Welcome to the Brain Care Institute at Children’s Hospital of Pittsburgh of UPMC. This issue of Pediatric Insights highlights our renowned, multifaceted Division of Pediatric Neurosurgery. We also focus on our cutting-edge neuroradiology service.

The Brain Care Institute conducts cutting-edge research and offers innovative treatments and approaches to children with disorders of, and injuries to, the brain, spinal cord, nerves, and muscles. The BCI comprises areas including pediatric and neonatal neurocritical care, neuro-oncology, neurorehabilitation, neuroradiology, neurodevelopmental disorders and rare disorders, autism and Down syndrome, in addition to neurology and neurosurgery. Developments over the past year include:

- **Sharyl Fyffe-Maricich, PhD**, will be profiled in an upcoming documentary produced by the National Multiple Sclerosis (MS) Society on women researchers in MS. Dr. Fyffe-Maricich’s neurology lab is interested in understanding the molecules and signaling pathways that are essential for controlling the onset of myelination and for determining the thickness of the myelin sheaths.

- “Early Treatment is Associated With Improved Cognition in Hurler Syndrome,” was authored by Michele Poe, PhD; Sarah Chagnon, MD; and Maria Escolar, MD, MS and published in Annals of Neurology. It shows that umbilical cord blood transplantation from unrelated donors has been shown to improve neurological outcomes of children younger than two years of age and prolong life.
The Pediatric Neurosurgery Division at Children’s Hospital of Pittsburgh of UPMC, is a multifaceted leader in neurosurgical care, providing care for children with tumors, spinal deformities, cranial malformations, spasticity, and epilepsy. The division — led by Ian Pollack, MD, and including the work of full-time faculty members Elizabeth Tyler-Kabara, MD, PhD; Stephanie Greene, MD; and Mandeep Tamber, MD, PhD — has gained worldwide recognition for the treatment of pediatric brain tumors, cerebral palsy, and traumatic brain injury.

**Neuro-Oncology**

Through its neuro-oncology program, the center provides comprehensive, multidisciplinary care for patients with brain and spinal cord tumors, in collaboration with the oncology and radiation therapy programs. Patients may be eligible for treatment in one of many innovative research protocols at Children’s Hospital. These protocols — several of which are unique to Children’s Hospital or available at only a few centers throughout the country — provide patients access to new treatments and promising studies.

Dr. Pollack is the institutional principal investigator and chair of the neurosurgery committee in the Pediatric Brain Tumor Consortium, supported by the National Cancer Institute to perform cutting-edge clinical trials in children with brain tumors. He also serves as the principal investigator on several studies involving vaccine-based immunotherapy for children with challenging brain tumors, such as newly diagnosed brainstem and high-grade gliomas and recurrent low-and high-grade gliomas and ependymomas.

Dr. Tyler-Kabara has pioneered the use of endoscopic endonasal approaches to the skull base in the pediatric population. Children’s Hospital offers this minimally invasive approach to skull base pathologies even in children under the age of five. The clinical brain tumor program is augmented by NIH-funded, laboratory-based research initiatives examining molecular markers of prognosis and novel treatment strategies in children with brain tumors.

**Pediatric Epilepsy Surgery**

The Surgical Epilepsy Program is the only center in the region able to provide comprehensive evaluation and surgical treatment options for children with intractable epilepsy. Dr. Tamber, the lead epilepsy neurosurgeon, collaborates closely with epileptologists within Child Neurology.

A comprehensive pre-surgical evaluation, using state-of-the-art neuro-imaging resources, is carried out to identify the specific site in the brain causing seizures, and to determine its relationship to important functional areas of the brain. Surgical candidates benefit from a full spectrum of treatment options ranging from lesionectomies (guided by intraoperative electrocorticography); tailored cortical resections following a period of invasive subdural EEG monitoring; corpus callosotomies; and hemispherectomies. Other patients may benefit from vagus nerve stimulation. Children’s Hospital has implanted more than 300 vagus nerve stimulators, making it one of the busiest programs in the country.

**Movement Disorders**

The Spasticity and Movement Disorders Clinic, led by Dr. Tyler-Kabara, is made up of a team of pediatric medical professionals who specialize in the comprehensive, multidisciplinary evaluation and treatment of children and young adults with spasticity and other movement disorders such as dystonia, chorea, athetosis, and tremor. The clinic was founded in 1986 by A. Leland Albright, MD, former head of the division. Dr. Albright was the first investigator in the United States approved by the FDA to study the use of intrathecal baclofen and the first doctor to perform deep brain stimulation for tremor dystonia resulting from cerebral palsy. The purpose of the clinic is to determine whether a patient would benefit from treatment with oral medications, intrathecal baclofen, selective dorsal rhizotomy, intramuscular BOTOX® injection, deep brain stimulation, or other therapies.

**Vascular Anomalies**

Patients with vascular anomalies such as aneurysms, arteriovenous malformations, cavernous malformations, and moyamoya syndrome are managed by Dr. Greene. Select patients undergo further evaluation at the department’s Center for Image-Guided Neurosurgery with L. Dade Lunsford, MD, for possible radiosurgical treatment; angiography by Brian Jankowitz, MD, for further definition of anomalies and possible embolization of feeding vessels; and assessment by a vascular neurologist for management of seizures, dystonia, and coagulopathies that may be identified during the course of the evaluation process. Patients with vascular problems involving more than one organ system, or those with syndromes such as Sturge-Weber or PHACES, are seen in the multidisciplinary Vascular Anomalies Clinic.
The Pediatric Neuroradiology service focuses on detecting and characterizing abnormalities and diseases that affect the brain, spine, head, and neck. We see patients from the fetal period to adulthood. Our practice attracts patients who experience common, uncommon, and often complex neurological symptoms. Our neuroradiology specialists use advanced imaging techniques to evaluate within the brain, the central nervous system, and associated blood vessels to diagnose problems. We use digital angiography, MRI (magnetic resonance images), CT (computed tomography), PET (positron emission tomography), and ultrasound to study and search for neurological diseases and disorders. We also perform advanced quantitative neuroimaging techniques including functional MRI, MR spectroscopy, perfusion MR, and diffusion tensor imaging to evaluate complex neurological issues in the developing brain. Our pediatric neuroradiologists have subspecialty expertise in neuro-oncology, fetal-neonatal imaging, head and neck imaging, neurovascular imaging, and neurometabolic imaging.

Collaboration and Research
The division is an integral collaborator in the Cleft-Palate and Craniofacial Center in the management of children with craniofacial disorders. Because children with complex craniosynostosis often require a staged approach to the treatment of their cranial, midfacial, and lower facial deformities, close multidisciplinary follow-up is maintained throughout childhood and adolescence in order to optimize long-term functional and cosmetic outcome. The division is also actively involved in the Brain Trauma Research Program, the Fetal Diagnosis and Treatment Center, and the Brachial Plexus Program. In conjunction with a team of specialists at Magee-Womens Hospital of UPMC, Dr. Greene has established a program to treat babies with myelomeningocele, or spina bifida, with in utero surgery here in Pittsburgh. Babies who are not candidates for in utero surgery for a variety of reasons undergo conventional closure of the defect within several days of birth. These children are seen throughout childhood by a multidisciplinary team of medical professionals in the Spina Bifida Clinic at Children’s Hospital, one of the largest such clinics in the country.

The Brachial Plexus Program, run through the division of pediatric plastic surgery, manages infants with obstetric injuries to the brachial plexus in a collaborative fashion with specialists from neurosurgery, plastic surgery, orthopaedic surgery, and physical and occupational therapy. Children’s Hospital is one of a handful of centers in the country that have a dedicated multidisciplinary clinic for these patients. Patients with peripheral nerve tumors or injuries are seen by Dr. Greene outside of the Brachial Plexus Program. Dr. Tamber has worked to include Children’s Hospital in several large multi-center clinical networks that are dedicated to the study of common pediatric disorders. Children’s Hospital is a member of the Hydrocephalus Clinical Research Network, a group of seven premier pediatric neurosurgical departments in North America that is dedicated to designing and undertaking field-changing prospective research into pediatric hydrocephalus. Children’s also has been selected as a member institution in the Park-Reeves Syringomyelia Research Consortium, a group dedicated to solving important clinical problems within the realm of Chiari malformation and syringomyelia. Dr. Tamber is the institutional principal investigator for both of these endeavors.
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Neuroimaging of Pediatric Brain Tumors
In this presentation, Ashok Panigrahy, MD, chief of Pediatric Radiology, discusses what specialists need to know when looking at an imaging study of a child who has a brain tumor.

Brain Injury in the Premature Newborn
In this presentation, Toby Yanowitz, MD, discusses the main forms of brain injury in the preterm infant based on findings on cranial imaging.

Video Rounds

Surgical Treatment of Moyamoya in the Pediatric Population
In this Video Rounds, Stephanie Greene, MD, director of vascular neurosurgery at Children’s Hospital of Pittsburgh of UPMC, explains how surgical intervention is the only viable treatment to effectively halt neurological decline associated with moyamoya.

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AWARDS AND RECOGNITION

Michael Bell, MD, director of Pediatric Neurocritical Care and Neurotrauma, is leading a $16.5 million international study to evaluate treatments for pediatric traumatic brain injuries (TBI) along with Stephen Wisniewski, MD, of the University of Pittsburgh. The five-year NIH study aims to provide compelling evidence to change clinical practices and provide recommendations for guidelines that could immediately improve outcomes for injured children.

According to ScienceWatch, pediatric critical care physician Patrick Kochanek, MD, is the most prolific author on traumatic brain injury worldwide, and the University of Pittsburgh is at the top of both the list of most prolific and most-cited institutions.

ABOUT CHILDREN’S HOSPITAL OF PITTSBURGH OF UPMC

Children’s Hospital of Pittsburgh of UPMC is a leader in the treatment of childhood conditions and diseases, a pioneer in the development of new and improved therapies, and a top educator of the next generation of pediatricians and pediatric subspecialists.

Children’s is consistently recognized for its research and clinical achievements, including ranking seventh among children’s hospitals and schools of medicine (FY13) in NIH funding for pediatric research, and being named to the 2014-15 U.S. News & World Report Honor Roll of America’s Best Children’s Hospitals.