

## Case study: Katie McCormick RNS offers seizure relief for RNS patient

**F**or the last 10 years, Mark and Teresa McCormick could only watch as their daughter, Katie, suffered with seizures.

A decade later, Katie, a patient at Le Bonheur Children's Hospital, has new hope that doctors can better control her seizures. In May, she became the one of the youngest children in the nation to receive the NeuroPace® RNS® system, a closed-loop brain stimulation system approved by the U.S. Food and Drug Administration for controlling seizures.

Katie was just 5 months old when she had her first seizure. Months passed before Katie had another. Neurologists at their local hospital in Jackson, Miss., tried to control her seizures with medications.

At first the medications helped, but by the time Katie turned 1 year old, the drugs were no longer effective. As Katie's seizures grew in frequency,

Teresa and Mark McCormick became more concerned with their daughter's health.

"The seizures were a lot more uncontrolled, and they started to change and she was having a lot of small seizures," Teresa said.

Katie's condition continued to worsen and their neurologist referred them to Le Bonheur Children's Hospital. The hospital's Comprehensive Epilepsy Program is led by James Wheless, MD, chief of pediatric neurology and co-director of the Neuroscience Institute, and Pediatric Neurosurgeon Frederick Boop, MD, chairman of the Department of Neurosurgery at the University of Tennessee Health Science Center and co-director of the Neuroscience Institute.

At Le Bonheur, an MRI revealed an abnormality of Katie's brain as the source for her seizures. She was

diagnosed with partial onset epilepsy. That's when the McCormicks began discussing surgical options with

doctors and soon after Katie underwent a frontal lobe resection. Katie had a second surgery, a frontal lobectomy, the following year. Results were promising at first, but the seizures returned — this time more severe.

"She developed drop seizures where she would lose control and hit the floor," Teresa said. "That got pretty tough because she was a toddler trying to walk and we pretty much had to keep her in a stroller and not put her down because she would lose control."

In the next four years, Katie underwent several more surgeries, including a corpus callosotomy and a placement of a ventriculo-peritoneal shunt, but her seizures always returned. While the procedures provided partial relief from her seizures, daily activities, such as going to school or playing in her bedroom, remained difficult.

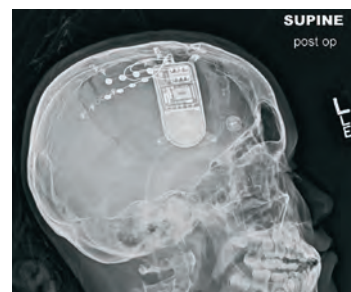
At school, Katie had small seizures during class, but most weren't severe enough for teachers or classmates to notice.

At home, Mark and Teresa were afraid of letting her stay in

a room by herself, she was forced to take medication three times a day and she attended therapy lessons three times a week. The McCormicks wouldn't let their daughter sleep in her bedroom alone because of the frequent seizures, which usually occurred around



Katie McCormick is the second youngest child in the nation to receive the NeuroPace RNS systems which Le Bonheur doctors hope will better control her seizures.



In May, Le Bonheur doctors placed an a NeuroPace RNS system on Katie McCormick's brain to help control her seizures.

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## Mobile Stroke Unit improves, quickens care

**A** new Mobile Stroke Unit launches this summer, designed to save time, administer quicker treatments and bring top-of-the-line technology to a stroke victim's front door.

The 14-ton van is the first mobile unit of its kind and is capable of conducting and producing advanced quality imaging for stroke diagnosis and noninvasive CT-angiography. The unit, a partnership among the University of Tennessee Health Science Center, Le Bonheur and area hospitals, will be used to transfer pediatric and adult patients.

For the first time, standard stroke care will be available in a mobile setting, creating the ability to diagnose and launch treatment, which can include tissue plasminogen activator (tPA) treatment and the potent blood pressure drug nicardipine within the critical first hour. Some patients may receive endovascular



The Mobile Stroke Unit is outfitted with the latest technology, including advanced quality imaging, to help treat strokes.

interventions, neurosurgery or neuro-critical care directly from the pre-hospital arena.

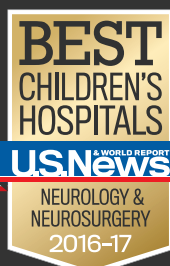
The 36-foot unit can hold up to nine people,

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Referrals: 866-870-5570

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St. Jude Children's  
Research Hospital



bedtime or early in the morning.

"It's so hard to watch her go through this all the time," Teresa said. "You're not in control and that's a hard thing as a parent. You're not in control of what's going on with your child and you aren't able to step in and fix it."

On May 12, Boop implanted the RNS Neurostimulator within Katie's skull, beneath the scalp. The neurostimulator is connected to two leads placed on the area of the brain that triggers the seizures.

For the next two weeks, Teresa and Mark used a computer to track and upload Katie's EEG (brain wave data) information nightly to the NeuroPace Patient Data Management System (PDMS), an interactive web-based database used for storage and clinician remote access. Le Bonheur doctors then reviewed the data and began adjusting the device's impulse setting. On May 23, the RNS device was activated.

The McCormicks will continue to monitor Katie's seizure activity levels nightly and upload the information to the online database. When she returns for checkups, doctors will be able to adjust the strength of the impulses, if necessary.



James Wheless, MD, co-director of the Neuroscience Institute, shares a laugh with Katie and Teresa McCormick while looking at family photos.

## Case study: Maddie Lens Surgery stops tuberous sclerosis-related seizures

Chris and Heather Lens remember the day their daughter, Maddie, had her first infantile spasm. The first-time parents were feeding their 5-month-old daughter when Maddie jerked her head and threw her arms in the air.

"At first they weren't overly concerned, but as the day went on, the spasms, later identified as seizures, grew in frequency and the couple took Maddie to doctors in nearby Tulsa, Okla. Within 36 hours of her first seizure, Maddie was diagnosed with tuberous sclerosis complex, a genetic disorder that causes tumors to grow in the body, primarily on the brain, eyes, heart, skin and kidneys.

The diagnosis, Heather and Chris said, was devastating.

options for their daughter. The Westville, Okla., residents were eventually referred to the doctors at The Tuberous Sclerosis Center of Excellence at Le Bonheur Children's Hospital under the care of Pediatric Neurologist James Wheless, MD, co-director of Le Bonheur's Neuroscience Institute and Tuberous Sclerosis Center of Excellence.

"She worked through several drug therapies and was still having frequent seizures so when she got to us we knew further drug therapy was probably unlikely to be successful based on the number of medicines she went through," Wheless said. "We quickly realized that she was a good surgical candidate."

After a consultation with Wheless in late 2015, the Lens family came back to Le Bonheur in November to remove a small section of Maddie's brain, which was responsible for the seizures.

Chris and Heather called the surgery a success and took their daughter home in late November 2015. Both said Maddie's care at Le Bonheur has helped their daughter to a better quality of life, and it's been more than five months since her last seizure.

"She's back to being a normal kid she's not having any more seizures and she hasn't had any since the day of surgery," Wheless said. "If you saw her playing on the playground or in your neighborhood, you'd never know."

In addition to being seizure free, the 3-year-old's communication skills also have greatly improved since surgery, her parents said.

"To be able to wake up in the morning and act like nothing is wrong, it's surreal because it took weeks to realize that this is our normal life," Chris said. "There are times now that I forget, until I see that scar, she had brain surgery, and she's just a normal little girl right now."



Maddie Lens, who was diagnosed with tuberous sclerosis, visits with James Wheless, MD, co-director of the Neuroscience Institute, along with her parents Chris and Heather.

"When you have a child, you're excited about their future – is she going to be a cheerleader, what kind of car is she going to drive," Heather said. "When we got that diagnosis, it almost felt like those things were being ripped away from us. We had no clue what her future was going to look like."

After her diagnosis, Maddie underwent several drug therapies, which were unsuccessful at controlling or stopping her seizures. That's when Chris and Heather began to discuss surgical

including nurse practitioners, a physician and family members. The van also will be staffed with a neurologist who specializes in treating stroke patients.

"It's like a small hospital outside the main hospital," said Le Bonheur Children's Hospital Pediatric Stroke Director and Pediatric Neurologist Paras Bhattarai, MD. "This can change the scenario on how strokes can be treated because time is money with strokes. If you delay the treatment of a stroke then it's almost the same as not doing anything."

While similar mobile stroke units allow for quick, initial treatment and preparation for an emergency room arrival, the Mobile Stroke Unit means a patient will be prepped to go immediately to the catheterization laboratory, intensive care unit or the hospital's stroke unit and completely bypass the emergency room.

The time saved can be life changing, Bhattarai said. In a field of medicine where seconds count, the Mobile Stroke Unit can provide faster, advanced treatment while lowering the risk of morbidity and mortality.

"If you don't have a Mobile Stroke Unit, treatment can be delayed by at least an hour," Bhattarai said. "There's a big difference between treating one hour before and one hour later because the time window for the patient is very short."

Stroke is the fifth-leading cause of death and leading cause of disability in the United States according to the American Stroke Association. African Americans have nearly twice the risk of a first-ever stroke and have a much higher death rate. Stroke is particularly prevalent in Memphis' Shelby County, which has a stroke rate 37 percent higher than the national average.



The Mobile Stroke Unit will begin delivering patients to area hospitals this summer.

Mobile Stroke Unit director Joe Rike said the van will be a benefit to all stroke patients by giving them better, faster care while being transported to the hospital.

"It's very exciting for the whole community and everyone who sees it or hears about it," Rike said. "We'll be able to deliver standard care normally done in a hospital and bring it to a person's doorstep."

# Epilepsy program reaccredited as Level 4 Epilepsy Center

**L**e Bonheur's Comprehensive Epilepsy Program was recently reaccredited as a Level 4 Epilepsy Center, the highest level, for 2016 - 2017 by the National Association of Epilepsy Centers. To achieve Level 4 status, epilepsy centers must meet certain criteria, including volume of video-EEG monitoring, physician experience and more. Level 4 centers have the professional expertise and facilities to provide the highest-level medical and surgical evaluation and treatment for patients with complex epilepsy.



*Le Bonheur's Epilepsy Program was recently accredited as a Level 4 Epilepsy Center by the National Association of Epilepsy Centers.*

## IN BRIEF

### Asim Choudhri publishes new book

Le Bonheur Director of Neuroradiology Asim Choudhri, MD, recently published "Pediatric Neuroradiology: The Clinical Essentials." In addition to his newest book, Choudhri was one of 20 radiologists who shared case studies in the book "Radiologists at Work: Saving Lives with the Lights Off," by Carolyn Jourdan.



Asim Choudhri, MD



*The 10th annual Pediatric Neurology Symposium was held at Big Cypress Hotel and topics covered included pediatric neuro-ophthalmology, epilepsy and more.*

### Boop named president of AANS

On May 5, Semmes-Murphey Pediatric Neurosurgeon Frederick A. Boop, MD, was named president of the American Association of Neurological Surgeon. Boop became the group's president during the 84th AANS Annual Scientific Meeting, which was held in Chicago.



Frederick A. Boop, MD

"It's an honor to serve and continue the long legacy of Semmes-Murphey chairmen who have presided over the organization," Boop said.

Boop is chairman of the Department of Neurosurgery at the University of Tennessee Health Science Center, co-director of the Le Bonheur Neuroscience Institute, medical director of the Le Bonheur Neurosurgical Intensive Care Unit and chief of the Division of Pediatric Neurosurgery at St. Jude's Children's Research Hospital.

### 10th annual Pediatric Neurology Symposium

Le Bonheur's Neuroscience Institute hosted its 10th annual Pediatric Neurology Symposium on April 29-30 at Big Cypress Hotel in Memphis, Tenn. This year's event included topics including updates in pediatric neuro-ophthalmology, diagnostic challenges in pediatric demyelinating disorders, management of cerebral palsy, epilepsy and more.

The two-day seminar covers state-of-the-art practices and trends in treating pediatric neurology patients and was moderated by James Wheless, MD, Le Bonheur's chief of Neurology.



*James Wheless, MD, was the moderator at the 10th annual Pediatric Neurology Symposium.*



*James Wheless, MD, presents Douglas Nordli, MD, with the Distinguished Lecture Award for his contributions in neuroscience.*

Brain Waves is a quarterly publication of the Neuroscience Institute at Le Bonheur Children's Hospital. The institute is a nationally recognized center for evaluation and treatment of nervous system disorders in children and adolescents, ranging from birth defects and learning and behavioral disorders to brain tumors, epilepsy and traumatic injuries.

*Institute Co-Directors*

Frederick A. Boop, MD  
Andrew C. Papanicolaou, PhD  
James W. Wheless, MD

Amanda Adamson, PhD  
Adam Arthur, MD  
Abbas Babajani-Feremi, PhD  
Paras Bhattarai, MD  
Elena Caron, MD  
Asim F. Choudhri, MD  
Ehab Dayyat, MD  
Lauren Ditta, MD  
Stephanie Einhaus, MD  
Lucas Eljovich, MD  
Stephen Fulton, MD  
Christen Holder, PhD  
Masanori Igarashi, MD  
Swati Karmarkar, MD

Paul Klimo, MD  
Amy McGregor, MD  
Robin Morgan, MD  
Basan Mudigoudar, MD  
Michael S. Muhlbauer, MD  
Shalini Narayana, MBBS, PhD  
Brian Potter, Psy D  
Roosbeh Rezaie, PhD  
Namrata Shah, MD  
Nicole Shay, PhD  
Adeel Siddiqui, MD  
Sarah Weatherspoon, MD

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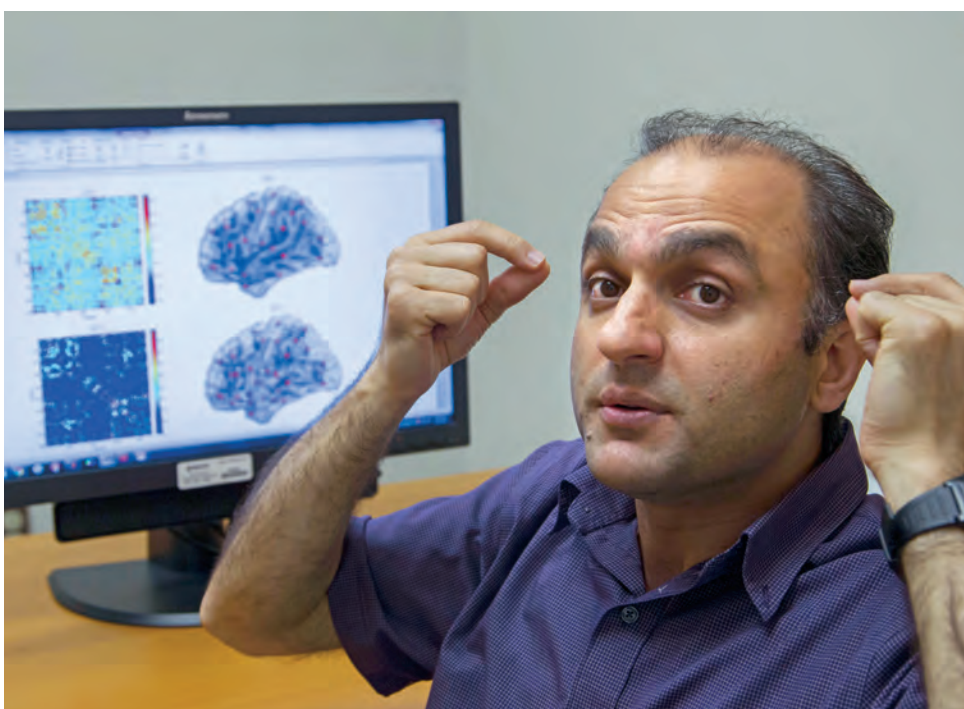
## Le Bonheur using new techniques for better language mapping

Researchers at Le Bonheur's Neuroscience Institute are using subdural high gamma electrocorticographic (ECoG) recordings to better map areas of the brain which control a patient's speech capabilities before surgery for brain tumors and epilepsy. Over the last 50 years, cortical stimulation mapping (CSM) has been used as the gold standard to localize the function of brain regions. One of the most promising alternatives to CSM is subdural high gamma electrocorticographic (ECoG) recordings.

ECoG recordings in the high gamma (>50 Hz) frequency band provides researchers a reliable and accurate tool for language mapping, said Le Bonheur's Abbas Babajani-Feremi, PhD, who leads the use of high gamma ECoG. The method provides a detailed map to show language-specific brain areas. It also reduces the time requirements of the CSM and eliminates the risk of producing seizures during passive ECoG recordings.

"A benefit of high gamma ECoG is that it can map function of the seizure onset zone," Babajani-Feremi said. "Language-specific brain areas show high gamma activity during a language task, and based on that I can map the brain to see which area is related to language and which area is not."

In addition to ECoG and CSM, Le Bonheur physicians also use magnetoencephalography (MEG), transcranial magnetic stimulation (TMS), and functional magnetic resonance imaging



Le Bonheur's Abbas Babajani-Feremi has been using subdural high gamma electrocorticographic readings to better map sections of the brain which control speech capabilities.

(fMRI) as non-invasive tools in pre-surgical planning, particularly for mapping language functions.

Multiple methods of pre-surgical language mapping provides safer, more detailed and more reliable information.

"Using high gamma and other pre-surgical mapping techniques, in addition to cortical stimulation mapping, we will be confident to get an optimal surgical outcome in our patients," Babajani-Feremi said. "With all of this information, doctors will be able to get better information and make an optimal decision for surgery."