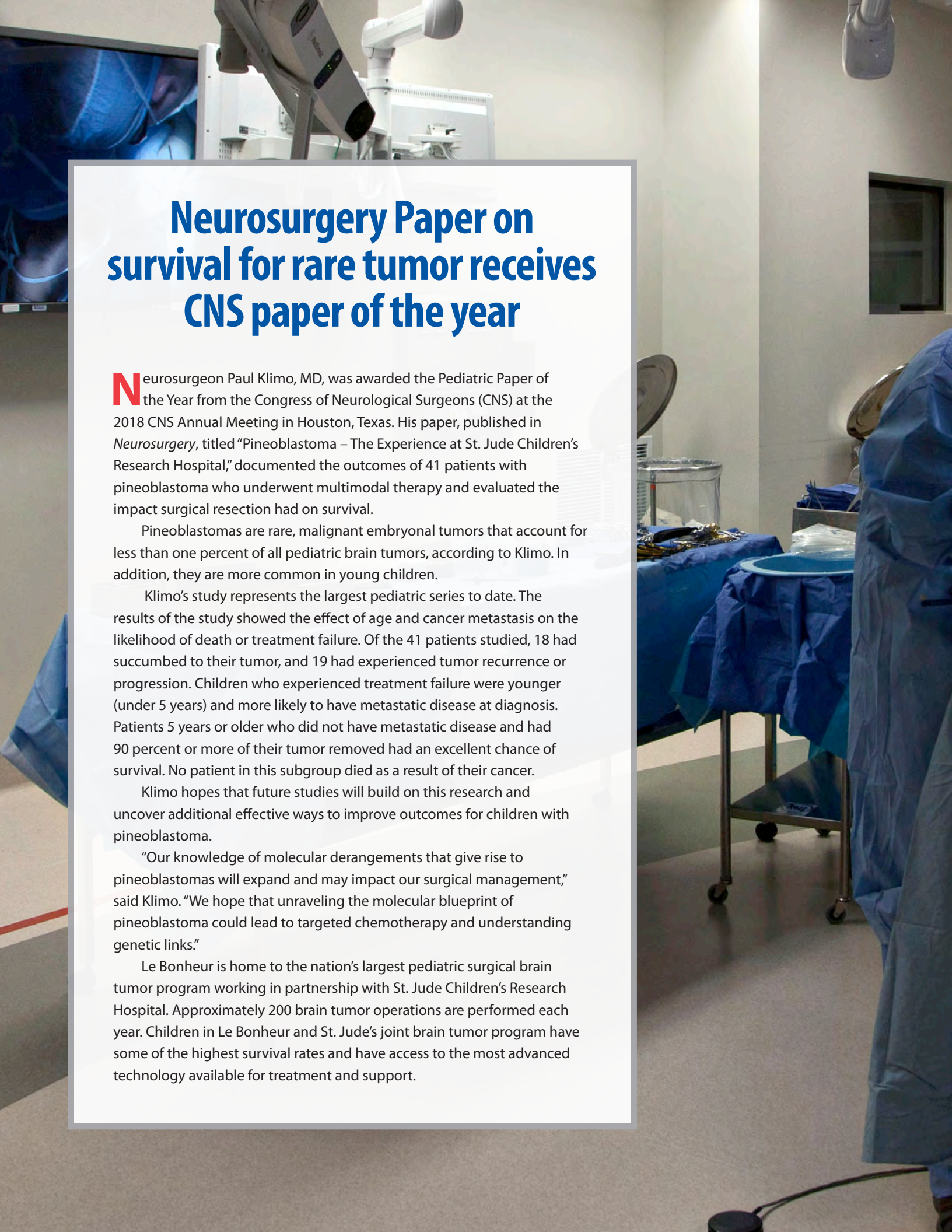


DELIVERING ON A PROMISE

Tiny Closures

Memphis doctors pioneer a minimally invasive cure for premature infants with heart defects

A photograph of an operating room. In the foreground, a surgical table is covered with blue drapes. To the right, a person in blue scrubs is partially visible. In the background, there are surgical lights and monitors. The text is overlaid on a white rectangular box in the center-left of the image.

Neurosurgery Paper on survival for rare tumor receives CNS paper of the year

Neurosurgeon Paul Klimo, MD, was awarded the Pediatric Paper of the Year from the Congress of Neurological Surgeons (CNS) at the 2018 CNS Annual Meeting in Houston, Texas. His paper, published in *Neurosurgery*, titled "Pineoblastoma – The Experience at St. Jude Children's Research Hospital," documented the outcomes of 41 patients with pineoblastoma who underwent multimodal therapy and evaluated the impact surgical resection had on survival.

Pineoblastomas are rare, malignant embryonal tumors that account for less than one percent of all pediatric brain tumors, according to Klimo. In addition, they are more common in young children.

Klimo's study represents the largest pediatric series to date. The results of the study showed the effect of age and cancer metastasis on the likelihood of death or treatment failure. Of the 41 patients studied, 18 had succumbed to their tumor, and 19 had experienced tumor recurrence or progression. Children who experienced treatment failure were younger (under 5 years) and more likely to have metastatic disease at diagnosis. Patients 5 years or older who did not have metastatic disease and had 90 percent or more of their tumor removed had an excellent chance of survival. No patient in this subgroup died as a result of their cancer.

Klimo hopes that future studies will build on this research and uncover additional effective ways to improve outcomes for children with pineoblastoma.

"Our knowledge of molecular derangements that give rise to pineoblastomas will expand and may impact our surgical management," said Klimo. "We hope that unraveling the molecular blueprint of pineoblastoma could lead to targeted chemotherapy and understanding genetic links."

Le Bonheur is home to the nation's largest pediatric surgical brain tumor program working in partnership with St. Jude Children's Research Hospital. Approximately 200 brain tumor operations are performed each year. Children in Le Bonheur and St. Jude's joint brain tumor program have some of the highest survival rates and have access to the most advanced technology available for treatment and support.



Le Bonheur

Children's Hospital

Le Bonheur Children's Hospital in Memphis, Tenn., treats more than 250,000 children each year in regional clinics and a 255-bed hospital that features state-of-the-art technology and family-friendly resources. Our medical staff of more than 240 physicians provide care in 40 subspecialties.



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Tiny Closures

Memphis doctors pioneer a minimally invasive cure for premature infants with heart defects

18-day-old Jaycie May Hoagland was in trouble. The premature, 800-gram infant was struggling to survive. One of her biggest obstacles: her heart's patent ductus arteriosus (PDA) needed to close.

With severely underdeveloped lungs,

Jaycie wouldn't make it through open heart surgery to close the opening. That's when her neonatologist at Niswonger Children's Hospital in Johnson City, Tenn., offered another option: Fly her 500 miles to Memphis for a transcatheter PDA closure at Le Bonheur Children's.



Le Bonheur's Pedi-Flite team transports a premature neonate 500 miles from Johnson City, Tenn., to Memphis for a transcatheter patent ductus arteriosus closure.

“It was a do or die situation,” said Jaycie’s mom, Jennifer. “If we stayed home and closed the hole with surgery, she wasn’t going to make it. The neonatologist told me, ‘If it was my child, I would fly her to Memphis.’”

In Memphis, pediatric interventional cardiologists were perfecting a new technique to close PDAs for extremely low birth weight (ELBW) premature infants in the hospital’s hybrid catheterization lab. The minimally invasive

technique was designed to shorten the length of stay for premature infants and improve the premature infant’s recovery time.

Le Bonheur Interventional Cardiologist Shyam Sathanandam, MD, FSCAI, pioneered the procedure before joining a 10-site, FDA trial for the device used in the closure. That device, Abbott’s Amplatzer Piccolo Occluder, received FDA pre-market approval last month to treat PDAs



in ELBW infants.

The Amplatzer Piccolo Occluder is the first transcatheter cardiac device to earn FDA-approval for premature infants.

“We believe this will change the field of cardiology and improve care for the tiniest neonates,” Sathanandam

said. “The transcatheter closure allows babies to grow and heal faster.”

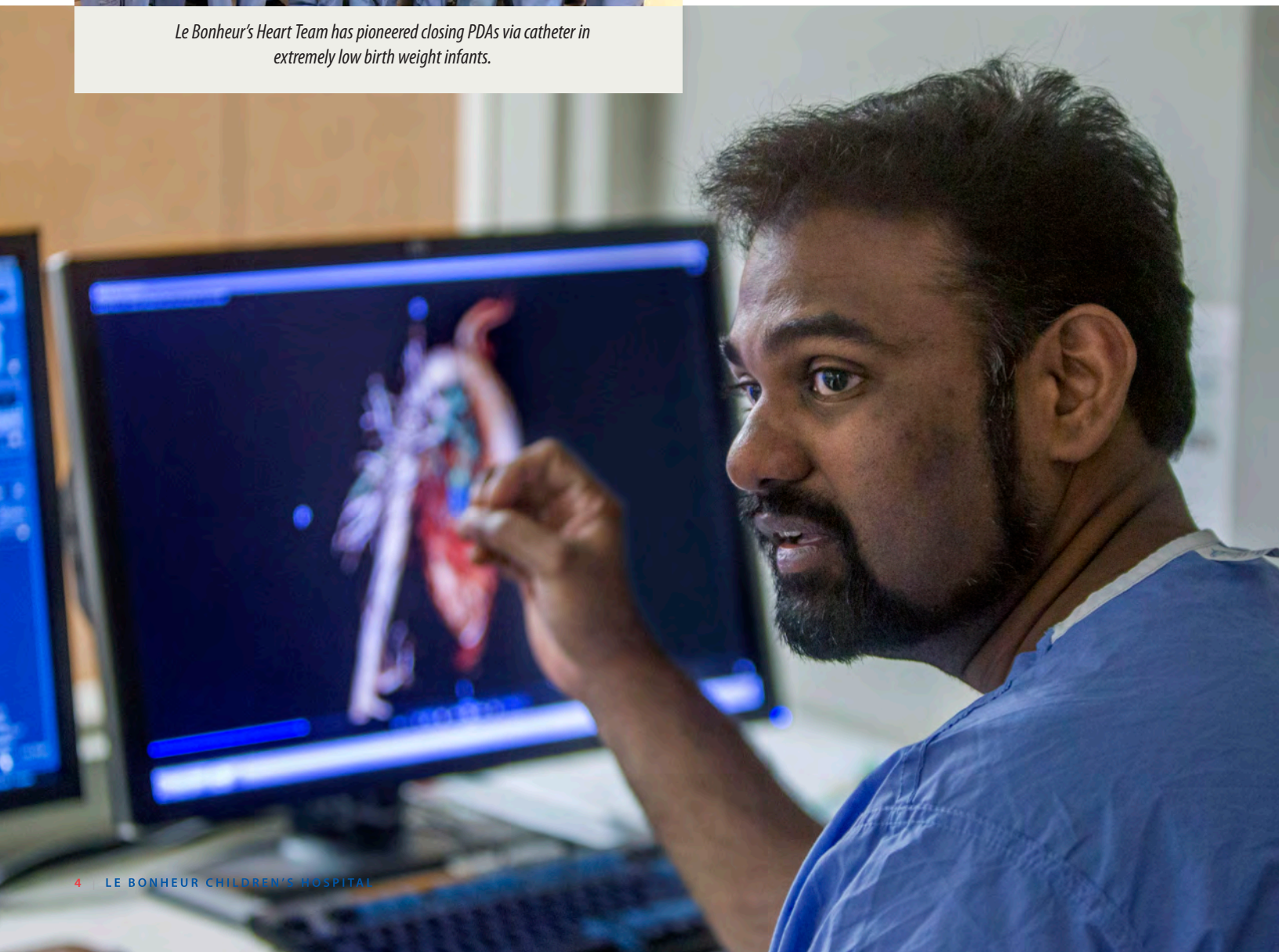
PERFECTING THE METHOD

To date, Sathanandam has performed 140 closures on neonates weighing 2 kilograms or less and played a key role in the multisite Abbott trial, which closed enrollment Feb. 1. Le Bonheur has enrolled more neonates than any other center in the study.

Collaboration among neonatologists, cardiac surgeons and cardiac anesthesiologists is key. For example, echocardiographic imagery from Cardiologists Ranjit Philip, MD, and Jason Johnson, MD, provide needed guidance, given the



Le Bonheur's Heart Team has pioneered closing PDAs via catheter in extremely low birth weight infants.



procedure requires no cutting or stitching.

“From being the top enrolling site, to being active in the publication and presentation committee, Sathanandam and the Le Bonheur team have

made a major contribution to the success of this landmark study,” said Evan Zahn, MD, FACC, FSCAI, director of the Guerin Family Congenital Heart Program at Cedars Sinai Medical Center and principal investigator of the trial. “The collaboration and teamwork which characterize Le Bonheur

“The collaboration and teamwork which characterize Le Bonheur Children’s Premature PDA program serve as a model for the rest of the world.”

Evan Zahn, MD, FACC, FSCAI, director of Guerin Family Congenital Heart Program, Cedars Sinai Medical Center

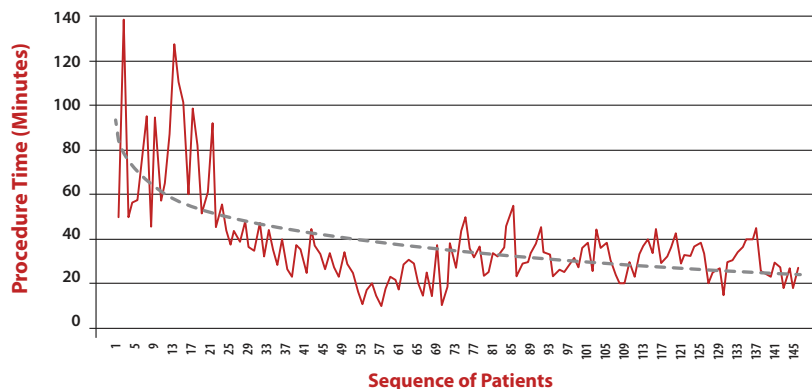
Children’s Premature PDA program serve as a model for the rest of the world.”

Since Le Bonheur’s Heart Institute began closing PDAs in the catheterization lab four years ago,

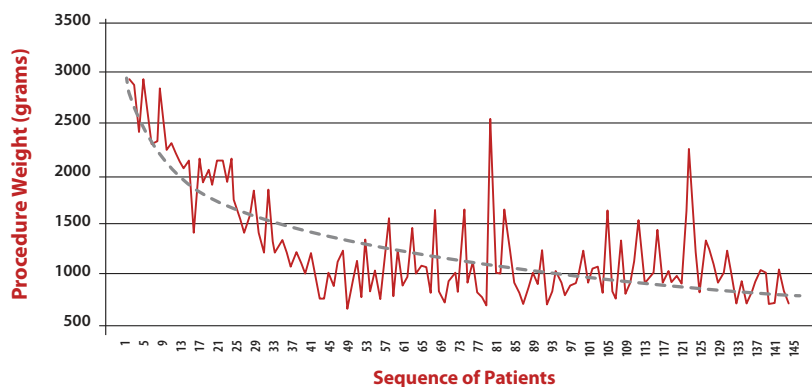
Sathanandam’s team has significantly decreased procedure time and the weight threshold for neonatal candidates. He also uses a different device – outside the trial – when appropriate.

The ideal candidates are extremely low birth weight

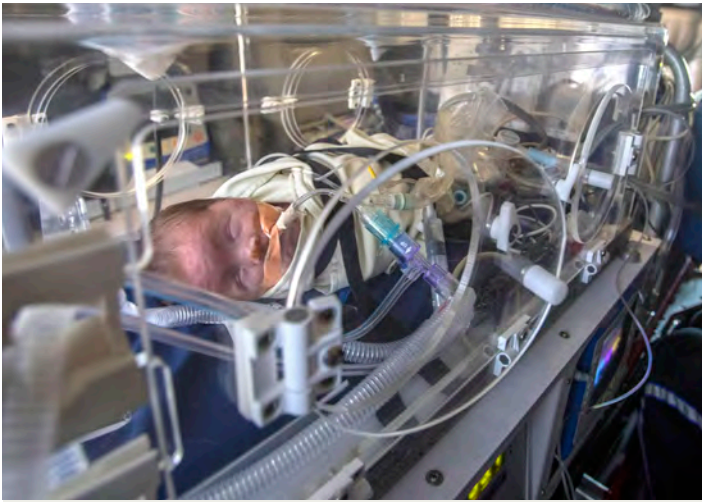
Transcatheter PDA Closures in Premature Infants – The Memphis Experience



Transcatheter PDA Closures in Premature Infants – The Memphis Experience



Since Le Bonheur’s Heart Institute began closing PDAs in the cath lab four years ago, they have decreased procedure time and the weight threshold for neonatal candidates.



The ideal candidate for transcatheter closure in neonates with extremely low birth weight (ELBW):

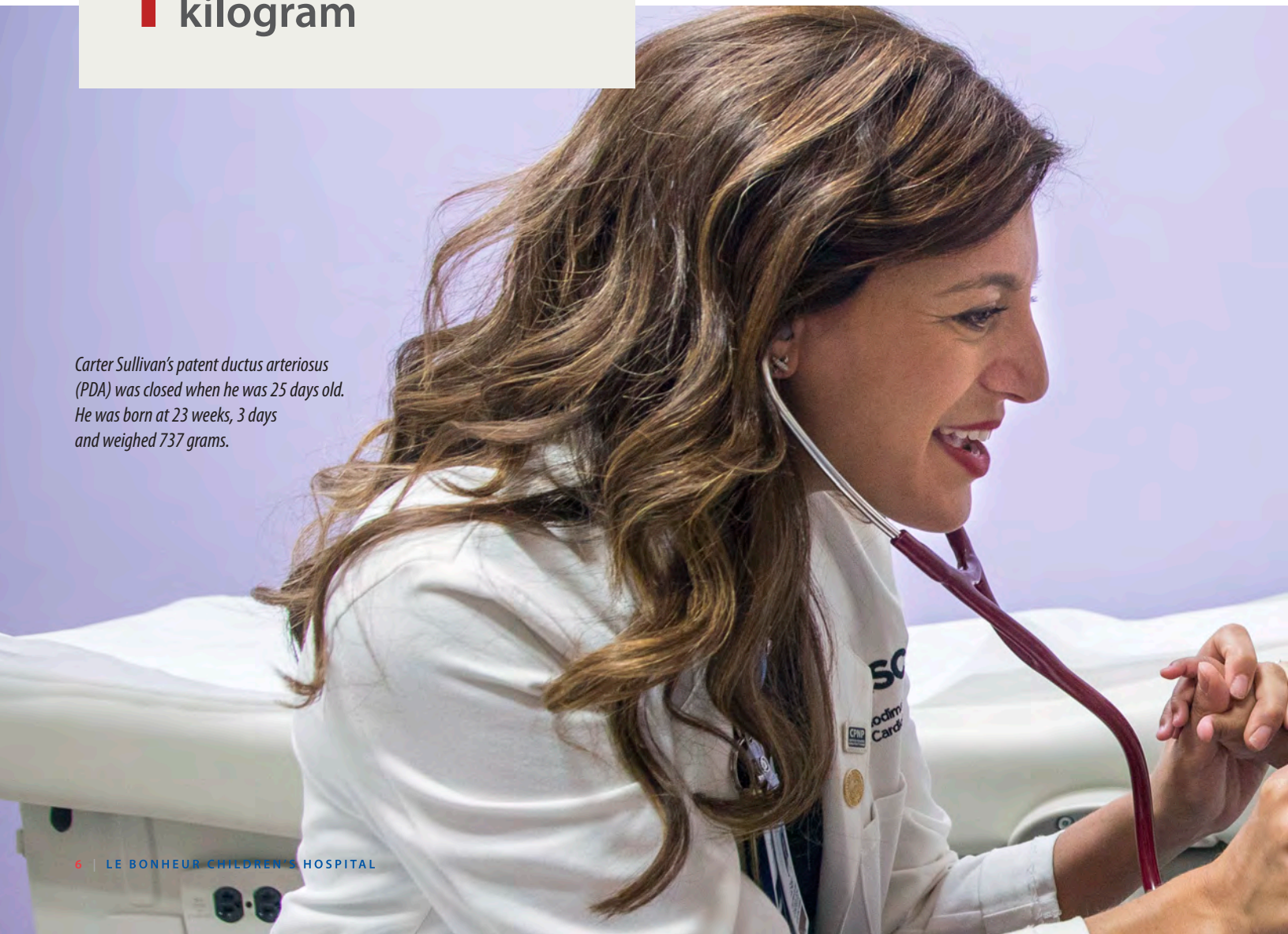
28 weeks gestation
1 kilogram

(ELBW) infants who are born less than 28 weeks, are less than 4 weeks of age and weigh less than 1 kilogram. The team also successfully transfers the neonates from other facilities and back when needed.

“We’ve found that the weight of the neonate doesn’t really matter, and the smaller babies who undergo the procedure early in life (<4 weeks of age) actually come off the ventilator faster,” Sathanandam said. The smallest baby to receive a transcatheter closure at Le Bonheur weighed 600 grams, he said.

To better follow these high-risk neonates — who require multispecialty services — Le Bonheur has established a comprehensive outpatient clinic focused on their unique needs. The clinic also sees infants and children with PDAs for follow-up after closure at any age.

Carter Sullivan’s patent ductus arteriosus (PDA) was closed when he was 25 days old. He was born at 23 weeks, 3 days and weighed 737 grams.



As they perfect the method, the team also has plans for animal studies to better understand the best candidates for transcatheter closure and the best age and timing for such a procedure. Sathanandam, in collaboration with the Comprehensive Continuous Integrated System of Care (CCISC) is developing a registry. Moving forward, infants who undergo this procedure will be entered into a national registry so physicians can learn more about benefits of the technique. That registry, he hopes, would further the knowledge base on device closures in ELBW.

EXPANDING REACH

Sathanandam has proctored at several children's hospitals throughout the trial to share his expertise with

other interventional cardiologists interested in advancing the work.

That willingness to teach and collaborate garnered interest from several sites who wanted to provide the transcatheter closure option to their families.

Interventional Cardiologist David Nykanen, MD, said he invited Sathanandam to his facility at Arnold Palmer Hospital for Children in Orlando, Fla., during the

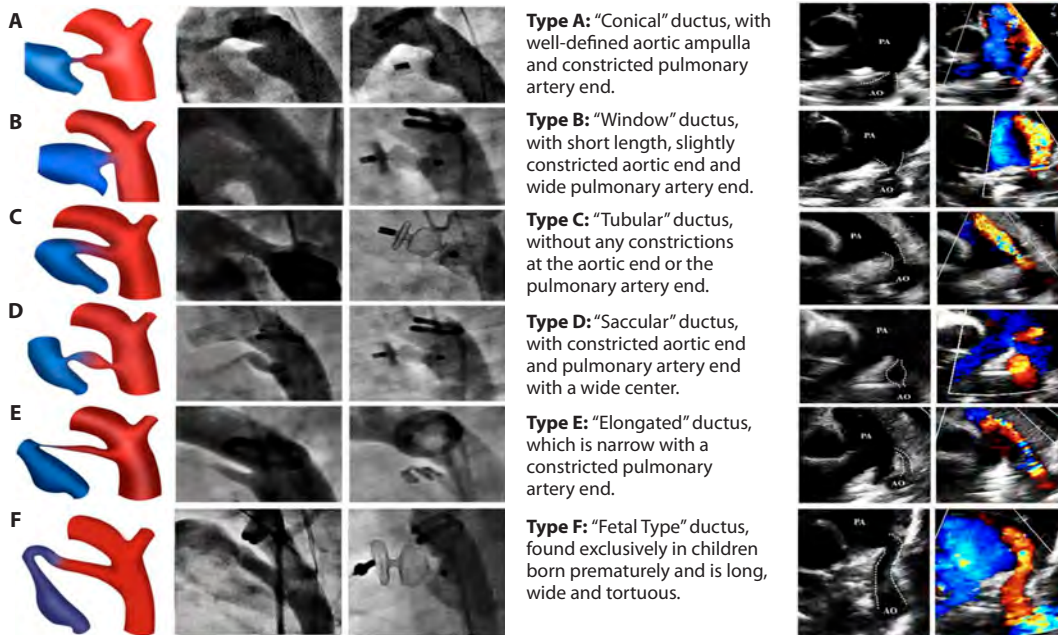
“We’ve found that the weight of the neonate doesn’t really matter and the smaller babies actually come off the ventilator faster.”

Pediatric Cardiologist Shyam Sathanandam, MD



Morphologic Characterization of the Patent Ductus Arteriosus in the Premature Infant and the Choice of Transcatheter Occlusion Device

Ranjit Philip, MD, B. Rush Waller III, MD, Vijaykumar Agrawal, MD, Dena Wright, RN,
Alejandro Arevalo, MD, David Zurakowski, PhD, and Shyam Sathanandam, MD



trial because he knew transcatheter PDA closures would be an important focus at the hospital, which delivers 15,000 babies each year.

At Nationwide Children's Hospital in Columbus, Ohio, Darren Berman, MD, FACC, FSCAI, co-director of Cardiac Catheterization and Interventional Therapies also relied on Sathanandam to proctor his team during the first phases of the trial. Many in his field believe the procedure has real potential to significantly help patients, he said.

Smaller studies have shown that there is some improvement in how babies do in the hospital in terms of their need for being on respirators and that it's helping in getting them off respirators sooner, Berman pointed out.

"We are in a new era in terms of how small an infant we can do this for," said Berman. "Shyam has been a

major part of helping to move this procedure forward. His experience with the procedure really is impressive in terms of the number of patients in Memphis and the surrounding area who are referred for this."

Furthermore, Sathanandam and his colleagues at Le Bonheur launched an International PDA Symposium in Memphis last May to bring neonatologists, pediatric cardiologists and pediatric cardiac surgeons together to discuss management of PDAs in newborns. More than 150 providers from seven countries attended the event, which largely focused on transcatheter closures.

During that meeting, more than 100 physicians watched a live PDA closure on a 700-gram, 14-day-old (24-week gestation) premature newborn girl. The girl successfully was weaned from the ventilator seven days later. The Second International Symposium will be held at Graceland in Memphis, April 10-12.



*Save the Date for our
Second Annual*

THE INTERNATIONAL **PDA**
Symposium

April 10-12, 2019

*Graceland (home of Elvis Presley)
in Memphis, Tenn.*

The course will bring neonatologists, cardiologists, cardiac surgeons, cardiac anesthesiologists and neonatal nurses together to discuss current management of PDAs in newborns. Teams will focus on transcatheter closures in extremely low birth weight neonates.

**Learn more or register at
www.pdasymposium.org.**

FACES of PDA



Carter Sullivan: Born 23 weeks, 3 days and 737 grams, Carter Sullivan's PDA wouldn't close. After trying drug therapy and eliminating the option of surgery, neonatologists at a neighboring NICU brought one more offer: transfer Carter to Le Bonheur for a new transcatheter procedure.

At 25 days old, Carter became the 48th patient to undergo the procedure and his mother, Rosalyn, felt at ease talking with Interventional Cardiologist Shyam Sathanandam, MD, about his plan to close the PDA.

"After the procedure, Carter just blossomed. We were able to start weaning him from the vent, he had growth spurts and started breathing better. We started to see his personality," said Rosalyn, who believes Carter is proof this procedure can work on the most premature of infants. "It's giving these babies a chance. He gave my child a chance."

Today, Carter weighs 31 pounds and has just started walking. He has no residual effects of his early infancy.

"He is so fearless and funny and creative, an outgoing child," Rosalyn said. "I can't say enough about the care I received at Le Bonheur."



Jaycie May Hoagland: Surgery wasn't an option for 18-day-old Jaycie May Hoagland, and her PDA needed to be closed. Quickly.

"If it was my child, I'd fly her to Memphis," Jaycie's Niswonger Children's Hospital's neonatologist told her parents, Jennifer and Jayson. The Hoaglands agreed to fly their 800-gram baby 500 miles across the state, hopeful that Le Bonheur Children's could close the PDA via a transcatheter device.

Jaycie arrived at Le Bonheur on Wednesday night. Interventional Cardiologist Shyam Sathanandam, MD, closed her PDA on Thursday morning, and she was flown back to Johnson City on Saturday – where she'd spend another several months growing.

Today, the nearly 3-month-old has "fat rolls," her mother brags. "I never wanted a fat baby until now."

Everett Williams: Born at 24 weeks, Everett Williams faced a number of obstacles – Grade 4 intracranial hemorrhages, surgery to correct necrotizing enterocolitis and breathing issues. The neonatologists at Everett’s delivery hospital discovered his PDA and transferred him to Le Bonheur Children’s, where Interventional Cardiologist Shyam Sathanandam, MD, successfully closed it with a transcatheter device. Everett was 34 days old and weighed 1.11 kilograms. He spent more than 300 days at Le Bonheur and endured 11 more surgeries for other conditions.

Today, he is home and thriving.

“He was the tiniest miracle I have ever seen,” said Everett’s father, Landon.



Demi Becton: Born at 25 weeks, twins Demi and Derrick Becton were relatively healthy – except for the PDAs in each of their hearts. That’s when Interventional Cardiologist Shyam Sathanandam, MD, visited their parents, Dominique Justice and Derrick Becton. He had a solution to close the PDA. Shyam was starting a new clinical trial that used a device to close PDAs via catheter in the cath lab – a way for many premature infants to avoid surgery.

Demi was an ideal candidate to be the trial’s first enrollee.

“I thought, ‘If he can help them get better and knows a better way to close the hole, we have to try it,’” said Dominique. The twins were transferred to Le Bonheur Children’s, where Sathanandam closed PDAs in both of the twins. Demi received the Abbott trial device, Derrick received a different device.

“Shyam really made me feel comfortable and prepared me upfront for every step,” Dominique said. “He was knowledgeable, empathic and checked on them every day.”

Today, Dominique is proud to say that Demi helped pave the way for change as part of the clinical trial – and is happy to have two 20-month-old twins.

“They are hitting every milestone,” she said.



“My goal is to provide encouragement to children and their families – to show them that I’ve been in their shoes and that it is possible to live a full life with Type 1 Diabetes.”

Kathryn Sumpter, MD

Assistant Professor, University of Tennessee Health Science Center
Clinical Director, Diabetes Program, Le Bonheur Children's Hospital



PROFILE: KATHRYN SUMPTER, MD

Endocrinologist launches Fresh Start Clinic to prevent hospitalizations due to diabetic ketoacidosis

Le Bonheur Endocrinologist Kathryn Sumpter, MD, never intended to pursue medicine. But a diagnosis of Type 1 Diabetes as a junior in college changed her life. She began to grow interested in the ways the medical field could impact the lives of others.

"I loved science but never wanted to be a doctor," said Sumpter. "After experiencing a different side of the medical field while learning to navigate a new diabetes diagnosis, I realized that I wanted to help people learn to manage and live with diabetes."

While attending the University of Texas Southwestern Medical School in Dallas, she initially assumed that she would want to care for adults – not children. It was during her pediatric rotations that she realized children actually make better patients.

Now, as clinical director of the diabetes program at Le Bonheur, Sumpter is looking for ways to keep her patients out of the hospital. The hospitalization rates for children with diabetes in Memphis are higher than national averages, at least partially due to the burdens of poverty and stress many patients experience. Since joining Le Bonheur in 2017, Sumpter has sought to help her patients with uncontrolled diabetes live a better life while managing their diagnosis.

"Twelve of our diabetes patients were causing about half of the hospitalizations for the entire clinic due to diabetic ketoacidosis (DKA)," said Sumpter. "Learning to take care of diabetes isn't rocket science but it requires a lot of steps. The hard part is getting children, especially teenagers, and their families to take all of those steps every day."

Last January, Sumpter launched the Fresh Start Clinic with the goal of giving hope to children at the highest risk of diabetes-related complications by improving their knowledge about their condition and providing family-centered care. Sumpter is joined by a multi-disciplinary team including nurses, diabetes educators, dietitians, social workers and a psychologist. The team assesses each area of the patient's life and focuses on areas that affect a patient's ability to manage diabetes.

Many of the children who enter Sumpter's clinic have diabetes distress, a term used to describe the emotional burdens and concerns specifically associated with managing their chronic

disease every day. Diabetes distress can lead to patients ignoring their disease, which can worsen diabetes control.

"My goal is to provide encouragement to children and their families – to show them that I've been in their shoes and that it is possible to live a full life with Type 1 Diabetes," said Sumpter. "We want to give them hope by celebrating their successes and promoting incremental change."

That incremental change comes in a variety of ways. The clinic focuses on the health of the whole patient in a way that is difficult to replicate in a traditional outpatient clinic. Education is a large component of the program so that children understand diabetes and its effects. The team also works on goal setting – identifying and tracking what small changes children and families are willing to make that will reduce hospitalization and improve quality of life for the patient.

Sumpter has already seen results from the new approach to diabetes management. Three patients have graduated from the program and 75 percent of the clinic patients were not admitted to the hospital for DKA treatment in 2018.

But Sumpter's innovation in diabetes management has only begun. With a grant from the Urban Child Institute, a non-profit dedicated to promoting the health of Mid-South children, she'll launch Fresh Start 2.0 in the summer of 2019. This program aims to reach the next group of patients who need a higher level of care in managing diabetes.

"We have more than 600 diabetes patients in our practice and many of them have poor diabetes control," said Sumpter. "Although they are not hospitalized at the same rate as our Fresh Start Clinic patients, on their current path they will have long term damage to their bodies from continued high blood sugar."

This program will include community health workers visiting patients' homes to assist with creating plans and goals for diabetes management.

At the end of the day, Sumpter's passion is to help children with diabetes live the life that they deserve. "This is a chronic condition that requires lots of work," said Sumpter. "But if we can manage these things, there is no reason that life shouldn't be normal for children with diabetes. It is rewarding to see someone with diabetes begin to feel like there is hope and that they are going to be OK."

"This is a chronic condition that requires lots of work. But if we can manage these things, there is no reason that life shouldn't be normal for children with diabetes."

Endocrinologist Kathryn Sumpter, MD

Kathryn Sumpter, MD

Education and Training

University of Texas (UT) Southwestern Medical Center – Pediatric Endocrinology Fellowship
UT Southwestern Medical School – Graduate Certificate, Clinical Science
UT Southwestern Medical Center – Pediatric Residency
UT Southwestern Medical School – Medical School

Board Certifications

American Board of Pediatrics
Sub-board of Pediatric Endocrinology

Society Memberships

Pediatric Endocrine Society
American Diabetes Association

More Room at the Inn

\$12-million expansion triples the space for families far from home

When Amy and David Gagel first saw RaeAnn's photo, they knew she would be their daughter. But when they read the physician's report from China, the Gagels wanted to know more. RaeAnn's diagnosis: transposition of the great arteries, pulmonary stenosis and ventricular septal defect. What would life look like once RaeAnn was adopted and home in Paragould, Ark.?

Amy started calling children's hospitals in September 2017. When she spoke on the phone to a cardiologist at Le Bonheur Children's Hospital in December 2017, she knew she had found the right place.

"My biggest concern was how do we get her home alive," Amy said. "We've never had a kid who



was sick. Do we need oxygen on the plane? How do we maneuver this?"

RaeAnn arrived in the U.S. on Jan. 15, 2018. Three days later, she met her cardiology team at the Le Bonheur clinic in Jonesboro, Ark.

While her first year stateside was filled with learning English and seeing the ocean for the first time, RaeAnn spent nearly a third of the year in-patient at Le Bonheur. Her heart condition worsened until she was in heart failure. She had three surgeries and three cath lab procedures. The latest surgery, in November, repaired her mitral valve and replaced her tricuspid valve.

While 90 minutes from home, the Gagels called FedExFamilyHouse their home away from home. It's the only facility in Memphis that provides free lodging to families receiving care at Le Bonheur. Patient families are referred to the house by their social worker.

"When we're tired and weary we have a place to come that is right across the street from the hospital, and we can sleep without the sounds of beeping monitors. A good night of sleep allowed me



RaeAnn Gagel spent nearly 100 days in the hospital last year. Her parents, David and Amy, were able to stay at FedExFamilyHouse for free.

to be a better mom to RaeAnn,” Amy said.

In December, FedExFamilyHouse opened a new four-story tower connected to the original building. The \$12-million, 51-room expansion was made possible thanks to FedEx Corporation and the gifts of many generous donors. Before the expansion, FedExFamilyHouse was often at full capacity with a waiting list of 30 families each night.

“Long-term hospitalization can be a tremendous burden on a child’s family – especially if the hospital is far from home. FedExFamilyHouse alleviates a big burden for our families – and does it in a very comfortable manner. FedExFamilyHouse helps keep families together in a challenging season,” said Heart Institute Co-Director and Cardiovascular Surgeon Christopher Knott-Craig, MD.

FedExFamilyHouse opened in 2010 in conjunction with the opening of the hospital tower across the street. The house was founded by Susan Graf and her husband, FedEx

“When we’re tired and weary we have a place to come that is right across the street from the hospital, and we can sleep without the sounds of beeping monitors. A good night of sleep allowed me to be a better mom to RaeAnn.”

Amy Gagel, RaeAnn’s mom

Corp. Executive Vice President and CFO Alan Graf. As a child, Susan’s brother underwent brain surgery in a hospital 300 miles from home. Susan had a dream to alleviate the burden on families who travel long distances to Le Bonheur and worked with donors and hospital leaders to establish the 24-room facility.

While Amy and David spent most of the day by their





Uriah Harlow and his mom Sarah were the first family to stay in the FedExFamilyHouse expansion which opened in December. Uriah had a heart transplant two years ago at Le Bonheur Children's. The family lives about two hours away from Memphis in Aberdeen, Miss. Thanks to the gifts of donors, no family pays to stay at FedExFamilyHouse.

daughter's bedside, the amenities at FedExFamilyHouse helped provide a bit of normalcy to their upside-down world.

FedExFamilyHouse staff and its many community volunteers have considered all the challenges families face and developed ways to support them. Families have access to a fitness room, free laundry, play rooms and more. Volunteers prepare bagged lunches, so family members can pick them up on the way to the hospital for a long day of appointments. Each family has access to four fully-equipped kitchens, so they can prepare a favorite home-cooked meal for their sick child.

"We have two older children who are home with grandparents. It's a special treat for us to bring them to Memphis and stay at FedExFamilyHouse so the five of us can be together," David said.



FedExFamilyHouse at a glance:

- Across the street from the hospital
- 2,623 families served in 2018
- 75 rooms and suites
- 3.5 days average length of stay
- Families from all 50 states and 18 countries served
- No cost to families
- Most referrals come from the Heart Institute, Neuroscience Institute and Neonatal Intensive Care Unit

Take a virtual tour of the house at fedexfamilyhouse.org

'The Miracle Drug'

*FDA approves pharmaceutical grade
cannabidiol oil for epilepsy treatment*



*Le Bonheur was the only Tennessee
hospital to participate in a
cannabidiol oil trial that brought
Epidiolex to market. Now more than
15 Le Bonheur patients benefit
from this medication.*

After trying four different epilepsy medications to eradicate their son's seizures without success, the Eagle family of Stuttgart, Ark., was given two options: undergo surgery for a vagus nerve stimulation (VNS) implant or take part in a trial for a new drug – cannabidiol (CBD) oil.

"Our choice was clear," said Jackson's mom, Ashley. "We could either do surgery or do the trial, and it seemed that the better option was to attempt the trial first."

Jackson is one of many children with epilepsy who are benefiting from the newly Food and Drug Administration (FDA) approved Epidiolex, a drug derived from the CBD compound in the Cannabis plant.

(Read more about Jackson's story on page 20.)

To date, 60 to 65 percent of patients using CBD oil at Le Bonheur Children's have seen a reduction in their seizures.

Le Bonheur began its study of CBD oil for epilepsy treatment in 2015 with a clinical trial and immediately began to see a reduction in quantity and duration of seizures in many cases. Although derived from the Cannabis plant, CBD oil does not cause psychoactivity as it does not contain any tetrahydrocannabinol (THC) – the chemical responsible for most of marijuana's psychological effects.

While CBD oil is commonly found at third-party dispensaries, Le Bonheur Chief Neurologist James Wheless, MD, co-director of the Neuroscience Institute, makes clear the differences between this and prescribed Epidiolex. Third-party

Cannabis to CBD Oil: How Epidiolex Is Made

GROWTH

Natural Cannabis plants, no synthetic plants, are grown in state-of-the-art greenhouses. No pesticides, fungicides or heavy metals are used in the cultivation of Cannabis plants for Epidiolex.

EXTRACTION

CBD oil is extracted from the Cannabis plant ensuring that each dose of Epidiolex contains only pure CBD oil.

APPROVAL

FDA approval ensures every bottle of Epidiolex is safe and consistent and matches the exact ingredients and percentages listed. Conversely, third-party CBD oil dispensaries have no federal oversight.

CONSUMPTION

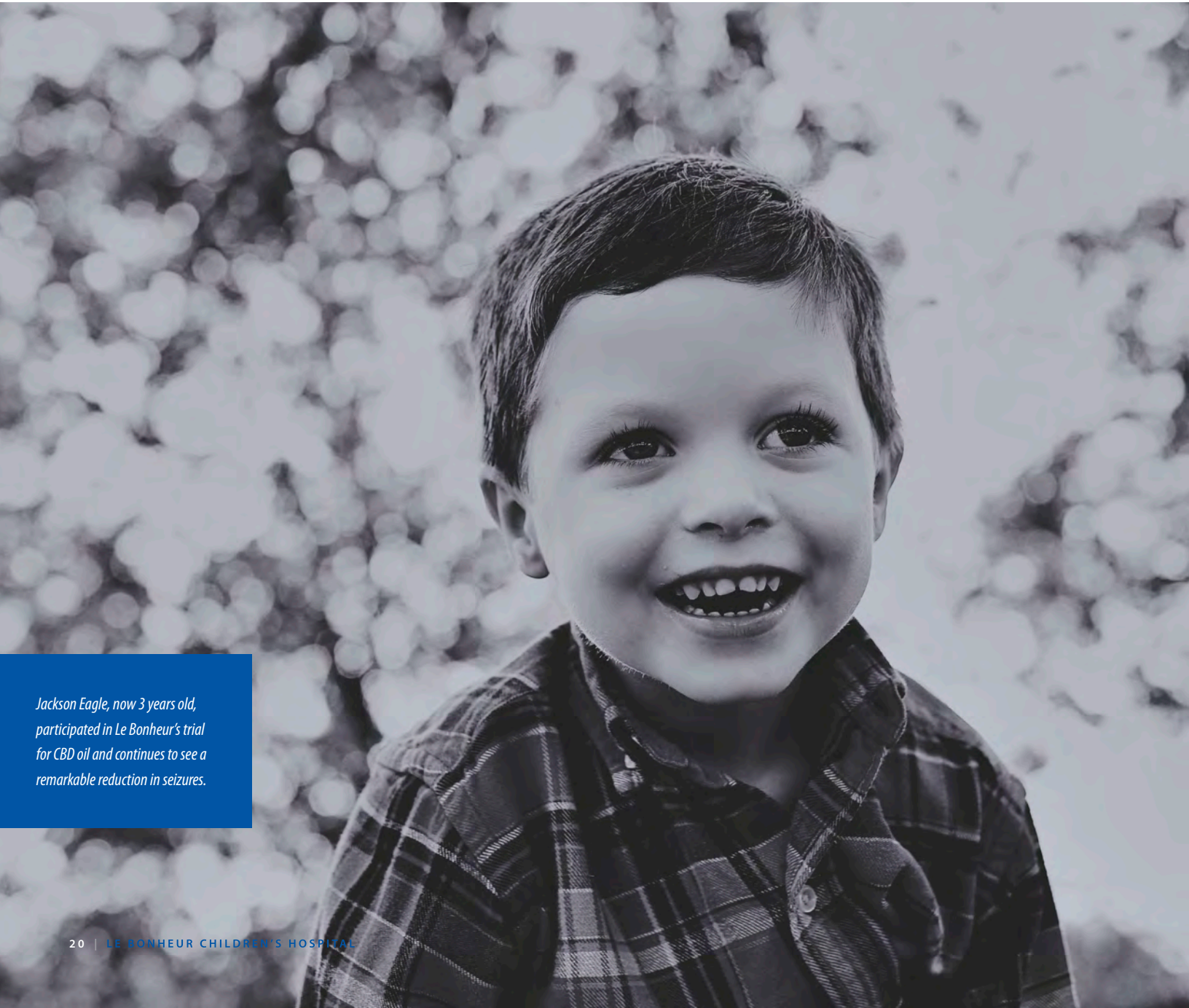
Epidiolex is prescribed by a doctor and only available through a pharmacy – not a dispensary. The CBD oil is combined with sesame seed oil for consumption.

CBD can vary in quality from month to month, while Epidiolex has to meet stringent federal standards and is pharmaceutical grade prescribed by a physician like any other medication. Prescription Epidiolex ensures that each dose is consistent and composed of pure CBD oil – no impurities, pesticides or herbicides.

After five years of trials around the country, the FDA approved the drug for use early 2018. Currently Epidiolex is approved to treat two specific epilepsies

– Lennox-Gastaut Syndrome and Dravet Syndrome, both of which are associated with convulsive seizures. However, other epilepsies are now being studied to see if Epidiolex would provide seizure relief, and children with other conditions have already been able to obtain the medication, Wheless said.

Le Bonheur patients on CBD oil are seeing benefits beyond controlling their seizures. “A huge focus is maximizing the development of young kids as well as



Jackson Eagle, now 3 years old, participated in Le Bonheur's trial for CBD oil and continues to see a remarkable reduction in seizures.

treating their seizures,” said Wheless. “We want to make sure they are doing as well as possible from a development and cognitive standpoint, too.”

Epidiolex has several advantages over other epilepsy medications. Comparatively, the side effects are less severe and easier to tolerate, and patients generally see a drop of seizure frequency and duration within the first few doses. If the patient is going to respond well to CBD oil, it will be clear within a few weeks of beginning the

medication, Wheless said.

“Discovering the newest therapies and medications is vital to providing the best outcomes possible for children whose ongoing seizures cannot be controlled with medicine, change in diet or surgery,” he added.

“CBD oil is part of the Neuroscience Institute’s commitment to provide patients with the best option for managing seizures – there is no ‘one size fits all.’”

Jackson Eagle

Ashley Eagle of Stuttgart, Ark., thought that her son, Jackson, was just having febrile seizures. But after an unrelated ER visit for salmonella poisoning, doctors noticed that his seizure activity was increasing – and his seizures were not due to a fever.

Multiple tests finally determined that five-month-old Jackson’s seizures were caused by tuberous sclerosis complex (TSC) a diagnosis that the Eagle family had never heard of before.

The Eagles discovered the Le Bonheur TSC clinic at a meeting of the Tuberous Sclerosis Alliance in Arkansas where Ashley Pounders, NP, TSC Clinic Coordinator, and Le Bonheur Nephrologist John Bissler, MD, were speakers. After a visit to the clinic, Jackson spent a week in the Epilepsy Monitoring Unit (EMU) and began trying various medications to get on the right path to seizure control.

“He did really well on those medications for a while,” said Eagle. “But then he began to have more frequent seizures, and his development was really suffering.”

The Eagles returned for another stint in the EMU in October 2017 when Le Bonheur Chief Neurologist James Wheless, MD, gave them the options for 2-year-old

Jackson – surgery for vagus nerve stimulation (VNS) implant or the cannabidiol (CBD) oil trial. Eagle asked Wheless, “If this was your kid what would you do?” His answer: the trial.

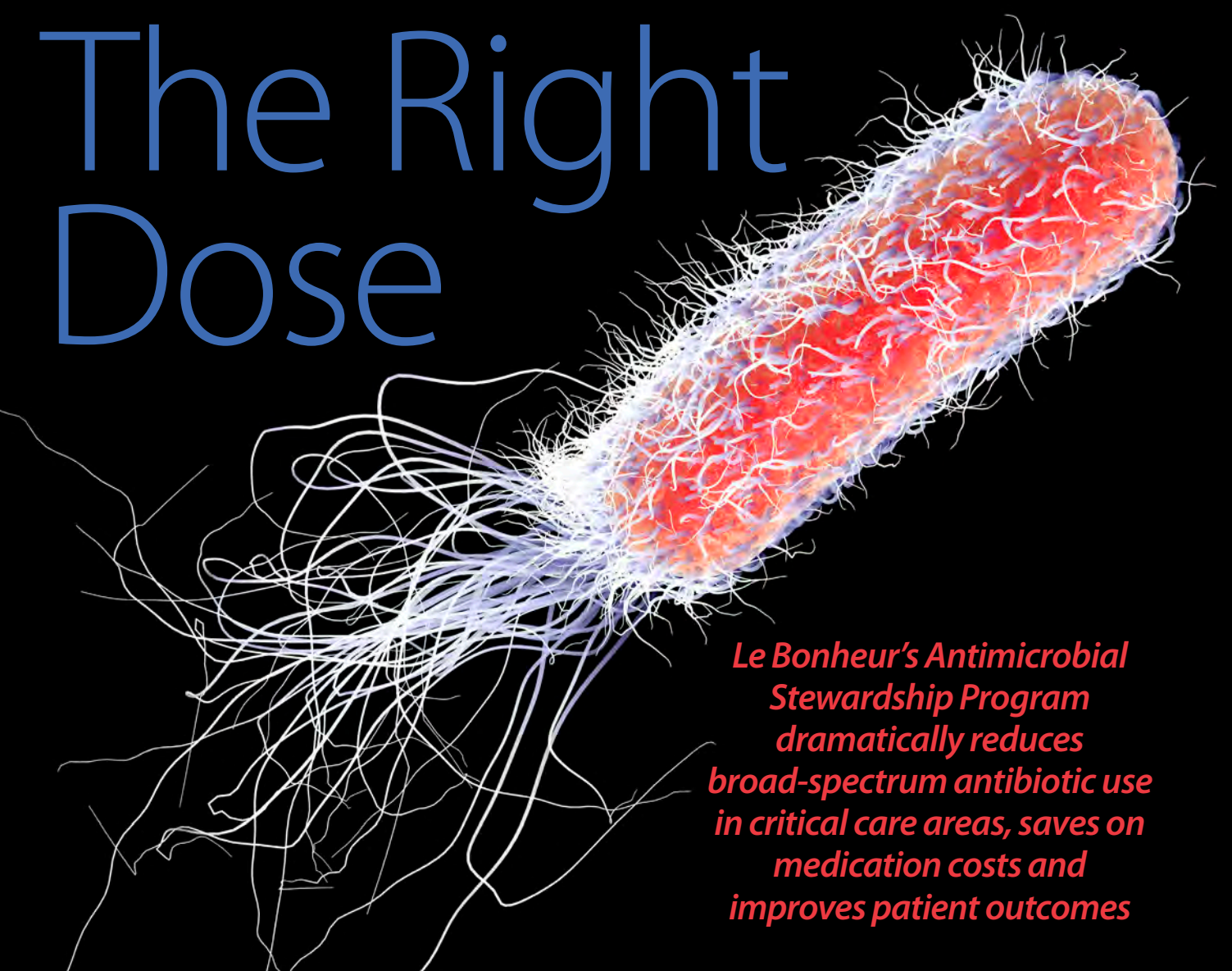
In the months leading up to the trial, Jackson had seizures every single day. He began CBD oil on Jan. 2, 2018. He had nine seizures that month as he adjusted to the medication and then went 154 days without a seizure – the longest ever in his young life.

“For any parents considering CBD oil for their child’s seizures, I would say ‘Give it a shot,’” Eagle said. “It’s been so amazing for Jackson, we call it the miracle drug. I feel that it could be a useful tool to help other kids as well.”

Not only has there been a dramatic drop in seizure frequency, Jackson is growing in his cognition and development by leaps and bounds. Whether it’s simple everyday tasks like taking shoes and socks off or enjoying sliding down a slide, he continues to do things that he wasn’t able to do just one year ago.

“CBD oil has reduced Jackson’s seizures but also given him an opportunity to be as normal a child as possible,” said Eagle. “Le Bonheur is fabulous – they don’t treat you like you’re a patient they treat you like you’re one of their family members.”

The Right Dose



Le Bonheur's Antimicrobial Stewardship Program dramatically reduces broad-spectrum antibiotic use in critical care areas, saves on medication costs and improves patient outcomes

In the battle against antibiotic resistance, Le Bonheur Children's pharmacists and physicians have joined forces on the front lines.

Threats to public health from antibiotic resistance have been reported in every state, and in 2017, lab tests revealed more than 200 instances of "nightmare bacteria" resistant to nearly every antibiotic, according to the Centers for Disease Control and Prevention (CDC).

Collaboration, according to Le Bonheur Antimicrobial Stewardship Program Co-Director Kelley Lee, PharmD, BCPS, will be crucial for success.

"We're not the antibiotic police," Lee said of the stewardship program, which was formed in 2011. "Our big concern is making sure that we're using antibiotics appropriately – that means the right dose, the right duration and the right antibiotic in the right patient."

Those principles have led to remarkable results: a 96 percent improvement in broad-spectrum antibiotic prescriptions in the hospital's neonatal intensive care unit; nearly \$150,000 saved per year in drug costs; and improved patient clinical outcomes.

The program recently earned the Methodist Healthcare System's Performance Excellence Award for its efforts.

The need

The advent of antibiotics came with a warning. In his 1945 Nobel lecture, Sir Alexander Fleming, who discovered penicillin, cautioned against prescription misuse.

"The time may come when penicillin can be bought by anyone in the shops," he said. "Then there is the danger that the ignorant man may easily underdose himself and, by exposing his microbes to non-lethal quantities of the drug,

The Le Bonheur Antimicrobial Stewardship Program has found that decreasing Meropenem use increases susceptibility for the pathogen Pseudomonas aeruginosa (above).

make them resistant.”

Even before Fleming’s speech, resistance to penicillin had emerged in patients. While antibiotics created easy treatment for once-deadly infections, misuse of these drugs has rendered many ineffective in the face of drug-resistant bacteria.

Clinicians at Le Bonheur Children’s, however, believe that a guided response can reduce or delay the development of antibiotic resistance and, in some cases, restore antibiotic efficacy.

Each year, at least 2 million people in the U.S. acquire infections with antibiotic-resistant bacteria and 23,000 die, according to the CDC. At least half of the antibiotics prescribed in hospitals may be unnecessary, according to the CDC. Limiting use of antibiotics to situations where they are necessary can help to stem the tide of antibiotic resistance.

The plan

In response to rising antibiotic resistance in bacteria isolated from Le Bonheur patients, the Antimicrobial Stewardship Program was formed under the leadership of Lee and Infectious Disease physicians Sandra Arnold, MD, and Bindiya Bagga, MD.

“Antibiotic resistance is currently one of the greatest threats to public health,” said Bagga. “Modern medical advancements have saved many lives but have also meant

221

New nationwide testing in 2017 uncovered 221 instances of unusual resistance genes in “nightmare bacteria.”

1 in 10

11% of screening tests, in people with no symptoms, found a hard-to-treat germ that spreads easily.

Source: CDC VitalSigns Report, April 2018

that there are very fragile and very ill patients in hospitals and in our communities. They are susceptible to infections from bacteria that would not sicken an otherwise healthy person. We need to preserve the effectiveness of antibiotics for these patients now and in the future.”

According to the Infectious Diseases Society of America, “The primary goal of antimicrobial stewardship is to optimize clinical outcomes while minimizing unintended consequences of antimicrobial use, including toxicity, the selection of pathogenic organisms (such as *Clostridium difficile*) and the emergence of resistance.”

For the first year and a half, the team worked to create guidelines for the management of common types of infections seen in the hospital’s critical care units such as pneumonia and bloodstream infections.

“During the creation of these guidelines, it was critical to involve the doctors working in the critical care units who would be using them,” said Lee.

After the guidelines were created, they were deployed through meetings, email reminders, individual training sessions and follow up with physicians and critical care unit pharmacy staff. Printed copies of the guidelines are available in each unit and are also posted on the hospital’s intranet for review.

To ensure continued appropriate antibiotic use, the

Commonly misused broad-spectrum antibiotics

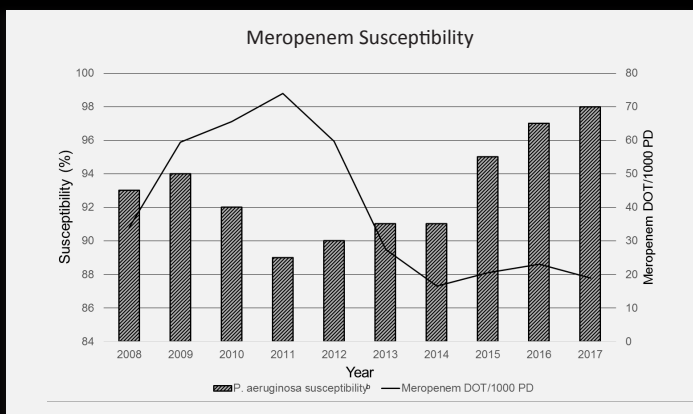
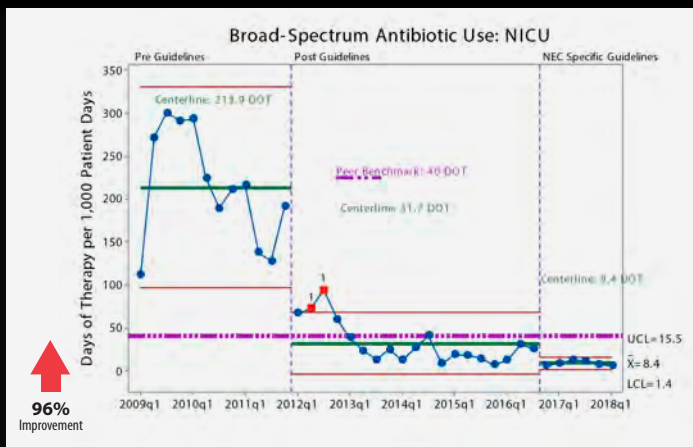
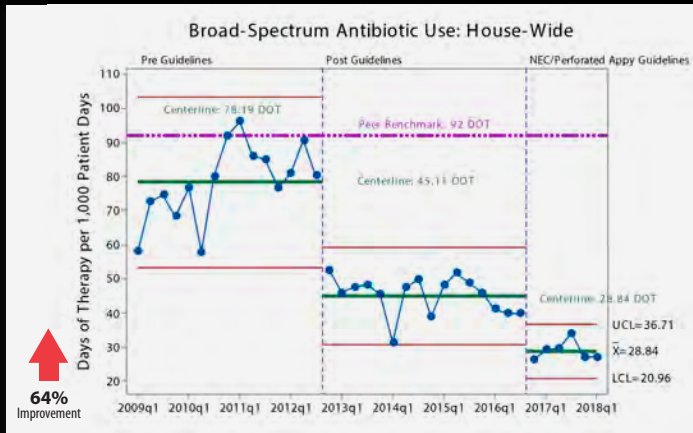
Would your charts be flagged for audit?

Some of the most commonly misused broad-spectrum antibiotics:

- **Vancomycin**
- **third generation Cephalosporins**
- **Meropenem**
- **Cefepime**
- **Linezolid**

stewardship team reviews individual patient charts daily where broad-spectrum antibiotics have been prescribed and follows up with prescribers with recommendations when a more narrow-spectrum or better suited antibiotic could be used.

To maintain consistency, retrospective audits are conducted for each unit. The stewardship team shares the ongoing work and improvements by meeting periodically with both medical staff and pharmacy groups.



The results

Since 2009, hospital-wide broad-spectrum antibiotic use has improved by 64 percent. The NICU boasts a 96 percent improvement and, in the PICU, a 56 percent improvement.

Physicians have also dramatically decreased use of two other frequently used antibiotics, third-generation cephalosporins and vancomycin.

From 2008 to 2017, the stewardship program found that when Meropenem, one of the more frequently prescribed broad-spectrum antibiotics, use decreased, susceptibility for the pathogen, *Pseudomonas aeruginosa* increased. Reversing antibiotic resistance in other bacteria and for other drugs will likely be more difficult and take longer than what was seen in this situation. Antibiotic resistance in other bacteria has remained relatively stable at Le Bonheur since the initiation of the stewardship program, which the program members consider a significant achievement.

Next steps

The program is currently focused on improving use of antibiotic therapy for Necrotizing Enterocolitis (NEC), ruptured appendix, urinary tract infections and neck infections. Reassessment of therapy at 48 hours, already vital to the team's success, will become more formalized with the implementation of a 48-hour "time out," where physicians stop and review every antibiotic course prescribed in the hospital after 48 hours to determine the need for ongoing antibiotics and whether therapy can be changed to narrower spectrum antibiotics.

And beyond that? A deep dive into diagnostics to better leverage laboratory information to inform prescription treatment. Additionally, the team plans to take stewardship out of the hospital and into the Memphis community to reduce unnecessary antibiotic use for viral infections.

"We are at a point in time where we could enter a post-antibiotic era where previously easily treated infections are untreatable," said Arnold. "Unfortunately this has already happened for some patients in the U.S. It is vitally important for physicians to think about every antibiotic they prescribe, whether it is absolutely indicated and whether it is the most narrow-spectrum antibiotic that could be used their patients. Antibiotic resistance is here. Only by continuing to aggressively attack this problem can we stop the spread of antibiotic resistant bacteria in our community and hospitals."

Le Bonheur to host Pediatric Emergency Conference

The 18th Annual Update in Acute and Emergency Care Pediatrics Conference will be held April 25-26 at the Sheraton Downtown in Memphis, Tenn. This event aims to help attendees understand emergency areas in pediatric care and be better prepared for complications in acute settings.

The conference is designed for pediatricians, nurses, EMS professionals, students and any others involved in the care of pediatric emergencies. Register for the conference by visiting www.etsu.edu/com/cme.



ABRET grants EEG laboratory a second five-year accreditation

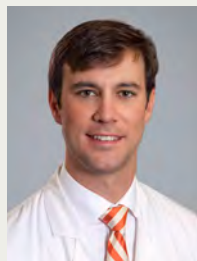
The EEG laboratory at Le Bonheur's Neuroscience Institute recently became the only EEG lab in Tennessee to receive a second five-year accreditation from the Laboratory Accreditation Board of ABRET. ABRET is a national credentialing board that encourages and promotes quality technical and clinical standards world-wide for neurodiagnostic technologists and laboratories through certification and accreditation.



EEG lab team

Orthopaedist David Spence named to *Memphis Business Journal* '40 Under 40'

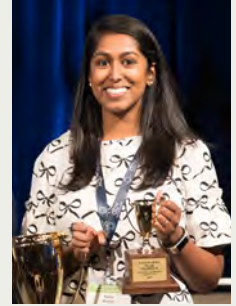
Campbell Clinic and Le Bonheur Orthopaedist David Spence, MD, recently was named as a *Memphis Business Journal* (MBJ) "40 Under 40." Each year the MBJ honors young professionals who are making a difference in their professions and the community.



David Spence, MD

Le Bonheur allergy fellow wins national ACAAI competition

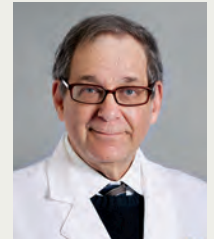
Anita Sivam, MD, won first place in the Fellows-in-Training (FIT) Bowl Competition held during the American College of Allergy, Asthma and Immunology (ACAAI) Annual Meeting. The competition is between allergy/immunology fellows from programs around the nation who compete to answer a variety of questions posed by an expert panel.



Anita Sivam, MD

Cohen receives award from the American College of Radiology

Harris Cohen, MD, FACR, received an award for Exceptional Leadership for his capacity as editor-in-chief of the American College of Radiology Continuous Professional Improvement educational module series over the last 10 years. He was recognized at the Radiological Society of North America annual meeting in 2018.



Harris Cohen, MD, FACR

Le Bonheur begins search for next President and CEO

Le Bonheur has engaged national firm Witt/Kieffer to search for the next President and CEO of Le Bonheur Children's. A new leader is expected to be in place in 2019. Last year, current President and CEO Meri Armour announced that she will retire in 2019. Armour has led the hospital since 2007, and under her direction Le Bonheur has received many accolades including ranking in eight categories in the 2018 *U.S. News & World Report's* Best Children's Hospitals survey. Armour will remain at Le Bonheur until her replacement is chosen.



Meri Armour, MSN, MBA

13th Annual Pediatric Neurology Symposium

April 26-27, 2019

The Guest House at Graceland, Memphis, Tenn.

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

This year's honorary speakers are Susan Iannaccone, MD, associate director of the Wellstone Center for Muscular Dystrophy at Children's Health Specialty Center, University of Texas Southwestern and Kim Meador, MD, clinical director of Stanford Comprehensive Epilepsy Center at Stanford School of Medicine.

To register, visit
www.methodistmd.org/cme
or call 901-516-8933.

