

## Brain Tumors and Epilepsy: The Toughest Mysteries in Pediatrics

**S**eemingly unsolvable medical mysteries about a child's seizures often land at Le Bonheur Children's Hospital.

Families arrive after skilled neurologists across the country exhaust their options, knowing Le Bonheur's national reputation for unraveling complicated puzzles, especially around children who have epilepsy and brain tumors simultaneously. For those families, their comprehensive search for answers for their children often ends in Memphis.

Brain tumors and seizures can both be life-threatening and devastate a child's quality of life. When those powerfully destructive diagnoses present together, the mystery runs deep, often with complicated answers. That's when Le Bonheur's expert-led pediatric programs — neurology, neurosurgery, neuroradiology and more — join forces to fight back in a united front.



Using a broad spectrum of the most advanced technology, Le Bonheur's experts work to identify epilepsy centers as well as key areas of brain function. Above, Le Bonheur and Semmes Murphey Neurosurgeon Nir Shimony, MD, uses the ROSA One Brain, a robotic technology that can help place electrodes to determine seizure locations.

### The Patient Path

Le Bonheur and Semmes Murphey Neurosurgeon Nir Shimony, MD, says nearly 70% of patients treated by Le Bonheur's epilepsy and brain tumor teams come from outside the Memphis area, including the Northeast, the Northwest and even Canada. These families seek out Le Bonheur for its reputation in handling the most complex cases combining seizures and brain tumors, often after being told elsewhere that treatment isn't possible.

Many of these children have been living with frequent, debilitating seizures — sometimes 10 or more a day — because other institutions deemed intervention too risky, Shimony said. "We are willing to take the challenge and be very transparent with the family about what we can achieve from the very beginning. But I think that with our experience, we're able to achieve a lot of success for those families who were told, basically, 'just live with your seizures.'"

While exact national data on children presenting with both epilepsy and brain tumors is limited, these complex cases are a regular part of Le Bonheur's work.

Shimony said seizures are very common in kids with brain tumors, especially low-grade tumors. Because not every kid with seizures will have a brain tumor, the seizures are often diagnosed, and epilepsy treatment started, far before the brain tumor is found. Tumors, when they do exist, will only be revealed with an MRI or CT scan, tests that unfortunately can come months after the original seizure diagnosis in some cases.

"From a treatment perspective, the easiest scenario is when a tumor is detected during the first emergency department visit that came after the first ever seizure episode," Shimony said. "Usually, if you take care of the brain tumor, that will be it. But sometimes it's more complicated. Kids may have very complex brain tumors and on top of that have very complex epilepsy. Those are the challenging cases coming to us a lot of the time."

This is when the brain tumor and epilepsy team of teams is activated and why so many patient families find their way to Le Bonheur Children's Hospital.

### A Team of Teams

Shimony made it clear that this program is successful not because of any one doctor or specialty, but because of the team. The collaboration works, he says, only because the

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## FROM DEBATE STAGE TO OPERATING ROOM — AND BACK Teenager finds answers, treatment, recovery at Le Bonheur's Neuroscience Institute

**T**wo global stages bookend Nathan Spencer's successful fight against a brain tumor and seizures. Nathan had recently turned 19 as he readied to compete at Canada's prestigious North American Debating Championship for his team, the equally prestigious Princeton Debate Panel. He stood at the dais for his first speech of the first round. But something was wrong.

"I just couldn't talk for about a minute," Nathan said. "It's not like nervousness or anything like that. I've been doing this for years and years."

What Nathan experienced that day was actually a seizure, one of several that had



Nathan Spencer

begun affecting his speech. Nathan saw a local neurologist, who originally diagnosed him with Sturge-Weber syndrome, a neurological

condition that causes atypical development of blood vessels. An MRI scan showed, however, that Nathan had a 5.5-centimeter brain tumor. Nathan remembers the day well; it was during finals week, and he was worried. His mother, Heather, remembered the day precisely: May 6, National Brain Tumor Awareness Day.

"My knees buckled," she said. "I felt like our world was crashing down."

His doctors recommended a watch and wait plan, a common approach in cases like Nathan's. But after the initial misdiagnosis, Heather wanted additional opinions. She reached out to brain tumor support groups and

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Referrals: 866-870-5570

www.lebonheur.org/  
neuroscience

A pediatric partner  
with The University  
of Tennessee Health  
Science Center/College  
of Medicine and  
St. Jude Children's  
Research Hospital



specialists, including all the entities they are associated with and all the hard-working administrative staff, are rowing in the same direction.

When it comes to neurosurgery, Le Bonheur has one of the largest pediatric surgical brain tumor programs in the country, powered by a unique partnership among Le Bonheur, Semmes Murphey Clinic, St. Jude Children's Research Hospital and the University of Tennessee (UT) Health Science Center. Led by Le Bonheur and Semmes Murphey Neurosurgeons Paul Klimo, MD, MPH, division chief of Pediatric Neurosurgery, and Shimony, the program is known for its aggressive surgical approaches and groundbreaking treatments. In 2024, the team performed more than 240 brain tumor surgeries.

Le Bonheur is also home to a comprehensive epilepsy program, accredited by the National Association of Epilepsy Centers as a Level IV center, the highest designation and one of only a few in the United States. Under the leadership of James Wheless, MD, chief of Pediatric Neurology, and Sarah Weatherspoon, MD, associate chief of Pediatric Neurology, the team consists of internationally recognized pediatric neurologists with a deep bench of knowledge and experience. Le Bonheur's neurologists have access to advanced neuroimaging, diagnostics, clinical trials and emerging therapies.

While neurosurgery and brain tumors often fall under one domain and epilepsy under another, these complex cases blur the lines. At Le Bonheur, treatment for these patients is a unified effort between neurosurgery, for tumors, and neurology, for epilepsy. Surgical epilepsy cases require ongoing collaboration among neurology, neurosurgery, neuroradiology, neuropsychology and specialized labs such as transcranial magnetic stimulation (TMS) and magnetoencephalography (MEG). Without the input from the TMS and MEG teams, and without the detailed input from the neuropsychology team, these complex surgeries would never have the same successful results.

## Getting to Work

When a patient needs them, neurosurgery, neurology, neuroradiology and other experts meet to discuss their cases. But the details of these discussions begin with questions. Where are the seizures coming from? Which part of the brain is involved? Can we treat the tumor and the seizures at the same time? Do we need to stage operations — conduct several surgeries to solve both problems? From these questions, the team begins to tailor a patient's treatment. And every team member knows, their work must be precise and delicate.

"A lot of these tumors reside in important areas of the brain that affect language, motor function or memory," Shimony said. "So, it's not as simple as just going in and removing tissue. In many of these complex cases, complete resection of the tumor is not possible, but the team still needs to

find a way to elevate the quality of life of the patient and their families, by minimizing the residual tumor and finding a way to control the seizures by removing or interfering with the epilepsy network."

The team moves through a patient's treatment in three major phases. In



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Leaders in Brain & Spine Care

Le Bonheur Children's Hospital and Semmes Murphey partner to provide world class neurosurgery care to children from around the country. Pediatric neurosurgeons at Le Bonheur are also pediatric neurosurgeons at Semmes Murphey.



Sarah Weatherspoon, MD, associate chief of Pediatric Neurology, is one of the many expert epileptologists and neurologists who work with neurosurgeons, neuroradiologists and more to find answers for kids with brain tumors and epilepsy.

Phase I, the patient sees a neurologist and has an electroencephalogram (EEG) that measures electrical activity in the brain to look for areas involved with generating the seizures.

Testing continues in this phase to gather deeper information or put "bricks in the wall," as Shimony says. These tests could include a neuropsychology evaluation, TMS or the advanced MEG system, used to identify important functional areas of the brain and plan surgeries for epilepsy and brain tumor removal.

Phase II fine-tunes all the discoveries made in Phase I. Surgeons use stereoencephalography (sEEG) (sometimes with other electrodes on the surface of the brain) to perform preliminary diagnostic surgery in which tiny electrodes, with a diameter of around 1 millimeter, are placed into the brain using a robotic surgery system. With these electrodes in place, doctors have a 3D map to see where seizures are being generated. From there, the doctors can devise the best plan for the needed surgical solutions.

"All these 'bricks in the wall' now show the final picture. We now have an advanced image of the brain, which helps me determine what I can and can't take out, which path I can or cannot go through," Shimony said. "You have to be very careful and know exactly where you are going in. The 3D map helps us a lot."

Phase III moves back into the operating room. The neuroradiology team is present in this stage to manage the intraoperative MRI (iMRI) and help guide surgeons through the procedure in real time. The neurology team is also present to monitor results, record brain activity directly from the brain and consult throughout the surgery. In the end, Le Bonheur surgeons will then activate the exact plan to help the patient, that might include removing the tumor or using a laser to destroy it, as well as intraoperative monitoring to make sure any epileptogenic tissue is removed to allow for best seizure control after surgery.

## 'Ultimate Success'

The "ultimate success" in these cases, Shimony said, is no tumor and no seizures. Often, though, the outcome includes significant tumor eradication and ongoing epilepsy management. If the patient needs to continue treatment for epilepsy, but now his or her epilepsy is completely controlled, this is considered a big success and step towards better quality of life.

"The kid can continue in his or her life, followed periodically with MRI and maintenance medication," Shimony said. ■

the National Brain Tumor Society for guidance. On one call, a nurse practitioner suggested a pediatric neurosurgeon and offered to help. Even so, Heather spent sleepless nights searching for help — and, she said, leaning on tears and prayer.

"This is the crazy part. The next morning — out of the blue — Dr. Klimo calls me up," Heather said. Le Bonheur and Semmes Murphey Neurosurgeon Paul Klimo, Jr., MD, MPH, serves as pediatric neurosurgery division chief. "He says, 'The National Brain Tumor Society contacted me. I'd like to take your son's case.' I told him this was either a miracle or a scam."

The Spencers flew to Memphis after Nathan finished his finals.

Nathan and the Spencers immediately felt better, as Le Bonheur staff had "in two days done more tests than we'd had in 10 weeks." Within a week, he had a diagnosis: a rare, Grade I pediatric ganglioglioma that had been in Nathan's brain for around five to 10 years. Le Bonheur Pediatric Neurologist Sarah Weatherspoon, MD, determined



Nathan Spencer spent a week in the epilepsy monitoring unit undergoing continuous video EEG monitoring, allowing his care team to evaluate his seizures in real time.

the tumor was likely responsible for the seizures. As the tumor slowly grew, it irritated the area of Nathan's brain

that was responsible for speech, triggering brief seizures that temporarily took away his ability to speak.

The team moved swiftly, performing a total resection of the tumor the next day. Recovery took time, and Nathan experienced some lingering swelling that affected his reading and speech. This was a challenge for a competitive debater.

Nathan and his family left Le Bonheur and returned home, where he was coached by a speech therapist from the University of Texas. Although it was an emotional time, his speech and reading comprehension returned in the first weeks of speech therapy.

Three weeks after leaving Le Bonheur, Nathan Spencer was back on stage at a debate convivium at England's University of Oxford. The next week, Nathan returned to school. In early January, he was preparing his internship applications and looking forward to an ethics course and learning Chinese. ■

# Pediatric Craniotomy Readmission

Le Bonheur and Semmes Murphey Neurosurgeons Paul Klimo Jr., MD, MPH, chief of Pediatric Neurosurgery, and Nir Shimony, MD, recently published research in *Journal of Neuro-Oncology* exploring the variables associated with 90-day readmission after an elective craniotomy for a brain tumor. Their research revealed four significant predictors of readmission in children: aged 5 years and younger, surgery time, return to the neurosurgical operating room (OR) due to a postoperative event (POE) and a high tumor grade. This is the first and largest known study evaluating these factors in the pediatric population. The variables for readmission were previously unknown in children.

“Readmission is a key metric for quality health care delivery,” said Klimo. “Our goal with this research is to provide analysis that will continue to guide improvements in the delivery of high quality and high value health care for kids.”

The study consisted of a review of all elective craniotomies for tumor resection performed at Le Bonheur from 2010 to 2022 in children and young adults 21 and younger. During that time, 1,276 patients underwent 1,497 elective craniotomies for tumor resection. Within 90 days, 208 (13.9%) were readmitted to the hospital with 154 (75%) returning within the first 30 days. Researchers defined readmission as readmission to the hospital for any reason and to any service within 90 days after discharge date after the original operation. After analyzing the cases, four key drivers of readmission were identified.



Le Bonheur and Semmes Murphey Neurosurgeons Paul Klimo, Jr., MD, MPH, chief of Pediatric Neurosurgery, (pictured on left) and Nir Shimony, MD, were authors on the paper that identified four key drivers of readmission after brain tumor craniotomy.

1. Young children (5 years and younger): Researchers posited that younger children are more likely to have surgical complications and that it is harder to identify the cause of postoperative issues in a younger child. Either could lead to the higher chance of readmission.
2. Surgical time: Each additional minute of time in surgery increased the chance of 90-day readmission by 0.2%. More complex craniotomies take the most time which may lead to a longer postoperative recovery with a higher risk of postoperative issues.
3. Return to neurosurgical OR due to POE: If a child returns to the OR, it is more likely that they have a complicated postoperative recovery and are therefore more prone to readmission.
4. Tumor type and grade: Higher tumor grade was a predictor of readmission. Researchers state that the relationship between tumor pathology and readmission is a complex relationship that requires additional study.

“These findings are important for preoperative and family counseling and optimizing the health care that we provide to this patient population,” said Shimony.

Researchers say that future studies are needed to provide deeper analysis into these relationships and continue better understanding these risk factors for readmission.

## IN BRIEF

### Le Bonheur co-hosts pediatric neurosurgery meeting

Le Bonheur joined the Pediatric Section of the Congress of Neurological Surgeons to host the 2025 Joint Pediatric Section Annual Meeting. The meeting brought together specialists from across the country to share advances in pediatric neurosurgery and collaborative approaches to care.



Chief of Pediatric Neurosurgery Paul Klimo, MD (left), neurosurgeons Stephanie Einhaus, MD (middle left) and Nir Shimony, MD (right) with Boo Mitchell following his presentation at the 2025 Joint Pediatric Section Annual Meeting.

### Jack presents at Tourette Association of America congressional briefing

Le Bonheur Neurologist Robin Jack, MD, presented for the Tourette Association of America (TAA) during an annual congressional briefing titled “Highlighting Care, Groundbreaking Research and Leadership: A Virtual Briefing on Tourette Syndrome.” The briefing highlighted advances in clinical care, emerging research and leadership efforts to improve outcomes for individuals with Tourette syndrome and tic disorders. The event also focused on the importance of continued federal support for research, education and access to care.



Robin Jack, MD

### Le Bonheur Neuroscience Institute recognized on Epilepsy Awareness Day

Le Bonheur’s Neuroscience Institute was recognized at Epilepsy Awareness Day as a leading destination for the Surgical Evaluation Travel Scholarship program. This program provides \$1,000 awards to seven families traveling to Le Bonheur for magnetoencephalography (MEG) testing.

### Specialists receive UT Health Science Center faculty awards

Multiple specialists in the Neuroscience Institute received awards from UT Health Science Center for 2024-25. Christen Holder, PhD, clinical director



Christen Holder, PhD



Negar Noorizadeh, PhD

of Neuropsychology at Le Bonheur and associate professor in the Division of Pediatric Clinical Neurosciences at UT Health Science Center, received the Excellence in Clinical Care Award. Negar Noorizadeh, PhD, neuroscientist at Le Bonheur and assistant professor at UT Health Science Center, received the Excellence in Research Award.

### Papanicolaou receives lifetime achievement award

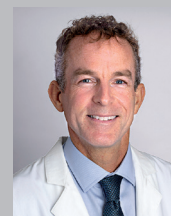
Former Le Bonheur Neuroscientist Andrew C. Papanicolaou, PhD, was recently honored with the Lifetime Achievement Award at the International Society for the Advancement of Clinical Magnetoencephalography (ISACM) 10th biennial conference. He received this award for his extraordinary contributions to the field of magnetoencephalography (MEG) and the establishment of the MEG Lab at Le Bonheur, the first in a children’s hospital in North America.



Chief of Pediatric Neurology James Wheless, MD, pictured with Andrew C. Papanicolaou, PhD

### Neuroscience Institute welcomes new providers

William Dalton, PhD, joined Le Bonheur’s Neuroscience Institute as a pediatric psychologist. He is an associate professor at UT Health Science Center. Dalton focuses on evidence-based treatment for common neurological conditions and obesity.



William Dalton, PhD



Amanda DeCrow, PhD



Connor Gatewood, MD

Amanda DeCrow, PhD, joined Le Bonheur’s Neuroscience Institute as a pediatric neuropsychologist. She is an associate professor at UT Health Science Center. She is certified by the American Board of Professional Psychology and American Board of Neuropsychology.

Connor Gatewood, MD, joined Le Bonheur’s Neuroscience Institute as a pediatric neurologist and assistant professor at UT Health Science Center. He completed his residency in Pediatric Neurology and his fellowship in Clinical Neurophysiology at UT Health Science Center.

*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*  
Paul Klimo, MD, MPH  
James W. Wheless, MD

Gwen Beard, PsyD  
Donald Bearden, PhD  
Elena Caron, MD  
Paola Castri, MD, PhD  
Beth Anne Cavanaugh, MD  
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Nitish Chourasia, MD  
William Dalton, PhD  
Amanda DeCrow, PhD  
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Steven Sogge, MD  
Erick Viorritto, MD, MPH  
Sarah Watts, PsyD  
Sarah Weatherspoon, MD

Scan to learn more about our  
Neuroscience Institute.



Christen Holder, PhD

## Holder named National Academy of Neuropsychology president-elect

Christen Holder, PhD, has been named president-elect of the National Academy of Neuropsychology (NAN), a global organization of more than 3,000 members dedicated to advancing neuropsychology. Holder serves as clinical director of Pediatric Neuropsychology and co-director of the Movement Disorders and Tourette Syndrome Center at Le Bonheur, as well as professor at UT Health Science Center. Her leadership reflects a commitment to shaping the future of neuropsychology.

## Join us for the 19th annual Pediatric Neurology Symposium

----- April 10-11 -----

Central Station Hotel  
Memphis, Tenn.

This symposium, directed by James Wheless, MD, is designed to encompass state-of-the-art practices and trends in treating pediatric neurology patients. Registration is now open.

To register, visit [lebonheur.org/continuing-medical-education](http://lebonheur.org/continuing-medical-education).

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