Pediatric Insights

BEST CHILDREN'S HOSPITALS U.S.News & WORLD REPORT NEUROLOGY & NEUROSURGERY 2018–19

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An Update From the Divisions of Child Neurology and Pediatric Neurosurgery

About the Brain Care Institute

The Brain Care Institute (BCI) at UPMC Children's Hospital of Pittsburgh is dedicated to developing innovative treatments and approaches for infants, children, and teens with disorders of and injuries to the brain, spinal cord, muscles, and nerves.

The Brain Care Institute is more than 200 physicians, nurses, and staff who treat more than 14,000 patients every year — patients who come to us from across the country and around the world.

What is truly innovative about the approach the BCI takes is the speed with which experts from all areas of brain care can come together and put the full force of their training, technology, and intelligence to bear upon any particular child's case.

Our system is designed so physicians and other specialists can quickly get to the heart of a problem — even the most rare — and identify the most effective treatment methods. Our top priority is to give families the confidence and comfort of knowing there is no better place in the world for them to be.

UPMC CHILDREN'S HOSPITAL OF PITTSBURGH

UPMC Children's Hospital Continues Its Success With Vagus Nerve Stimulation for Epilepsy

Since 2005, UPMC Children's Hospital of Pittsburgh has been a leader in the use of vagus nerve stimulation (VNS) to treat epilepsy in pediatric patients. One of the oldest programs in the country performing VNS implantations, the Epilepsy Surgery Program at UPMC Children's typically performs 30 to 50 implantation procedures a year.

In April 2018, UPMC Children's began testing the newest generation of the SenTiva® VNS device from LivaNova that received FDA approval in October 2017. UPMC Children's is one of the first sites in the country to begin using the new VNS system in pediatric patients.

Christina Patterson, MD, director of the UPMC Children's epilepsy program, says that the newest device offers patients and clinicians a suite of new features and benefits to make the implantation and long-term use of the devices easier and more user friendly.

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About the Pediatric Epilepsy Surgery Program

The Pediatric Epilepsy Surgery Program at UPMC Children's Hospital of Pittsburgh, under the direction of Christina Patterson, MD, and Taylor Abel, MD, offers comprehensive assessment and care to children with medically refractory epilepsy, care that is on par with the best programs in the nation. On average, we perform brain surgery on 25 patients a year. In addition, about 50 patients a year undergo vagus nerve stimulator implantation. As the only center in the region that provides comprehensive preoperative evaluation and access to the full spectrum of epilepsy surgery procedures, as well as the opportunity to participate in the latest research into epilepsy, the Brain Care Institute offers access to all of the resources required for managing complex epilepsy cases.

For more information on the Pediatric Epilepsy Surgery Program, please visit **CHP.edu**, or call **412-692-6928**.

Pediatric Neurosurgery Welcomes New Faculty

In July 2018, **Taylor Abel, MD**, joined the Brain Care Institute at UPMC Children's Hospital of Pittsburgh as its newest pediatric neurosurgeon. Dr. Abel's appointments include assistant professor of neurological surgery at the University of Pittsburgh in addition to his role as the surgical director of the Pediatric Epilepsy Surgery program at UPMC Children's. Prior to joining the faculty at UPMC Children's and the University of Pittsburgh, Dr. Abel was a fellow associate in neurosurgery at the University of Iowa.

Following the completion of his medical degree at the University of Washington in Seattle, Dr. Abel continued his training at the University of Iowa with his internship and residency in neurological surgery, followed by a neurological surgery fellowship where he trained specifically in epilepsy surgery and brain mapping techniques. Dr. Abel also completed a fellowship in epilepsy surgery at the Centre Hospitalier Universitaire de Grenoble in La Tronche, France, where he received special training in the identification of epileptic foci using stereoelectroencephalography (SEEG). While SEEG has been used in France since the 1950s, there are few centers in the United States that use the procedure, and Dr. Abel is one of only a handful of neurosurgeons in the United States who have trained to use the procedure to map seizure activity in the brain for surgical planning.

Pediatric Neurosurgery Faculty. *Drs. Ian Pollack, Elizabeth Tyler-Kabara, Taylor Abel, Stephanie Greene.*

SEEG and Its Benefits

"SEEG is a minimally invasive way of identifying epileptic networks in the brain in three dimensions. It can provide very detailed information with respect to how seizures organize in the brain and how and where they propagate," says Dr. Abel.

Dr. Abel also has a particular expertise in frameless robot-assisted SEEG using the ROSA® (Robotic Stereotactic Assistance) robot, training for which he also received while studying at CHU at Grenoble. Since his arrival at UPMC Children's, the hospital has invested in acquiring this technology for use in Dr. Abel's practice in the epilepsy surgery program.

"The ROSA robot allows us to conduct SEEG without the need for a large craniotomy. We can place the electrodes directly through the skull without even making an incision. We also are able to record information not just from the surface of the brain, but from deep inside the cerebral cortex and other deep brain structures. We derive a much more complete picture of the patient's seizure activity, which allows us to more precisely target our surgical procedure to remove as little brain tissue as possible. This technology is a huge advance for UPMC Children's, but really it is of most benefit to our patients because of its minimally invasive nature and reduced complication rates," says Dr. Abel.

Research and Future Plans

Dr. Abel has an extensive background in human electrophysiology research and systems neuroscience, which provides a foundation for his studies of the physiology and functional connectivity of brain regions in children with epilepsy.

Dr. Abel's current research interests focus primarily on aspects of epilepsy and include methods of identification of epileptic networks using invasive and noninvasive techniques; clinical outcomes with both pediatric and adult epilepsy patients; epilepsy pathogenesis and pathophysiology; and the use of electrophysiology and neurologic imaging in the study of human cognition and development.

"What I hope to accomplish with my research is driven by the desire to make treatments for epilepsy more effective. I have a particular interest in better understanding how various forms of epilepsy influence or affect brain development in the growing child. As a field, we do not have a good appreciation of these complexities. We do know that children with epilepsy can have behavioral and psychological comorbidities that can

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Vagus Nerve Stimulation for Epilepsy *Continued from Page 1*

A major benefit from Dr. Patterson's perspective is the ability to tune the settings of the device to precisely match the patient's seizure burden for a better level of control.

"For example, if a patient is experiencing seizures more frequently at night, we can program the device to account for that and change function depending on the time of day," says Dr. Patterson.

VNS devices typically are used when antiepileptic medications are not effective at controlling seizures and when the patient is not a good candidate for another type of surgery.

Another important aspect is the ability to titrate an individual's settings to bring them up to the best therapeutic level for their situation. "We can program the device to do this over time and cut down on the number and frequency of clinic visits patients need to make for device adjustments. This is a great benefit for our particular patient population because we have many individuals who have to travel from significant distance to get to the hospital," says Dr. Patterson.

Dr. Patterson, along with neurosurgeon Elizabeth Tyler-Kabara, MD, PhD, have so far implanted more than a dozen of the new devices and are aggregating data for long-term usage studies and research.

VNS — Benefits and Usage

VNS devices typically are used when antiepileptic medications are not effective at controlling seizures and when the patient is not a good candidate for another type of surgery.

VNS devices are implanted in an outpatient procedure, and the patient oftentimes will go home the same day, or they may just need a single overnight stay in the hospital before discharge.

"I usually explain to families that one of the goals of VNS therapy is to hopefully minimize the number of other medications that are being used to treat seizures. This can reduce the cumulative side effect burden, which for some can be significant and present quality-of-life issues beyond those attributable to their underlying epilepsy," says Dr. Patterson.

In 50 percent of patients with an implanted VNS, clinicians typically see a 50 to 70 percent reduction in seizures. While not a cure-all for epilepsy or seizure disorder, this level of reduction in seizures from a VNS device can substantially reduce a patient's medication needs and improve their overall quality of life.

VNS — Emerging Benefits and Trials

Depression continues to be a common occurrence in patients with epilepsy. Many epilepsy patients with VNS implants see an improvement in their mood, and this aspect of VNS continues to garner research interest. VNS also has been trialed for use in the treatment of depression and has been FDA approved since 2005 for the treatment of severe, recurrent unipolar and bipolar depression, but broader adoption of the platform as an effective treatment modality is still in its infancy.

Video Rounds

Video Rounds is a series of short, informative, and educational videos created for physicians and cover a variety of medical and surgical disciplines. The following Video Rounds in Pediatric Neurology and Neurosurgery are available by visiting **UPMCPhysician Resources.com/Pediatrics.**

Surgical Treatment for Moyamoya in the Pediatric Population

Presenter: Stephanie Greene, MD, Director of Vascular Neurosurgery, Brain Care Institute

Pediatric Neuromuscular Diseases

Presenter: Hoda Z. Abdel-Hamid, MD, Director, EMG Laboratory and Neuromuscular Program

Neurodevelopment in Rare Disorders

Presenter: Maria Escolar, MD, Director, Program for the Study of Neurodevelopment in Rare Disorders

UPMCPhysicianResources.com

CME Courses, News, and Events for Physicians

Visit **UPMCPhysicianResources.com/Pediatrics** for the latest CME courses, news, and upcoming events available for physicians from UPMC and UPMC Children's Hospital of Pittsburgh.

Recent Neurology/Neurosurgery Courses

Main Cognitive Outcome of Infantile Spasms: Are We Making A Difference?

Presenter: Yoshimi Sogawa, MD

Dr. Sogawa discusses infantile spasms, also known as West syndrome, and examines which factors are associated with cognitive outcomes.

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influence cognitive development, but to what degree and which individuals are most at risk we just don't know," says Dr. Abel.

Below is a sample of Dr. Abel's most recent peer-reviewed published papers and other writings. More of his work can be sourced through the **PubMed.gov** website.

Abel TJ, Varela Osorio R, Amorim-Leite R, Mathieu F, Kahane P, Minotti L, Hoffmann D, Chabardes S. Frameless Robot-Assisted Stereoelectroencephalography in Children: Technical Aspects and Comparison with Talairach Frame Technique. *J Neurosurg Pediatr.* 2018; 221(1): 27-46.

Chabardes S, Abel TJ, Cardinale F, Kahane P. Commentary: Understanding Stereoelectroencephalography: What's Next? *Neurosurgery.* 2018; 82(1) Epub ahead of print.

Abel TJ, Woodroffe RW, Nourski KV, Moritani T, Capizzano AA, Kirby P, Kawasaki H, Howard M 3rd, Werz MA. Role of the Temporal Pole in Temporal Lobe Epilepsy Seizure Networks: An Intercranial Electrode Investigation. *J Neurosurg.* 2018; 129(1): 165-173.

Abel TJ, Rhone AE, Nourski KV, Ando TK, Oya H, Kovach CK, Kawasaki H, Howard MA 3rd, Tranel D. Beta Modulation Reflects Name Retrieval in the Human Anterior Temporal Lobe: An Intracranial Recording Study. *J Neurophysiol.* 2016; 115(6): 3052-3061.

Abel TJ, Manzel K, Bruss J, Belfi AM, Howard MA 3rd, Tranel D. The Cognitive and Behavioral Effects of Meningioma Lesions Involving the Ventromedial Prefrontal Cortex. *J Neurosurg.* 2016; 124(6): 1568-1577.

Perrodin C, Kayser C, Abel TJ, Logothetis NK, Petkov CI. Who is That? Brain Networks and Mechanisms for Identifying Individuals. *Trends Cogn Sci.* 2015; 19(12): 783-796.

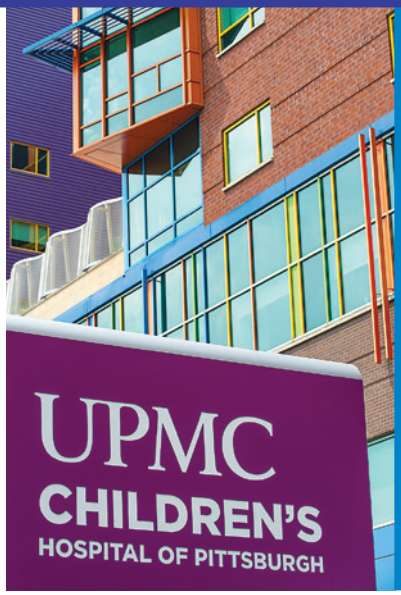
Abel TJ, Kawasaki H, Barrash J. Naming and Recognition After Laser Amygdalohippocampotomy: Is the Hippocampus Involved? *Epilepsia.* 2015; 56(8): 1317.

Abel TJ, Rhone AE, Nourski KV, Howard MA 3rd, Tranel D. Investigating the Anterior Temporal Lobe With Direct Intracranial Recordings. *Neurosurgery.* 2015; 62 Suppl 1:185 9.

Abel TJ, Rhone AE, Nourski KV, Kawasaki H, Oya H, Griffiths TD, Howard MA 3rd, Tranel D. Direct Physiologic Evidence of a Heteromodal Convergence Region for Proper Naming in Human Left Anterior Temporal Lobe. *J Neurosci.* 2015; 35(4): 1513-1520.

Abel TJ, Rhone AE, Nourski KV, Granner MA, Oya H, Griffiths TD, Tranel DT, Kawasaki H, Howard MA 3rd. Mapping the Temporal Pole With a Specialized Electrode Array: Technique and Preliminary Results. *Physiol Meas.* 2014; 35(3): 323-337.

UPMC Children's Hospital of Pittsburgh is affiliated with the University of Pittsburgh School of Medicine and nationally ranked in nine clinical specialties by *U.S. News & World Report*.



About UPMC Children's Hospital of Pittsburgh

Regionally, nationally, and globally, UPMC Children's Hospital of Pittsburgh 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. With generous community support, UPMC Children's Hospital has fulfilled this mission since its founding in 1890. UPMC Children's is recognized consistently for its clinical, research, educational, and advocacy-related accomplishments, including ranking 13th among children's hospitals and schools of medicine in funding for pediatric research provided by the National Institutes of Health (FY2017).

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