- Immunological studies on relapsing multiple sclerosis
- Immune therapy in experimental myasthenia gravis
- Genetic linkage studies of Parkinson’s disease
- Surgical treatment of Parkinson’s disease and other movement disorders
- Stimulation of the immune system for treatment of brain cancer
- Prevention of post-traumatic seizures
- Functional mapping using electrode arrays or microelectrodes to define areas to be spared during epilepsy or brain tumor surgery and to be targeted for deep brain stimulation therapies
- Molecular rearrangement of chemical signaling receptors implicated in normal brain function and in disease
- Development of pharmacotherapies for nicotine addiction
- Vagus nerve stimulation for treatment of chronic epilepsy
- Investigation of novel complementary therapies for the treatment of brain tumors
- Micro RNAs and therapy resistance in brain tumors
- Molecular profiling of meningiomas to identify markers of tumor aggression
- Effects of early environmental alterations on seizure susceptibility
- Impact of prenatal and postnatal stress on brain gene expression
- Experimental models of pathogenesis of Rett syndrome neurofibromatosis and tuberous sclerosis
- Oxidative stress, the ketogenic diet, and metabolic approaches to neuroprotection
- Mechanisms of seizure genesis in hypothalamic hamartomas
Neuropsychology Research:

- Predicting functional outcome after traumatic brain injury
- Interactions between susceptibility to traumatic brain injury and genes that predispose toward neurocognitive disorders
- Neuroimaging and cognitive correlates of normal and abnormal aging
- Effects on memory of perimenopause and its treatment
- Functional and structural imaging in epilepsy and brain tumors to help identify brain regions involved and best ways to spare important areas during surgical intervention
- Cognitive and behavioral disorders associated with hypothalamic hamartomas
- Process and outcome measures associated with effective neuropsychological rehabilitation
- Anosognosia and impaired awareness after various forms of brain injury

Neurobiology Research:

- Brainstem pathways and mechanisms responsible for impaired movement control resulting from diseases of the basal ganglia, such as Parkinson’s disease
- Mechanisms for the spinal generation of rhythmic movements, such as walking
- Structure and function of chemical signaling receptors
- Roles for chemical signaling receptors in neuropsychiatric diseases
- Drug development for improved pharmacotherapy of neuropsychiatric diseases and of addictions
- Pathways and mechanisms responsible for visual perception and consciousness
- Contribution of higher centers to the control of balance and visually guided locomotion
- Brain mechanisms responsible for the ability to learn and produce vocalization

Neuroimaging Research - Keller Center for Imaging Innovation:

- Innovations in imaging technology for improved diagnostics including instrumentation and programming developments that decrease scan times (and expense) and artifacts and increase resolution
- Training of engineers, scientists and clinicians in imaging technology
- Provision of novel imaging resources and expertise to enhance biomedical research state-wide
- Functional and structural imaging to follow treatment progression or disease course
- Presurgical mapping using imaging
Clinical Trials:

- More than 400 protocols involving human subjects or samples
- More than 200 clinical trials actively enrolling patients in work defining effectiveness of novel surgical or medical interventions in disease

Research Partnerships:

Barrow has established formal partnerships with numerous local and national organizations. Barrow investigators individually also have developed collaborations with investigators state-, nation- and world-wide. These partnerships and collaborations simultaneously spread the reach of Barrow while allowing advances to be accelerated thanks to complementarity of expertise. For example, Barrow’s partnership with Arizona’s Translational Genomics Institute (TGen) includes collaborative research, clinical trials and shared use of facilities. A unique agreement with GE Healthcare has accelerated joint research efforts and quickly transitioned discoveries into improved diagnostic imaging. Barrow and Arizona State University have partnered to form a Neuroscience Interdisciplinary Graduate Program that offers doctoral students access to the most sophisticated clinical and biotechnological resources available in the field. This program increases opportunities for students to obtain doctoral degrees while working with Barrow investigators.

...today researchers are placing a heavy emphasis on genetics, helping to identify the specific genes for conditions such as epilepsy and brain tumors. Such research promises to lead to improved diagnoses and treatment of disease.
St. Joseph’s is a teaching hospital – a fact that contributes enormously to the hospital’s medical advances. The academic environment ensures that our medical staff remains on the cutting edge of medicine, teaching and providing tomorrow’s medicine today. To effectively train future generations of physicians, Barrow faculty members must be committed to continually challenging themselves and staying open to new ideas and discoveries.

Barrow offers the nation’s largest non-university-based neurology and neurosurgery residency programs. These competitive programs, which are made up of more than 60 residents and 20 fellows, attract the best and brightest students from around the world. Currently, Barrow offers residency programs in child neurology (at Phoenix Children’s Hospital), neurology and neurosurgery, and fellowships in cerebrovascular, endovascular and spine surgery, clinical neuropsychology, epilepsy/clinical neurophysiology, movement disorders, neuroimmunology, neuro-oncology, neuroradiology and stroke.

To encourage the exchange of knowledge among health professionals, Barrow hosts multiple conferences and seminars for medical professionals and community members each year. Among those is the annual Barrow Symposium, which attracts hundreds of national and international participants. Conference support is available to Barrow residents and physicians. In addition, hundreds of neurosurgeons from around the world visit Barrow every year to observe and learn the latest surgical techniques.

Barrow’s Neuroscience Publication’s provides editing, manuscript formatting and other support for publishing such as medical illustrations, animations and interactive multimedia for the most prestigious medical publications and presentations. Specialists at Barrow have published hundreds of articles and textbooks covering the latest developments in neurology and neurosurgery, and many serve on the editorial review and national certification boards in their specialties.

PortalVision, a new advance in medical education developed at Barrow, offers residents, fellows and practicing neurosurgeons an opportunity to learn surgical techniques and neuroanatomy virtually. This unique interactive software integrates live surgery, multilayered annotated cadaveric dissections, radiographic images and animations of more than 30 complex neurosurgical approaches.
Because brain and spinal cord injuries are among the most devastating and costly preventable injuries, Barrow’s mission to educate medical professionals as well as the public at large includes an extensive community outreach program dedicated to education and prevention. Barrow’s programs reach thousands of children and adults each year. “Helmet Your Head” is a safety program developed by Barrow that focuses on the prevention of head and traumatic brain injuries and the effect these injuries have upon the individual, the family and the community. The curriculum was designed to be used in a variety of classroom settings, from kindergarten to 12th grade. “ThinkFirst” offers evidence-based educational presentations and programs for schools and communities to prevent brain and spinal cord injuries by teaching strategies on how to make safe choices. Barrow serves as the state-wide training center for both the “Helmet Your Head” and “ThinkFirst” programs. The “Oliver Otter You Better Be Water Wise” is a water safety program developed by staff at St. Joseph’s. It teaches children and adults the importance of following good water safety rules through educational materials such as a video, a mascot and a contract to encourage safe behavior around water. The Fall prevention program offers an informative presentation designed to reduce the incidence of falls by increasing the knowledge and awareness of the causes and risk factors related to falls, especially in the older adult population.

**Stroke prevention.** The “Stroke Prevention Program” offers informative presentations and educational materials to increase awareness of the causes, signs and symptoms of stroke. Working in collaboration with a number of community agencies and the American Heart/Stroke Association, Barrow seeks to reduce the incidence of stroke by increasing awareness of healthy habits and by emphasizing the importance of seeking prompt medical attention.

**Educational Outreach.** The Scientific Enrichment Program for Students (SEPS) offers a variety of opportunities for high school and college undergraduate students to learn about research by participating in “hands on” laboratory experience. The program attracts over a hundred high school students and teachers to Barrow each year for lectures, tours of the research laboratories and “hands on” biotechnology workshops. Barrow scientists also support the Arizona Bioengineering Collaboration (ABC), an educational outreach program for teachers run by the Arizona Science Center. A monthly science lecture series is also offered free to the public in collaboration with the Spirit of the Senses. In addition, Barrow sponsors support groups on a variety of neurological diseases and conditions for patients and their family members.
PHILANTHROPY

Barrow Neurological Foundation is a non-profit support foundation that raises funds for research, medical education, technology, facilities and clinical services at Barrow. A generous gift from Charles Barrow in the late 1950s helped establish Barrow Neurological Institute in the early 1960s, and ongoing benefactor support has fueled the institute’s growth through the years. For information on how you can contribute to Barrow’s future, contact the Foundation at 602-406-3041 or visit SupportBarrow.org. Gifts to the foundation are tax deductible as allowed by law.

REFERRAL SERVICES

Barrow’s ResourceLink Information and Referral Service provides physician referrals, information about clinical programs and services, and help scheduling registrants for community education classes and screenings. ResourceLink is available weekdays from 7:30 a.m. until 5:30 p.m. Arizona time. To find a neurospecialist at Barrow, call 1-800-Barrow1 (1-800-227-7691).