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# Virtual Blueprints

Le Bonheur Heart Institute launches virtual reality program to plan surgeries, cath lab procedures

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# Le Bonheur pediatric surgeon research develops best practices for inguinal hernia management

deal timing and technique of surgical specialties for inguinal hernias in children are highlighted in a recent statement in *Pediatrics* by Le Bonheur Pediatric Surgeon Tim Jancelewicz, MD, MA, MS. In his role as American Academy of Pediatrics (AAP) Section on Surgery liaison to the AAP Committee on Fetus and Newborn, Jancelewicz reviewed existing literature and data to identify best practices, including optimal timing of repair in preterm infants, which doctors should perform inguinal hernia repair and the best surgical approach.

“We continue to see controversies in how inguinal hernias should be managed in children,” said Jancelewicz. “This report reviewed how inguinal hernias form and evaluated how pediatric hernias are treated, with special attention to the risks of general anesthetic in very young children. Our results show the ideal timing, surgeons and surgical methods for hernia repair.”

Inguinal hernias occur when the contents of the abdomen protrude through a hole in the processus vaginalis known as a patent processus vaginalis (PPV). Inguinal hernias occur in approximately eight to 50 full-term infants per 1,000 births, a rate which increases to 20% or more in extremely low birth weight infants. But the timing of repair in preterm infants continues to be debated because of comorbidities associated with prematurity and anesthesia-related concerns. Jancelewicz and his co-authors reviewed multiple studies to show that it is beneficial to defer inguinal hernia repair in preterm infants until after NICU discharge. This may reduce the risk of respiratory complications without increasing the risk of hernia incarceration or reoperation, said Jancelewicz.

When determining who should perform inguinal hernia repairs, all evidence points to pediatric surgical specialists or general surgeons with a high case volume of pediatric inguinal hernia repairs for the best outcomes. The overall risk of hernia



Tim Jancelewicz, MD, MA, MS

recurrence was more than double among patients managed by adult general surgeons, but high-volume general surgeons had recurrence rates similar to pediatric surgical specialists, the research reported.

“To achieve optimal outcomes, ideally, pediatric surgical specialists, pediatric urologists or general surgeons with a significant yearly case volume should repair pediatric inguinal hernias,” said Jancelewicz. “In addition, care under a pediatric specialist anesthesiologist led to a lower incidence of complications in infants.”

Between 2009 and 2018, the laparoscopic approach to pediatric inguinal hernia repair has increased fivefold compared to traditional open surgery. Studies have shown no difference in complications or recurrence rates in the two approaches, but the laparoscopic approach had significantly shorter operation times and fewer post-operative complications.

Additional best practices Jancelewicz and his AAP co-authors determined include:

- **Laparoscopy is a feasible alternative to managing recurring hernias.**
- **Evidence does not suggest that exposure to a single, short duration of anesthesia needed for inguinal hernia repair has adverse effects on neurodevelopmental outcomes.**
- **If an additional PPV is found without an existing hernia, no strong data exist for or against its repair. A nuanced conversation should be held with the family regarding the risks and benefits of each option.**

“Inguinal hernias are a common condition and one of the most commonly performed procedures in children, but their management continues to be debated,” said Jancelewicz. “Our hope is that this publication establishes evidence-based guidelines for pediatric surgeons to follow in their care of children with inguinal hernias.”

Le Bonheur Children's Hospital in Memphis, Tenn., treats more than 250,000 children each year in regional clinics and a 276-bed hospital that features state-of-the-art technology and family-friendly resources. Our medical staff of more than 240 physicians provide care in 45 subspecialties.

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Research included in this report was funded by the Children's Foundation Research Institute.

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*Le Bonheur Interventional Cardiologist Neil Taylor, MD, founded the Le Bonheur Heart Institute Virtual Reality Program, which uses virtual reality to build a 3D model of a patient's heart, place devices and create a precise plan for procedures and surgeries.*





# Virtual Blueprints

Le Bonheur Heart Institute launches virtual reality program to plan surgeries, cath lab procedures

Le Bonheur Interventional Cardiologist Neil Taylor, MD, and Cardiovascular Surgeon Umar Boston, MD, faced an obstacle. A patient with mitral valve disease had developed a clot in a recently placed bioprosthetic valve and urgently needed another valve replacement. But the patient was in such poor condition that further surgery was not an option. Instead, Boston requested that Taylor perform a cardiac catheterization and place a percutaneous valve inside of the patient's bioprosthetic valve.



This technique is known as a percutaneous mitral valve-in-valve replacement and is not commonly performed in children. But Boston and Tailor had one major advantage for the smoothest and safest possible procedure — virtual reality (VR).

“Positioning and placement of the valve was critical, and we needed to think outside of the box for this case,” said Boston. “The VR technology provided another option for planning and precise placement of the implant that avoided another open heart surgery.”

Tailor, who founded the Le Bonheur

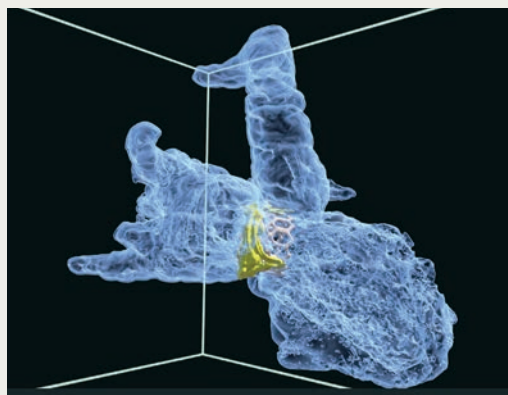
Heart Institute Virtual Reality Program, created a 3D model of the patient’s heart and the valve to be implanted. Using VR technology, he planned the procedure by placing the 3D model of the valve in the 3D model of the heart in a virtual space to determine the optimal position for the valve and to see how this placement related to other structures in the heart.

This VR planning led to a straightforward, successful percutaneous valve-in-valve replacement that was completed within 30 minutes.

“Thanks to VR we can grab and hold the simulated heart, place devices and position them where needed,” said Tailor. “VR allows us to get inside the heart defect and create a more precise plan ahead of surgeries and procedures.”

### Case #1: Mitral valve replacement

When a patient with recurrent mitral valve disease developed a clot in their recently placed bioprosthetic mitral valve, Le Bonheur Cardiovascular Surgeon Umar Boston, MD, needed to act quickly to replace the clotted valve. The patient, however, was too ill to go back to the operating room for open heart surgery. A catheterization procedure would be a safer option, but percutaneous mitral valve replacement is not commonly performed in children. Thanks to virtual reality (VR), Interventional Cardiologist Neil Tailor, MD, was able to model the valve placement in VR and see how this placement related to other heart structures. This led to a successful, safe and efficient percutaneous procedure that was completed within 30 minutes.



*By building the patient’s heart in a virtual reality space, cardiologists could see how the device would fit inside the mitral valve (pictured in yellow).*





Le Bonheur Children's Hospital is one of only a few pediatric centers in the world using VR to plan heart surgeries and cath lab procedures. This precise planning leads to safer and faster surgeries and procedures for patients at Le Bonheur's Heart Institute.

### Dynamic Perspectives

When Tailor was searching for his niche in the cardiology field, VR modeling immediately stood out. While the software used was initially created for planning otolaryngology (ENT) and skull surgeries,

it also has proved to offer opportunities in treating congenital heart disease. In 2022, Tailor established the Le Bonheur Heart Institute Virtual Reality Program.

"VR allows us to model procedures in the cath lab and surgical operating room



*Le Bonheur Interventional Cardiologist Neil Tailor, MD, (left) and Cardiovascular Surgeon Umar Boston, MD, (right) work together to use virtual reality (VR) technology to plan heart surgeries. An expansion to the Heart Institute, currently underway, will incorporate a VR station for families to better see their child's heart defect and how physicians will repair it.*



in a more dynamic way. Existing imaging gives, at best, a 3D reconstruction of a heart that is similar to looking at drawings in a book. With VR, we can move around inside the heart as if we are holding it in our hands,” said Tailor.

To build these 3D models, Tailor uses raw data from a patient’s CT scan, MRI

or 3D echocardiogram. And to create the most accurate models, Tailor does not rely completely on computer algorithms. He segments the data himself taking the patient’s 2D scan and turning it into a 3D model for the highest level of accuracy. With time, he has also built a library of 3D models of every device that Le Bonheur

interventional cardiologists and surgeons might use by scanning them with a fluoroscopy machine.

Tailor and Boston work together to discuss cases and determine which ones might benefit from VR planning. In the cath lab, Tailor uses VR for every patient who already has a CT scan. For surgical



*Le Bonheur Interventional Cardiologist Neil Tailor, MD, uses virtual reality (VR) to build 3D models of patient hearts and devices. The precise planning afforded by VR leads to safer and faster surgeries and procedures for patients.*



cases, Boston finds that VR planning is useful in more challenging surgeries, such as partitioning ventricles, redirecting systemic veins or heart transplants.

### The Virtual Advantage

Taylor and Boston have discovered that the use of VR in surgery planning is

providing myriad benefits — for themselves as physicians but also for their patients.

“Previously, we had limits on planning before cath lab procedures. We would look at an ECHO and CT scans, but have to figure out many details of the procedure as we went along,” said Taylor. “With VR, we’re moving away from that and can plan substantially more beforehand.”

The planning capabilities that VR provides before a cath lab procedure means shorter procedure time, as well as less high-radiation imaging and contrast for the patient. Plus, the VR plan provides a reference for correct device placement that interventional cardiologists can use in the cath lab to verify the device’s correct location via fluoroscopy.

Boston sees similar benefits for his heart surgeries that can be planned with VR. The extensive preoperative planning that VR allows means his patients have less time under anesthesia and less time on heart-lung bypass during surgery.

“If you have a well-orchestrated plan, it’s better over time and down the road for patients,” said Boston. “VR gives us another way to fine tune our management strategy from a preoperative standpoint.”

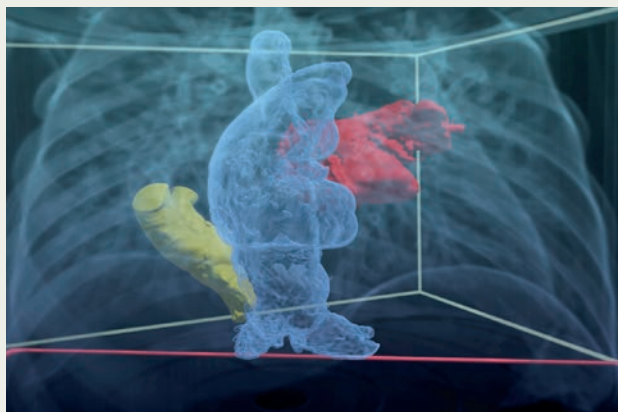
### A New Dimension

A key focus for expansion of this program is further developing the use of VR for heart transplants — even when determining whether a donor heart will fit a recipient’s chest cavity. While Boston can



#### Case #2: Anomalous pulmonary vein surgery

When Cardiovascular Surgeon Umar Boston, MD, was preparing for an anomalous pulmonary vein surgery, it was critical for him to know where along the inferior vena cava (IVC) this vein inserted. Surgeons work with narrow views of the heart and its defects, and the patient’s MRI couldn’t clearly delineate where this abnormal connection was located. Thanks to VR, Boston could identify the connection and its relation to other structures of the chest. This altered his surgical approach, which saved time and resulted in a successful surgical repair.



*Pictured above is the patient’s heart in virtual reality. Yellow is the pulmonary vein, red shows the left atrium and blue shows the right atrium and inferior vena cava.*



currently use VR to plan parts of the heart transplant surgery, the hope is that soon he will be able to use a 3D scan of the donor's heart and a 3D scan of the recipient's chest cavity to virtually place the donor heart

into the recipient's chest.

This builds upon work already underway in Le Bonheur's Heart Transplant Program to better match a recipients with the proper donor heart. Working

with radiologists, Boston and his team have developed a database of chest cavity volumes and associated weights to help surgeons determine the appropriate donor weight range for patients waiting for a heart. VR would take this a step further, providing another checkpoint for accurately matching a donor and recipient.

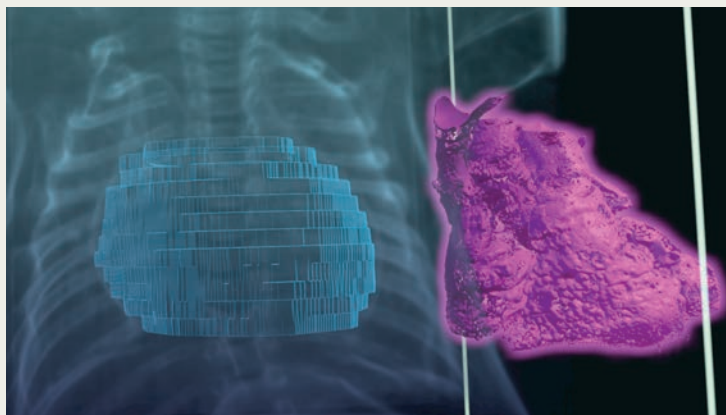
VR has implications for the education of the next generation of physicians, too, says Tailor. Currently, cardiologists in training learn in 2D, but the ability to view the heart through VR means 3D perspectives as well as the ability to see specific slices of the heart and overlay different areas.

Tailor and Boston feel so strongly about the potential for VR that Le Bonheur is incorporating a VR station into the Heart Institute expansion currently underway. Scheduled to open in 2024, this expansion will add a hybrid cardiac MRI and cath lab to the two existing cath labs, all on the same floor as the Cardiovascular Intensive Care Unit and CV Operating Room. The VR station will allow families the opportunity to see their child's heart defect and cath lab procedure plan to better understand exactly what's going on with their child's heart.

"For families, it's helpful to see their child's heart in 3D, and with the dedicated cardiac MRI, we'll be able to use that imaging to build our 3D models with no radiation for the patient," said Tailor. "Eventually we hope to use VR for 4D modeling — allowing us to plan surgeries and procedures on a VR heart that is pumping blood and beating." ■

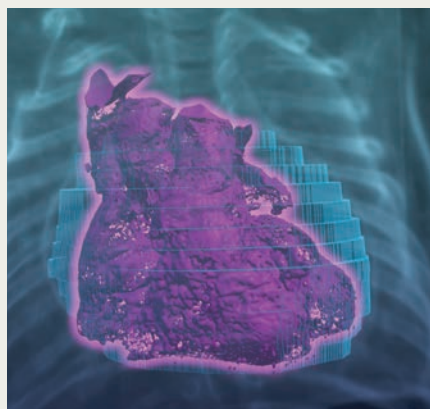
### Case #3: Heart transplant

Heart transplantation in children presents numerous challenges compared to those in adults. One such challenge is that the recipient child may be drastically different in size and weight compared to the donor. In order to determine whether the donor's heart will fit in the recipient's chest, a CT scan measures volumetrics in two dimension. Although this provides a general roadmap, Le Bonheur now uses VR to implant the donor heart into the recipient's chest cavity volumetrics to plan for surgery.



*Above is the patient's chest cavity and the donor heart in virtual reality.*

*Pictured at right shows how the heart will fit into the recipient's chest.*





# Cell Connections

*Le Bonheur nephrologist investigates cellular dynamics that lead to polycystic kidney disease*

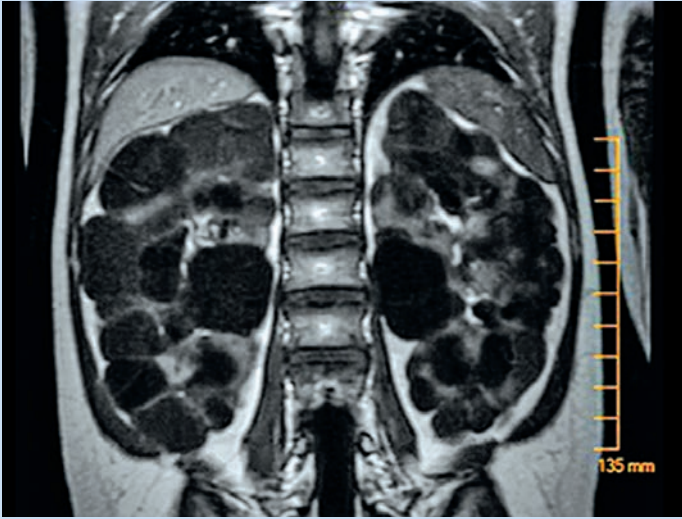
John Bissler, MD, Le Bonheur chief of Pediatric Nephrology and director of the Tuberos Sclerosis Center of Excellence, recently published research in *Biology* investigating the cellular-level dynamics that lead to polycystic kidney disease (PKD) when the *Pkd1* gene or the *Tsc2* gene is deleted.

The results showed that deletions of either gene increased the production of extracellular vesicles (EVs), particles that provide communication between cells, which appear to recruit genetically unaltered cells to participate in the development of kidney cysts. In addition, deletion of either the *Pkd1* or *Tsc2* gene caused kidney cells to take up more EVs and hold onto the EVs for a longer period of time. Researchers hope that further understanding of EVs' impact on PKD will provide an avenue for new therapies.



*In a recent publication, Le Bonheur Chief of Pediatric Nephrology and Director of the Tuberos Sclerosis Center of Excellence John Bissler, MD, explored how deletion of the *Pkd1* or *Tsc2* genes leads to polycystic kidney disease at a cellular level.*





Polycystic kidney disease (PKD) causes cysts to form all over the kidneys (pictured above), leading to high blood pressure and consistently decreasing kidney function. Bissler hopes that the results of this study can lead to new therapies for patients with PKD.

“Patients with PKD and tuberous sclerosis complex (TSC) are born with typical kidneys but quickly develop cysts causing a premature loss of kidney function,” said Bissler. “The more we understand how EVs are involved in the development of PKD, the more potential we have for early intervention to preserve kidney function.”

Results also showed that primary cilia, structures on the surface of cells that act as antennae or sensors, play a large role in transmitting and receiving EVs. When researchers deleted the *Pkd1* gene and the gene responsible for the protein that builds cilia, EV production was lowered and PKD was less severe.

#### Other results included:

- **Cells without the *Pkd1* gene produced more EVs than cells without the *Pkd2* gene.**

- Previously published studies from Bissler’s group showed that *Tsc2* gene deletion greatly increased EV production compared to *Tsc1* deletion. The same proved to be true when comparing *Pkd1* and *Pkd2* deletion — with the former producing twice as many EVs.
- In addition, EVs from cells without *Pkd2* had changes on the surface, which raised the possibility that they may interact or bind differently with cells.

- **Removing primary cilia lowers EV production.**

- Researchers added a treatment to kidney cells to remove primary cilia. This caused a significant reduction in EVs, showing that primary cilia are important contributors to the production of EVs.

- **Deletion of the *Tsc2* gene leads to EVs that migrate to the kidney at high rates.**

- To understand how EVs move through the body, researchers used a mouse model to isolate EVs from kidney cysts and inject them into the peritoneal cavity. Mice without a functioning *Tsc2* gene had EVs that migrated to the kidney at a significantly greater amount than those with the *Tsc2* gene. EVs from cells with mutations in *Pkd1* or *Pkd2* also had significantly increased migration to the kidneys.
- Researchers posited that kidney cyst EVs must have a method to conscript cells to migrate to the kidneys.

- **Gene deletions in *Pkd1*, *Pkd2*, *Tsc1* and *Tsc2* caused cells to take in EVs faster and hold them longer.**

- EVs from cells with *Pkd1* deletion had an uptake process 14 times faster and clearance five times slower than those from the cells with *Pkd2* deleted. These results suggest that polycystin-1, a protein produced by the *Pkd1* gene, regulates EV trafficking.

All of these results provide insight into the cellular-level mechanisms that lead to PKD, particularly the role that EVs play in this process.

“Our study suggests the possibility that EV production rates, tissue half-life, target homing and cargo differences may be involved in the disease process,” said Bissler. “Additional studies can help us identify diagnostic and prognostic biomarkers and ultimately reveal novel therapies to reduce cystic disease.”



# More than a Birthmark

Le Bonheur physicians provide coordinated care for children with vascular anomalies

Le Bonheur Chief Dermatologist Teresa Wright, MD, first saw 1-month-old Kimberly Femat in her clinic in early 2020. Kimberly was born with a vascular birthmark on her left arm and chest, but wasn't experiencing any problems.

Wright decided to watch her closely to see if the birthmark would change or grow. The next

time Wright saw Kimberly, her condition had deteriorated significantly. Kimberly had landed in Le Bonheur's Emergency Department with swelling and a lesion in her upper chest — a drastic change in her birthmark. Physicians also discovered that she was very anemic, even after receiving a recent blood transfusion from another local hospital.



Le Bonheur Chief of Pediatric Dermatology Teresa Wright, MD, (at right) and Hematologist Cliff Takemoto, MD, (far left) examine Kimberly Femat at a follow-up appointment.



Kimberly was suffering from a complex vascular anomaly, a condition where blood vessels develop abnormally. She appeared to be having internal bleeding, but it wasn't immediately clear where. She needed a team of specialists from multiple divisions to uncover what treatment she needed. Fortunately, Le Bonheur is home to a multidisciplinary Vascular Anomalies Program that brings together every specialty Kimberly needed for diagnosis and treatment.

"Without the Vascular Anomalies Program, Kimberly would have been referred to multiple specialists and clinics for diagnosis and treatment," said Regan Williams, MD, pediatric surgeon with the Vascular Anomalies Program. "Instead of families having to connect the dots between specialists, we can meet in the same room, review a patient's case and figure out the best way forward for each child."

## Benign Birthmarks and Rare Anomalies

Vascular anomalies fall into two broad categories: benign or aggressive vascular tumors that can cause bleeding or clotting complications and vascular malformations that occur when arteries, veins or lymphatic channels develop abnormally. The most common diagnosis seen in Le Bonheur's Vascular

Anomalies Program is infantile hemangioma — a benign growth of blood vessel tissue.

Wright says it is unclear why these anomalies develop in the first place. Premature birth is a risk factor, but Le Bonheur's experts hope that a deeper understanding of genetics will uncover causes (and potential therapies) for these conditions.

"Most hemangiomas show up in the first month after birth, and many don't require any treatment at all. But if they start to interfere with a child's function or cause a cosmetic defect, it's time for us to intervene," said Wright.

Because of this, the Vascular Anomalies team sees children at a range of ages and even adults who don't have other options for the multidisciplinary care that vascular anomalies can require.

When the team determines that a child needs treatment, a variety of options are available at Le Bonheur based on the

type and severity of the anomaly. Many vascular anomalies are asymptomatic and do not require any treatment at all.

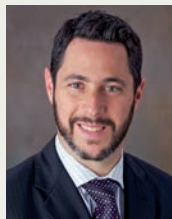
For more complicated vascular lesions, Le Bonheur's specialists provide treatment options specific to a child's needs. Sclerotherapy, a minimally-invasive radiology procedure, is a common treatment for vascular malformations where



*When Kimberly Femat (above) presented at Le Bonheur's Emergency Department, physicians discovered she was bleeding internally. Thanks to the collaborative Vascular Anomalies Program, physicians identified that she had a rare presentation of infantile hemangioma.*

### Meet the Team:

## Vascular Anomalies



#### Lucas Elijovich, MD, FAHA

Director, Pediatric Neurointerventional Surgery and Vascular Anomalies Program, Le Bonheur Children's Hospital

Interventional Neurologist, Semmes Murphey Clinic

Professor of Neurology and Neurosurgery, The University of Tennessee Health Science Center

- Vascular anomalies of the head, neck, brain and spine



#### Vijay Agrawal, MD

Section Chief, Interventional Radiology, Le Bonheur Children's Hospital

Associate Professor, The University of Tennessee Health Science Center

- Vascular malformations of all types
- Sclerotherapy





*Le Bonheur Pediatric Surgeon Regan Williams, MD, (above left) worked with Interventional Neurologist Lucas Eljovich, MD, FAHA, to form the Vascular Anomalies Program almost 10 years ago.*

medication is injected into the blood vessels to reduce the size of lesions, thereby easing symptoms of pain and dysfunction. In rare cases, surgery may be required to remove the lesions, but Le Bonheur’s specialists avoid this invasive treatment unless necessary for a child.

“Vascular anomalies patients are very heterogeneous — they have different conditions that need different types of therapies,” said Cliff Takemoto, MD, a pediatric hematologist

in the program. “This requires input on treatment from a team comprised of various specialties.”

But many times the largest barrier to treatment is simply getting children in the door. The Vascular Anomalies team sees two major issues in getting these patients the appropriate care. Conditions are so uncommon that their pediatrician doesn’t recognize the anomaly, and children get bounced from specialty to specialty because they don’t know about



**Cliff Takemoto, MD**

Chief, Clinical Division of Hematology, St. Jude Children’s Research Hospital  
 Professor of Pediatrics, The University of Tennessee Health Science Center

- Medical management of vascular tumors and malformations
- Coagulation defects with vascular anomalies
- Clotting complications



**Regan Williams, MD**

Medical Director, Trauma Services  
 Associate Professor of Surgery and Pediatrics, The University of Tennessee Health Science Center

- Management of vascular anomalies in the head, neck, chest, abdomen and extremities
- Surgical excision and wound care
- Biopsies for diagnosis



**Teresa Wright, MD, FAAD, FAAP**

Chief, Pediatric Dermatology, Le Bonheur Children’s Hospital  
 Professor of Dermatology, The University of Tennessee Health Science Center

- Skin exams
- Clinical diagnosis of hemangiomas and variations of vascular malformations

## Case Study: Kimberly Femat Infantile Hemangioma

In early 2020, Kimberly Femat saw Le Bonheur Chief of Pediatric Dermatology Teresa Wright, MD, to examine a vascular birthmark on her left arm and chest. The mark was not causing any issues for Kimberly, so Wright decided to wait and see how it progressed before any kind of treatment.

“Vascular anomalies can take time to develop, so it was hard to determine exactly what was going on,” said Wright. “To predict how it will behave, we need to know what it is. With time and follow up, we could properly diagnose and then treat Kimberly.”

The COVID-19 pandemic broke out just weeks later, and Wright did not see Kimberly again until she presented in Le Bonheur’s Emergency Department in significantly worse condition. She now had swelling and a lesion in her upper chest and was severely anemic. The anemia indicated that Kimberly was bleeding internally, but it wasn’t clear where. The Vascular Anomalies team needed to determine exactly where and why she was bleeding and diagnose the lesion in her chest as quickly as possible.

“When Kimberly presented with anemia, it became clear that it was because of blood loss,” said Cliff Takemoto, MD, a hematologist in Le Bonheur’s Vascular Anomalies Program. “We went through the question of if the chest mass was associated with her blood loss, but it didn’t fit with a typical vascular tumor.”

After a blood transfusion, Kimberly underwent myriad tests to find the root of the problem. A biopsy confirmed that the chest lesion was an infantile hemangioma. An MRI and ultrasound of her abdomen showed that her small intestines were thickened, but an upper and lower endoscopy didn’t reveal anything out of the ordinary — a puzzling result for the Vascular Anomalies team.

Still hunting for the source of Kimberly’s internal bleeding, Le Bonheur Pediatric Surgeon Regan Williams, MD, conducted a diagnostic laparoscopy while gastroenterologists performed a push endoscopy. In this procedure, Williams and the gastroenterologists work in tandem. While gastroenterologists could see the inside of Kimberly’s small intestines, Williams could see the outside of them simultaneously. As a result, Williams found something she had never seen before — Kimberly’s mesentery, the blood supply to the intestines, was covered in red lesions.

A biopsy confirmed this was a very rare presentation of infantile hemangioma. Because the hemangioma



*Kimberly Femat, now 3 years old, was diagnosed with infantile hemangioma at just a few months old. With medication and steroids, Kimberly has now been stable for a long time.*

was covering her mesentery, the lesions could not be surgically removed, so physicians started her on the medication propranolol and steroids. Kimberly did have recurrence of bleeding and required another transfusion. Over time, the team was able to take her off steroids, and she has now been stable for a long time.

“Hemangiomas on the skin typically go away

within the first 4 to 5 years of life, but internal hemangiomas like Kimberly’s can be more stubborn and take longer to go away,” said Wright. “Kimberly’s condition was complicated and confusing, but I love that my job has a challenge and a mystery. It’s a privilege to see patients like her thrive over time.”

Le Bonheur’s multidisciplinary model was especially crucial for Kimberly’s care. She had lesions on the skin, which Wright could treat, but also lesions in the abdomen and anemia on top of that, which required coordination from Williams, Takemoto and additional specialists on the team.

“In the old context, Kimberly would have been sent to me for biopsy, then back to Dr. Wright and then again to Dr. Takemoto for her anemia. None of us would have been in the same room to collaborate simultaneously on patients,” said Williams.

Now Kimberly is 3 years old and seen every two or three months for checkups at the Vascular Anomalies Clinic because internal infantile hemangiomas can have recurrences. But her physicians are hopeful that the hemangiomas will disappear as she grows.



*Kimberly Femat first saw Le Bonheur Chief of Dermatology Teresa Wright, MD, for a vascular birthmark on her left arm and chest, which was eventually diagnosed as a very rare presentation of infantile hemangioma.*





*Vascular Anomalies Program Director and Interventional Neurologist Lucas Eljovich, MD, FAHA, reviews a patient case with the vascular anomalies team. Thanks to this strong multidisciplinary team, children can get the care they need from multiple specialists in one visit.*

multidisciplinary centers.

“Since vascular anomalies is a relatively new field, patients get scattered all over the place and by the time we see them, they can be really scared about what’s going on,” said Williams. “It’s a huge sigh of relief when we can tell families that we know what it is and what they can expect next.”

## Collaborative Care for Kids

When Interventional Neurologist Lucas Eljovich, MD, FAHA, and Williams began meeting about the idea of a Vascular Anomalies Program almost 10 years ago, they knew they had one particular strength on their side — a robust multidisciplinary team ready to work together to provide the best care for patients.

“With experts from a wide range of specialties, we were able to create a truly multidisciplinary Vascular Anomalies Program at Le Bonheur. Children can get the wide range of care and services that they need in one place and at one time,” said Eljovich, director of the Vascular Anomalies Program.

The Vascular Anomalies team consists of specialists from cardiology, dermatology, pediatric surgery, neuroendovascular surgery, ophthalmology, otolaryngology (ENT), plastic surgery and radiology. This team meets twice a month before clinic to discuss patient cases and review imaging.

Le Bonheur physicians say it is the collective knowledge

present in this room that sets their program apart. Vascular anomalies can be so rare that an individual physician may not have seen a specific anomaly before, but, with a room full of experts, someone has seen it or can find someone who has.

“We have many years of combined experience that comes from training with a high volume of vascular anomalies patients from all over the country and the world,” said Wright. “While individually we might not always have the answer, patients get the benefit of all the people here and the contacts each of us has nationally and internationally.”

## The Future of Vascular Anomalies

It took every member of the Vascular Anomalies team to determine what was happening to little Kimberly Femat. After extensive tests, Williams conducted a diagnostic surgery during which she discovered that Kimberly had infantile hemangioma covering her mesentery, the blood supply to the intestines. After blood transfusions and medication, she has been stable for an extended time and only sees her team for follow up every few months.

“It’s a privilege to see patients like Kimberly over months and years of their lives and see how they are growing and thriving,” said Wright. “Knowing we have played a small part in helping them, especially when it’s a complicated and confusing case, makes this work very rewarding.”

The Vascular Anomalies team is looking forward to the future of vascular anomalies treatments as the field has changed significantly in recent years. Targeted genetic treatments are on the horizon as the study of the genetic component of vascular anomalies is exploding, says Takemoto.

“Vascular anomalies is such a fun field because it’s still innovating,” said Williams. “So much of medicine is already known, but many aspects of vascular anomalies are still unknown, so it’s actually really exciting.” ■







# PINPOINT PRECISION

## *ROSA One Brain technology provides minimally-invasive, more precise seizure localization*

**F**or Le Bonheur neurosurgeons to perform a successful epilepsy surgery, they need two critical pieces of information: where a child's seizures are located and what areas of the brain to avoid to preserve function. Previously, neurosurgeons had to open the skull, expose the brain and place electrode grids directly on the brain's surface. The electrodes could help identify seizure focus areas, which neurosurgeons could remove in a second brain surgery.

But this meant children had to undergo two separate operations with a craniotomy and an exposed brain. It was typically a tough surgery recovery for patients and a grueling, lengthy surgery for neurosurgeons. Moreover, in many cases, the grids did not capture enough information to eliminate all seizure activity.

Enter the ROSA One Brain — a robot that provides neurosurgeons with presurgical mapping and precision instrument guidance. ROSA consists of advanced software for mapping and guidance and a robotic arm that the software directs to precise, premapped locations. ROSA fits inside of Le Bonheur's neurosurgery Operating Rooms (ORs).

Currently, this technology is used for stereoelectroencephalography (SEEG), a minimally-invasive procedure that places a large number of electrodes deep in the brain using incisions of around 2 to 3 millimeters to insert an electrode of just 1.2 mm in diameter. No longer do neurosurgeons have to expose a patient's brain to place electrodes, and ROSA's guidance and planning abilities lead to less OR time and higher accuracy.

"When I conduct an epilepsy surgery, my goal is to find the problem and fix it," said Le Bonheur Neurosurgeon Nir Shimony, MD. "With the ROSA's capabilities, the chances of finding and fixing the seizure problem areas are much higher and much safer."



Combining ROSA with Le Bonheur’s full brain imaging suite, which includes magnetoencephalography, functional MRI and transcranial magnetic stimulation, Le Bonheur neurosurgeons can create detailed surgery plans to remove seizure areas while also focusing on preserving language, sensory and motor function.

### A Precise Operation

Because of ROSA’s precise mapping and guidance, Le Bonheur neurosurgeons can reach previously inaccessible areas of the brain with electrodes in a fraction of the time and with less recovery for the patient. The result of these benefits is a better chance for neurosurgeons to identify seizure locations and create a tailored treatment plan for each child.

From a practical standpoint, SEEG with ROSA is a far easier and safer procedure for children. With its minimally-invasive nature, patients can recover more quickly. Conducting a major surgery that removed the skull and exposed the brain, as was needed previously, had increased potential for bleeding, infection or other surgical complications.

“In a way, SEEG with ROSA is a completely different operation,” said Shimony. “The patient wakes up like you haven’t done anything neurosurgically invasive. Previously we had to open and expose the brain to place grid electrodes and then repeat the same exposure a few days later to remove the grids.”

When preparing for an SEEG procedure, ROSA’s assistance begins before reaching the OR. Combining MRI,



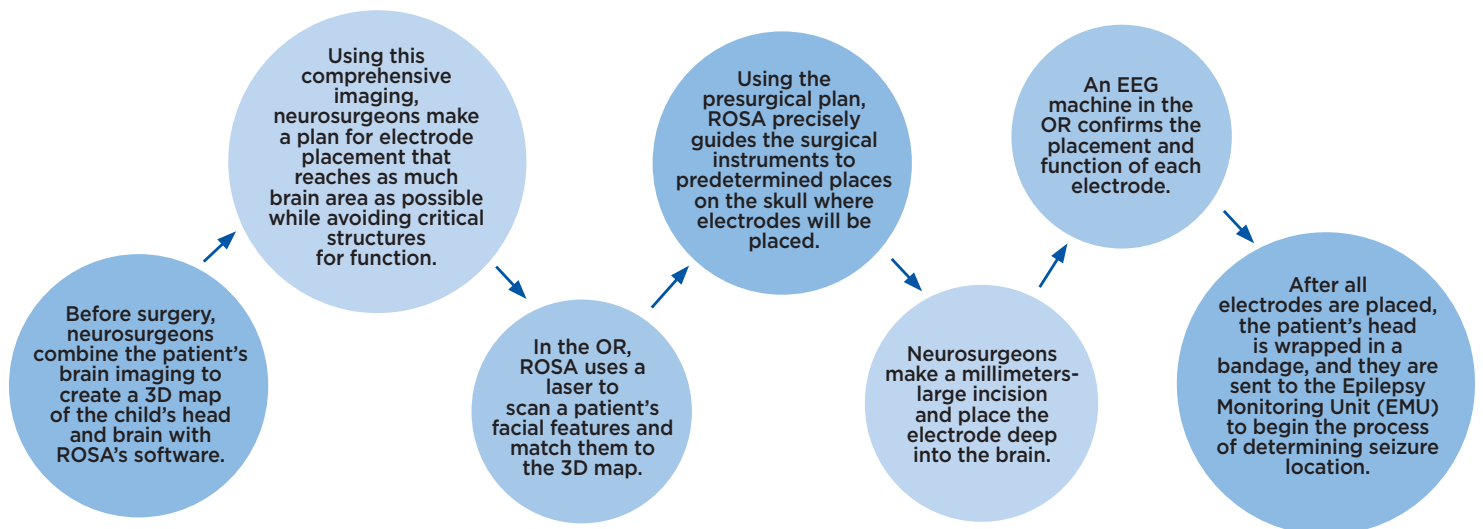
*ROSA One Brain is used in the OR to guide surgical instruments into place based on the surgery plan created prior to entering the OR. This guidance means less time in the OR, more electrodes that can be placed and a higher chance of finding seizure locations.*

CT scans and any other brain imaging from the patient, ROSA creates a comprehensive 3D map of the patient’s brain and head. Using these maps and ROSA’s software, neurosurgeons can create a plan for the trajectory of the electrodes so that they reach precise areas of the brain while avoiding critical structures. This advanced planning typically means less time in the OR and less time a child is under anesthesia.

Once in the OR, ROSA scans the patient’s facial features with a laser and matches the scan to the 3D map of the brain and head. ROSA then guides the surgical instruments to precise locations on the skull based on the surgical plan created before surgery. With just a millimeters-large incision, Shimony and his team can place the electrode deep into the brain with an error margin of less than 1 mm.

The time saved with ROSA-assisted SEEG means that neurosurgeons can place more electrodes in less

## How It Works: SEEG with ROSA One Brain





time, which equals a higher probability of identifying seizure focus areas. Previous surgical methods to place electrodes directly on the brain generally required several hours. Now, the team can place 15 electrodes in usually fewer than 90 minutes. Moreover, the extensive preoperative planning available with ROSA means that electrode placement accuracy is higher, as the robot guides instruments to their precisely planned location.

“We used to limit ourselves to four to five electrodes because it took so long and meant that patients were under anesthesia for an extended amount of time,” said Shimony. “This is much easier and safer, so we have the ability to put in more electrodes, potentially finding not only where seizures are coming from, but also where they propagate to. This gives us much better options and a higher chance to have a successful solution for the patients and their families.”

An EEG machine in the OR confirms the placement and function of each electrode. A Neurology team including neuromonitoring specialists work collaboratively in an effort to achieve the best results for patients. Once finished, the patient’s head is wrapped with a bandage, and they are sent to Le Bonheur’s Epilepsy Monitoring Unit (EMU).

And the process of removing the electrodes is easier, too. If not removed during epilepsy resection surgery, neurosurgeons can remove them with light sedation, closing each incision with just one stitch. With previous methods, the brain would be exposed a second time to remove the electrodes.

All of these benefits combine in an effort to reach the ultimate goal of these neurosurgeons — finding the source of seizures and helping alleviate the epilepsy burden for patients and families, potentially even eliminating seizures completely. ROSA’s technology provides the ability to pinpoint multiple targets and cover much more space in the brain. Instead of looking at just where seizures start, neurosurgeons can potentially find the extensive networks

## Benefits of SEEG with ROSA One Brain

- Lower risk of complications due to the minimally-invasive nature of the procedure
- Higher accuracy in electrode placement as a result of precise presurgical mapping
- Less time children are under anesthesia
- Ability to reach previously inaccessible parts of the brain and cover more areas with electrodes
- Higher chance of finding seizure areas because more electrodes can be placed in less time



*With just a millimeters-large incision, neurosurgeons are able to place electrodes deep in the brain at precisely planned locations.*

of the brain that are involved in the seizures.

“ROSA allows us to cover a lot of space in the brain with a better chance to find the problem and benefit the patient,” said Shimony. “In the past, we could find the seizure area about 70% of the time. With ROSA and SEEG, we are up to 90%.”

## Advantage over Epilepsy

This new technology fits in seamlessly with the Le Bonheur Neuroscience Institute’s existing suite of brain imaging — one of the most comprehensive for a children’s hospital in the country. Transcranial magnetic stimulation (TMS), magnetoencephalography (MEG) and functional MRI are all non-invasive technologies that can map the brain’s language, sensory and motor centers to assist with epilepsy surgery planning to avoid these areas.

“Very few centers use all ancillary tests like Le Bonheur does,” said Shimony. “We fuse the results of every test together, which allows us to have a very precise plan regarding anatomy and function of the patient when we proceed with epilepsy surgery.”

While Le Bonheur uses ROSA mainly for SEEG procedures, the uses for the technology are vast for other high precision procedures. ROSA is also used at Le Bonheur for precision placement of responsive neurostimulation (RNS) or deep brain stimulation (DBS) electrodes and extreme precision placement of laser probes to treat epilepsy focuses deep in the brain. As one of the largest programs for pediatric brain tumors, Le Bonheur neurosurgeons eventually hope to use ROSA for laser operations to ablate tumors deep in the brain.

Minimally-invasive surgery continues to be the trend, and neurosurgeons continue to look for ways to do extensive surgeries through a small entry point, says Shimony.

“Having ROSA adds a very robust tool to our suite of technologies,” said Shimony. “We can make data-driven decisions when planning a surgery and provide an easier and more effective seizure localization process or treatment for deep seated tumors for our patients.”



# Patched Up

*Clinical trial shows effectiveness of patch-based therapy in toddlers with peanut allergy*

**Epicutaneous immunotherapy for peanut allergy has the potential to desensitize children ages 1 to 3 to peanuts as well as reduce allergic reactions to accidental exposure, says research published in *The New England Journal of Medicine*, co-authored by Le Bonheur Allergist/Immunologist Jay Lieberman, MD.**

“The children who participated in this trial at our site all had excellent response and were all able to tolerate large amounts of peanut at the end of the study,” said Lieberman. “The hope with this patch, based on the results of this study, would be that very young children diagnosed with peanut allergy in the first couple years of life could use this patch to treat the allergy in a very safe way.”

Currently, no approved treatment exists for peanut allergy in children younger than 4, but early peanut consumption can reduce the risks of severe allergic reactions while the immune system is still developing. The Viaskin patch, the medication tested in the EPITOPE trial, delivers 250 micrograms of peanut protein through a patch that is placed between the shoulders of the child daily for 12 months. The primary goal of the study was to desensitize the allergic children to peanuts, which was measured by an increase in the amount of peanut required to induce a reaction in the child.

The study was held at 51 sites, including Le Bonheur, with a total of 350 patients — 233 receiving the intervention dose and 117 the placebo. Researchers measured how many patients in both groups reached a predetermined endpoint. The two endpoints measured were patients with a baseline eliciting dose of more than 10 mg of peanut protein and a post-treatment eliciting dose of at least 1000 mg of peanut protein (three to four peanuts) or a baseline eliciting dose of 10 mg or less and a post-treatment eliciting dose of at least 300 mg (one peanut).

After 12 months, 67% of the intervention group and 33.5% of the placebo group met one of the two endpoints. In addition, the most severe allergic reaction symptoms had shifted to be less severe in the intervention group. At baseline, the mild, moderate and severe symptoms in the two groups were balanced. The most common adverse events were skin reactions at the site of the patch. Anaphylaxis occurred in 19 children in the intervention group (four of which were determined to be a result of the patch) and four in the placebo.

“These results showed that the Viaskin patch resulted in a higher frequency of desensitization that was sufficient to lessen the likelihood of allergic reactions upon accidental exposure,” said Lieberman. “This patch would be a great step in getting very young children desensitized in a safe manner early in life when the immune system is still somewhat malleable.”



The EPITOPE trial has now entered into a 24-month open label extension to continue following treatment response and determine the best duration for maximum treatment response. Le Bonheur will also participate in the VITESSE study, which will evaluate the Viaskin patch for children 4 to 7 years with peanut allergy.

“Many new medications are being studied for peanut allergy, so we are hopeful that in the coming years, we will have more than one treatment option to offer families,” said Lieberman. “Le Bonheur will also be a site for future peanut allergy studies, so we are excited about that.”

***“These results showed that the Viaskin patch resulted in a higher frequency of desensitization that was sufficient to lessen the likelihood of allergic reactions upon accidental exposure. This patch would be a great step in getting very young children desensitized in a safe manner early in life when the immune system is still somewhat malleable.”***

Le Bonheur Allergist/Immunologist Jay Lieberman, MD

*Le Bonheur Allergist/Immunologist Jay Lieberman, MD, was co-author on a study showing the efficacy of a patch-based medication to desensitize children ages 1 to 3 with peanut allergy. This medication has the potential to be the first peanut allergy treatment for children younger than 4 years.*



# PROFILE: ROBIN EVANS, MD, FACS, FRCS

Co-Director, Le Bonheur Craniofacial and Cleft Program

**Le Bonheur Pediatric Plastic Surgeon Robin Evans, MD, FACS, FRCS, has always been drawn toward service to others. He attributes this heart for helping to his faith, and to the inspiration of many excellent mentors throughout his life – most notably his grandfather, whom Evans considers his earliest role model.**

“My grandfather was an engineer by trade and constantly used his skills to help others,” said Evans. “He was very active in our local church, and I spent many summer days as a kid helping him construct a new church building and lend a helping hand to people in the congregation.”

When Evans was young, his grandfather suffered a heart attack and went on to become one of the world’s first recipients of an implantable cardiac defibrillator (ICD). Witnessing the healing power of modern medicine sparked an epiphany for Evans regarding the career path he would ultimately pursue.

“It was then that I realized my calling,” recounts Evans. “To serve others in Jesus’ name through the practice of medicine. To help others the way my grandfather did.”

A native of Canada, Evans eventually went on to obtain an undergraduate degree in Psychology at Wilfrid Laurier University in Ontario. From there, he immediately enrolled in medical school at Ontario’s McMaster University – but initially, Evans’ current specialty wasn’t even a blip on his professional radar.

“When I started medical school, I didn’t know anything about reconstructive plastic surgery or what these surgeons do,” said Evans, who was first introduced to the field through an immersive learning opportunity at Boston Children’s Hospital. “At Boston Children’s, I had the chance to work with a team of plastic surgeons and learn about the miracles that take place in an operating room. From that moment, I prayerfully entered residency and followed my calling to become a



Robin Evans, MD, FACS, FRCS

pediatric plastic surgeon.”

After earning his doctor of medicine degree from McMaster in 2006, Evans completed his residency in Plastic and Reconstructive Surgery at University of Western Ontario, followed by a fellowship in Pediatric Plastic Surgery at British Columbia Children’s Hospital. Prior to joining the team at Le Bonheur Children’s Hospital, Evans served as director of Pediatric Plastic Surgery at a University of Southern California-affiliated hospital in Ventura, Calif. In this position, he oversaw program development, family-centered care delivery and the innovation of new treatments for patients with facial clefts and other complex craniofacial conditions.

Ever faithful to the view of healing as ministry, Evans also dedicated his time and talents to the development of new

technologies for the treatment of burns in low-income countries.

“I am very thankful to have had the opportunity to partner with a drug-delivery lab to help develop a new class of synthetic skin that can be made very inexpensively,” said Evans. “I love the idea that high technology can be made accessible to everyone and subsequently make a huge difference in anyone’s life.”

Today, Evans is leveraging his expertise in pediatric reconstructive surgery as the new co-director of Le Bonheur’s Craniofacial and Cleft Program, where he serves alongside the program’s director, Pediatric Neurosurgeon Paul Klimo, MD. Le Bonheur’s comprehensive Craniofacial and Cleft Program specializes in advanced treatment options for children with severe congenital facial and skull malformations. Currently, Le Bonheur surgeons have some of the busiest practices in the country. The team performs more than 40 large craniofacial surgeries annually – the majority of which serve patients between the ages of 6 to 12 months.

In his new role, Evans hopes to build upon Le Bonheur’s foundational commitment to clinical excellence and patient- and family-centered care, strengthening the hospital’s already



robust Craniofacial and Cleft Program.

“Our shared vision for the program is a reimagined, holistic approach to craniofacial care,” said Evans. “People deserve to feel genuinely cared for and to have health care providers who can see things from the perspective of the kids and families we serve. By collaborating with multiple specialties to create a truly multidisciplinary clinic environment, we can offer patients a full range of services in one appointment and bring the very best of each specialty to the forefront.”

*“People deserve to feel genuinely cared for and to have health care providers who can see things from the perspective of the kids and families we serve. By collaborating with multiple specialties to create a truly multidisciplinary clinic environment, we can offer patients a full range of services in one appointment and bring the very best of each specialty to the forefront.”*

Robin Evans, MD, FACS, FRCSC, Le Bonheur Pediatric Plastic Surgeon

Emphasizing his enthusiasm about the newly-minted partnership with Klimo, who is widely regarded as a boundary-breaking pediatric neurosurgeon, Evans said the two are eager to innovate new treatments and improve outcomes for kids and families, ultimately aiming to become a national leader in the care of children with craniofacial differences.

While his professional pursuits occupy a significant portion of his time and energy, Evans spends the lion’s share of his free time enjoying various adventures with his wife and children.

“I was fortunate to marry the love of my life, my high



school sweetheart, and we have five kids together who keep us crazy busy,” said Evans. “For instance, we now have a horse and are involved in barrel racing at rodeos, riding multiple times a week and typically competing at events once a month.”

While Evans admits that barrel racing was a foreign concept in his and his wife’s Canadian upbringing, his family has fast grown to appreciate the sense of camaraderie and good cheer the rodeo community brings — and Evans adds that there are many great life lessons one can learn on the back of a horse.

Bolstered by his faith and buoyed by his family, Evans feels honored by the opportunity to “create something meaningful” through his work at Le Bonheur and across the field of Pediatric Plastic Surgery.

“I consider it an honor and a true privilege to serve kids and their families,” said Evans. “Being a Christian, medicine has always been a sacred calling to me — and following that calling remains one of the great blessings of my life.”

## Robin Evans, MD, FACS, FRCSC

### Education and Training

McMaster University, Ontario, Canada – Medical School  
University of Western Ontario – Plastic and Reconstructive Surgery Residency  
BC Children’s Hospital, University of British Columbia –  
Pediatric Plastic Surgery Fellowship

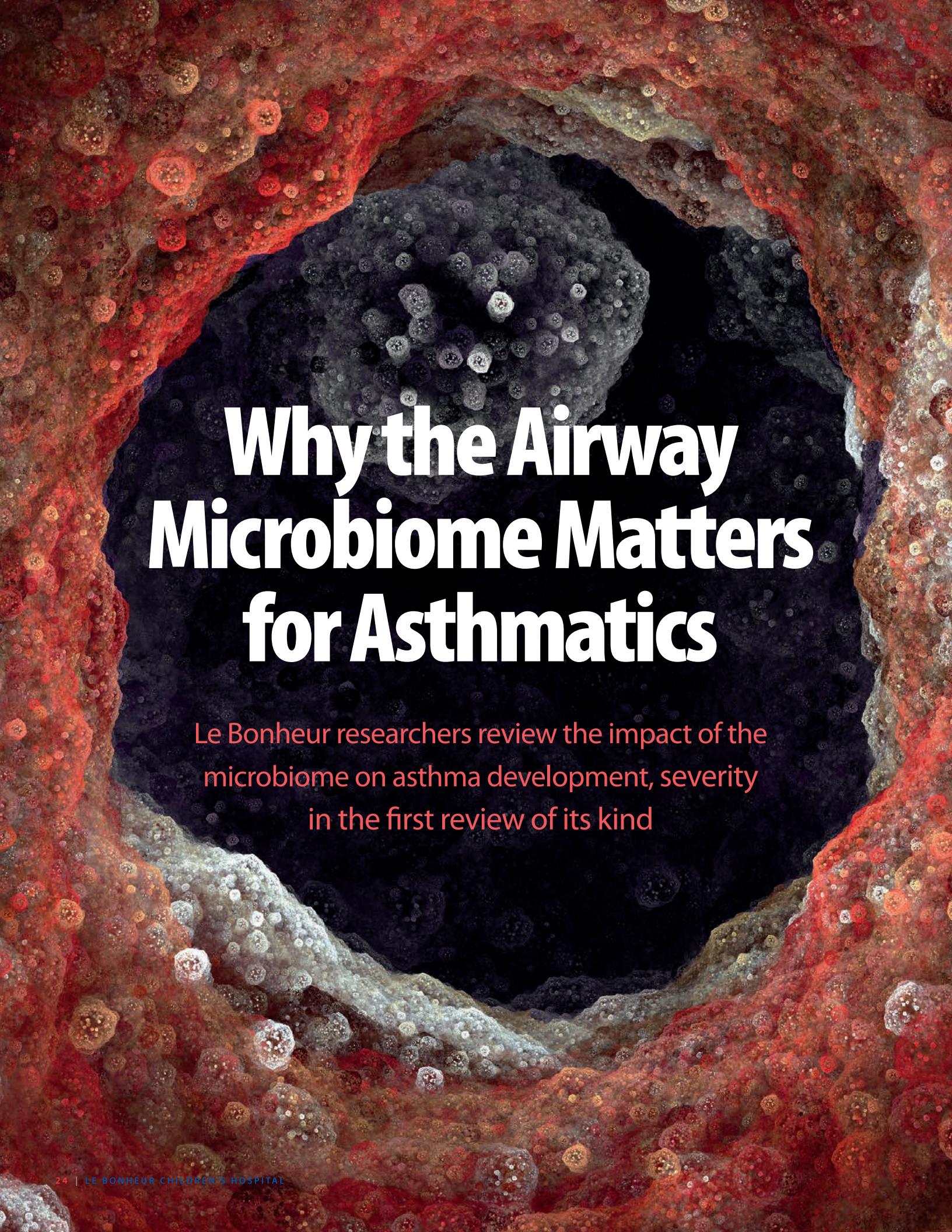
### Board Certifications

Plastic and Reconstructive Surgery, Royal College of Physicians and Surgeons

### Society Memberships

Fellow, American College of Surgeons (ACS)  
American Cleft Palate Association (ACPA)  
American Society of Plastic Surgery (ASPS)  
American Society of Maxillofacial Surgeons (ASMS)  
AO Craniomaxillofacial (CMF) Foundation  
Christian Medical and Dental Association (CMDA)




A detailed microscopic image of an airway. The airway lumen is dark, and the surrounding tissue is heavily colonized with a diverse microbiome. The microbes are visible as numerous small, colorful (red, orange, yellow, and grey) spherical and irregular structures. The overall appearance is that of a complex, multi-layered microbial community within the airway walls.

# Why the Airway Microbiome Matters for Asthmatics

Le Bonheur researchers review the impact of the microbiome on asthma development, severity in the first review of its kind





**U**nderstanding the role of the airway microbiome in the development and progression of asthma may lead to new treatments or more effective administration of current therapeutics, says a review article from a team of investigators at Le Bonheur Children's Hospital published in *Frontiers in Pharmacology*. The review explored the relationship between the airway microbiome and asthma alongside other intrinsic and extrinsic factors, with particular emphasis on how these factors impact asthma development and severity in pediatric and Black populations as high-risk groups. This review was co-authored by Emergency Medicine Physician Mark A. Snider, DO, Chief of Pediatric Pulmonology, Allergy, Immunology and Sleep Medicine Patricia J. Dubin, MD, and Director of the Asthma Research Program and Plough Foundation Chair of Excellence in Pediatrics Amali E. Samarasinghe, PhD.

"Crosstalk between the mucosal microbiota and the immune system as well as the gut-lung axis have direct correlations to immune bias that may promote chronic diseases like asthma," said Dubin. "Asthma initiation and pathogenesis are multifaceted and complex with input from genetic and environmental components."

### **Composition and Development of the Airway Microbiome**

When comparing the airway microbiome, which includes bacteria, viruses and fungi, a microbiome of high density and low diversity is associated with inflammation. Historically, bacteria have been associated with asthma exacerbations, severity of disease and how individuals respond to treatments. Patients with asthma generally have a higher abundance of the phylum *Proteobacteria* (which include a wide range of potentially pathogenic bacteria), while patients with eosinophilic asthma may have increased abundance of the family *Enterobacteriaceae* and the genus *Streptococcus*.

The virome of asthma patients is of reduced abundance and diversity of the viruses that attack bacteria, and patients with severe asthma may have an increased virome density that correlates with poor lung function. When looking at the asthma patient lung mycobiome (fungi living in the airway), research has shown that significant fluctuations, with the loss of good fungi and the proliferation of pathogenic fungi, may promote the development of asthma.

"Existing literature on the airway microbiome has compellingly demonstrated differences in microbial diversity and composition between asthma patients and healthy subjects," said Samarasinghe. "Furthermore, there may be significant differences in the airway microbiome in asthma patients of different ethnicities or racial groups that may impact disease progression and may require personalized therapeutic approaches."



Research also shows that the time between infancy and early childhood is critical for the development of the immune system and the typical microbiome. Early life airway microbiota play a role in the regulation of the immune system to impede the development of allergic asthma. Lack of microbial colonization in this critical period increases total immunoglobulin E (IgE), airway eosinophils and airway resistance in laboratory models. Another risk factor for asthma development is cesarean section as it may place newborns at a risk of viral infections during infancy and childhood. Researchers say this is a concern as C-sections are increasing globally, with Black women more likely to have a C-section, which correlates with asthma prevalence and severity.

## The Role of the Gut-Lung Axis

While the airway microbiome is important to asthma development and severity, researchers also looked at the gut-lung axis and how this might impact asthma patients. It is postulated that the microbiota of the gut and lungs may cross-regulate as the respiratory and gastrointestinal tracts share a common embryonic origin. Certain gut bacteria were more abundant in Black women,

showing a link between the gut microbiome and disease susceptibility and severity in terms of race. Researchers noted that the observed variation in microbiome may be a result of socioeconomic differences rather than inherent biological factors.

***“The link between diet and microbiota is evident from the co-occurrence of malnutrition and gut dysbiosis. A diet that is rich in nutrients and dietary fibers can result in a diverse gut microbiome that is favorable for host immunity and health. A compromised diet not only affects the intestinal health, but also leads to chronic pulmonary disorders such as asthma.”***

Le Bonheur Director of the Asthma Research Program Amali E. Samarasinghe, PhD

“Differences in gut microbiota have been associated with disease susceptibility by race and sex,” said Samarasinghe. “Analysis of the gut microbiome may be a simple and early biomarker for disease predisposition.”

## Factors Affecting the Microbiome

The review looked at additional factors that affect the airway microbiome and thereby might have an impact on asthma development and severity. Genetics can impact microbiome composition, and smoking can disrupt the relationship of normal microbiota in the upper

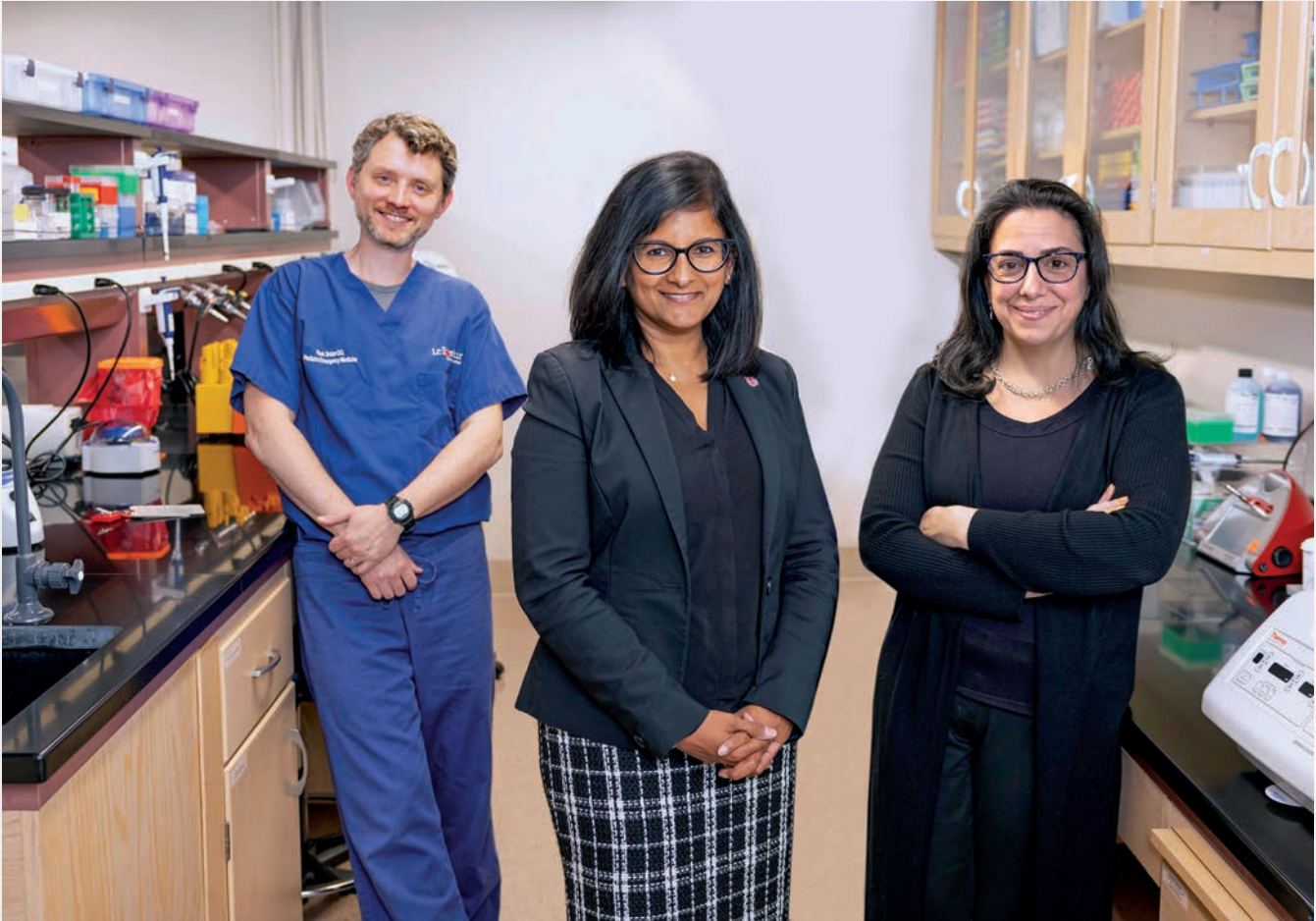
and lower airway. Black smokers have more negative consequences of smoking, including asthma, compared to White smokers, and third-hand smoke exposure, particularly for children, can cause an alteration in the airway microbiome.

Diet and nutrition can impact the microbiome — particularly gut microbiota — in myriad ways. Obesity-associated inflammatory responses can ultimately lead to asthma. Breastfed infants have lower incidence of hypersensitivity to allergens and subsequent asthma development than infants who are not breastfed. Nutritional factors may also explain race-related

differences in asthma development. Incorporating fiber-rich foods led to significant alterations to the gut microbiome and improved mucosal health in Black populations. Vitamin D (which can alleviate asthma severity) deficiencies are correlated with asthma in Black children.

“The link between diet and microbiota is evident from the co-occurrence of malnutrition and gut dysbiosis,” said Samarasinghe. “A diet that is rich in nutrients and dietary fibers can result in a diverse gut microbiome that is favorable for host immunity and health. A compromised diet not only affects the intestinal health, but also leads to





*Le Bonheur Emergency Medicine Physician Mark A. Snider, DO, Director of the Asthma Research Program Amali E. Samarasinghe, PhD, and Chief of Pediatric Pulmonology, Allergy, Immunology and Sleep Medicine Patricia J. Dubin, MD, (pictured left to right) recently published an article reviewing how the airway microbiome affects asthma development and severity. The team hopes that understanding more about the intersection of asthma and the microbiome could lead to new and more effective treatments.*

chronic pulmonary disorders such as asthma.”

Drugs also impact the microbiome of asthma patients and can impede the ability for some medications to function properly. Antibiotic use can increase asthma severity as they alter the gut and lung microbiome richness, evenness and composition. Corticosteroids are also associated with alterations to the airway microbiome including overall reduction in bacterial diversity and richness.

“The risk factors for the pathogenesis and severity of asthma are multifactorial. Whether race contributes to asthma severity and outcomes more as a biological factor or a social construct is unclear, but what is clear is that higher prevalence, higher severity and worse outcomes are associated with the Black race as defined in literature,” said Snider.

This review shows the important role that the microbiome plays in asthma and discusses the various

factors that influence the diversity and richness of the microbiome. Further research is needed to understand how the airway microbiome participates in asthma pathogenesis in order to develop new and more focused treatments and therapeutics.

Postdoctoral Scholars Armando Flores-Torres, PhD, and Sandesh Marathe, PhD, at the University of Tennessee Health Science Center are also co-authors of this review article.





# Heart Hero

Le Bonheur cardiac surgeon provides hope, healing for severely ill neonate with rare heart defect

Seven-week-old Leo Webster's heart was functioning at 20% capacity when he arrived at Le Bonheur Children's via airplane from his home in Pennsylvania. Born with the rare heart condition Ebstein's anomaly, a defect of the tricuspid valve, Leo was coming to see the one person who could save his life, Le Bonheur Chief of Cardiothoracic Surgery Christopher Knott-Craig, MD — an expert in neonates with Ebstein's anomaly.

"Leo was one of the sickest patients I've ever operated on," said Knott-Craig. "The only thing keeping him alive was his mother, who watched him like a hawk. I've never not accepted a neonate with Ebstein's anomaly, and I knew there was a really good chance that I could repair Leo's heart defect."

Leo's mom Jessica knew something was wrong when her son was born. A nurse by training, Jessica advocated with her son's physicians for an echocardiogram, which revealed a condition she had never heard of — Ebstein's anomaly.

"I went from the highest high of bringing a baby into the world to the lowest low of an unknown future for my baby," said Jessica.

Initially, Leo's local physicians hoped the condition could be managed with outpatient monitoring and surgery later in life. However, after just two weeks, Leo's heart function plummeted from 45% to 10%. The Websters found themselves back at the local children's hospital.



*Although physicians originally thought Leo's heart condition could be managed with outpatient monitoring, his heart function plummeted to 10%. He was flown from his Pennsylvania home to Le Bonheur for surgery with Le Bonheur Co-Director of the Heart Institute Christopher Knott-Craig, MD.*

Leo's physicians began consulting with heart programs around the country for a path forward, and Jessica continuously heard the words that are a parent's worst fear: "There's nothing we can do." Expert pediatric cardiologists said Leo needed a complete heart transplant, but he wouldn't survive long enough to get one.

***"Send him to me, and I'll find a way to fix his heart."***

Le Bonheur Heart Institute Co-Director and Cardiothoracic Surgeon Christopher Knott-Craig, MD

But Jessica kept pushing for more options for her son.

That's when a leading pediatric cardiac surgeon in their hometown connected them with Knott-Craig, who has a history of good outcomes with Ebstein's anomaly repair and a high caseload of patients with this diagnosis. After hearing Leo's story and studying his heart condition, Knott-Craig



said, “Send him to me, and I’ll find a way to fix his heart.”

“It was calming to know that there was hope and reassuring to know there was someone willing and knowledgeable enough to help our child,” said Jessica about meeting Knott-Craig. “And I have never had a surgeon sit down and talk to a family as much as he did.”

Typically in Ebstein’s anomaly, the right side of the heart doesn’t function, but the left side does and can support the right side. Knott-Craig determined that in Leo’s case neither side was functioning, because the left side of the heart had a large hole. His condition was further complicated by severe left ventricular noncompaction, which meant his left ventricle had not developed properly to pump blood. Surgery would need to rebuild both sides of Leo’s heart and close the hole for him to have a chance at full recovery.

Le Bonheur’s surgical team, led by Knott-Craig, performed the complex Ebstein’s repair surgery. First, they successfully closed the hole on the left side of Leo’s heart with a mesh patch. Then



*Le Bonheur Heart Institute Co-Director and Cardiothoracic Surgeon Christopher Knott-Craig, MD, (above left) is an expert in the rare heart defect Ebstein’s anomaly. During surgery, Knott-Craig was able to repair both sides of Leo’s heart, preserving his heart and saving his life.*

Knott-Craig carefully restored as much function as possible to the right side of the heart through repair of the tricuspid valve and closure of the atrial septal defect. Leo had a speedy recovery and was discharged from the hospital less than two weeks after surgery.

“Not only did Leo progress faster than expected after surgery, but his heart has remodeled itself into a typical heart,” said Knott-Craig. “After six weeks, the left side of the heart began to see the benefit of the repairs and started remodeling and getting stronger.”

Leo is now back home in Pennsylvania enjoying life as a happy and healthy baby. He will continue to be monitored by a cardiologist. His heart function is now in a normal range, and he no longer needs heart failure medications. While the Websters and Knott-Craig keep in touch on how Leo is growing, the family will most likely never need his surgical services again.

“I hope that Leo knows how blessed he is to have had Dr. Knott-Craig in his life who saved and preserved his heart,” said Jessica.



*Leo’s surgery was an overwhelming success, and he is enjoying life as a happy, healthy baby. His heart function has returned to normal levels, and he no longer takes any heart failure medication.*





# A Greater Cost

***High-flow nasal cannula usage outside of intensive care associated with longer hospital stays, higher costs***

**H**igh-flow nasal cannula (HFNC) treatment for patients with mild to moderate bronchiolitis may be associated with longer hospital stays and higher cost of care, according to a study led by Le Bonheur Hospitalist Jeffrey C. Winer, MD, MA, MSHS,

and published in the American Academy of Pediatrics (AAP) journal *Hospital Pediatrics*. Le Bonheur co-authors included Chief of Pediatric Infectious Diseases Sandra Arnold, MD, Hospitalist Kristen Bettin, MD, MEd, and Chief of Pediatric Hospital

Medicine Elisha McCoy, MD.

“Historically, the relationship between HFNC usage outside of the intensive care unit and outcomes including hospital length of stay and cost is unclear. Our study sought to see if HFNC itself may be partially



responsible for these outcomes,” said Winer.

HFNC is a treatment that delivers oxygen to a patient at a high rate, reducing the work of breathing. It is widely used for treating bronchiolitis, a lower respiratory tract infection and a leading cause of emergency room visits for children younger than 2 years. Recent studies on HFNC have shown variable results across patient populations, particularly regarding outcomes such as hospital length of stay (LOS) and cost of care. While severe cases of bronchiolitis where HFNC was used were associated with symptom improvement and decreased LOS and cost, HFNC use in mild to moderate cases has been associated with less symptom improvement, along with increased LOS and cost.

The purpose of this study was to explore the relationship between HFNC usage for non-intensive care unit (ICU) patients and patient outcomes, LOS and cost of care. Researchers reviewed data from 20 hospitals in the Pediatric Health Information System. The data included patients younger than 2 years with a principal or secondary diagnosis of acute bronchiolitis. Researchers categorized these hospitals based on the proportion of non-ICU patients treated with HFNC into low, moderate

or high non-ICU HFNC usage (NIHU).

Results showed that LOS was longer for patients in moderate to high NIHU hospitals compared to low NIHU hospitals. Analysis of cost of care showed similar results, where moderate and high NIHU hospitals showed higher costs compared to low NIHU hospitals, even after adjusting for clinical and demographic characteristics. Based on their analyses, researchers estimate that high NIHU hospitals have 5% to 30% longer LOS and 2% to 31% higher cost of care than low NIHU hospitals.

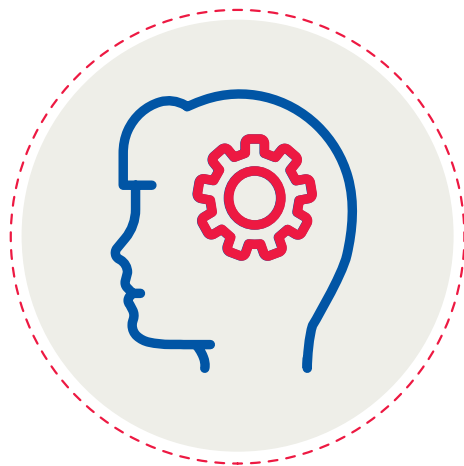
“The large number of patients admitted to children’s hospitals means that even small relative changes in these values may lead to large burdens to hospitals and the health care system,” said Winer.

This study suggests that higher NIHU may lead to increased overall resource utilization for pediatric bronchiolitis patients. More research is needed to assess how HFNC usage affects LOS and cost of care across pediatric hospitals and if HFNC should be limited in non-ICU patients.



*Le Bonheur Hospitalist Jeffrey C. Winer, MD, MA, MSHS, recently published a study that showed use of high-flow nasal cannula outside of the intensive care unit was associated with longer hospital stays and higher costs.*





# MENTAL HEALTH EPIDEMIC

**LE BONHEUR PROVIDERS DEVELOP NEW PROGRAMS TO ADDRESS MENTAL HEALTH CARE OF CHILDREN**

When Le Bonheur Children’s Hospital opened in 1952, its founders and physicians made a promise to provide the best medical care to all children. In 2023, that promise has taken on a new meaning.

Le Bonheur providers have seen drastic changes in the mental health of kids with sharp rises in mental health inpatient admissions and Emergency Department visits for suicide attempts and self-injury.

“We have to address what the data is telling us on a local, state and even national level,” said Regan Williams, MD, medical director of Trauma Services. “Numbers show that our youth are suffering, and they need our help.”

In the wake of a national mental health crisis largely prompted by the COVID-19 pandemic, providing the best possible medical care to children means providing mental health care, too.

Le Bonheur has responded to this growing concern by establishing multiple mental health programs to care for youth in the Memphis region and beyond. With the goal of addressing mental health inside the hospital and clinic walls, Le Bonheur embedded trained mental health professionals into existing programs to provide immediate care to patients in need, allowing them to begin their recovery process as soon as possible.

## THE FRONTLINES OF PEDIATRIC CARE

In recent years, the hospital’s pediatric primary care group, Le Bonheur Pediatrics, has seen a dramatic increase in patients with mental and behavioral health needs. Lauren McCann, director of Operations at Le Bonheur Pediatrics, sought to address this growing need.

“Pediatricians are the frontlines of pediatric primary care, and they didn’t have the resources to handle the influx of children in need of mental and behavioral health care,” said McCann. “Our pediatricians had to refer patients out to trained professionals, but that meant sending children away knowing that it could be months



*Behavioral Health Consultant Colby Butzon, PhD, (center) and her team are able to provide behavioral health services alongside pediatricians as part of the patient’s medical team. Patients are seen quickly, often the same day as their clinic appointment.*

before they got the care they need.”

McCann knew the answer was to embed behavioral health care into the pediatrician’s office, but the main



**31%** INCREASE IN  
**MENTAL HEALTH  
INPATIENT**  
ADMISSIONS (AGES 3-18)\*

**153%** INCREASE IN  
EMERGENCY DEPARTMENT VISITS  
FOR **SUICIDE ATTEMPTS**  
AND **SELF INJURY**  
(AGES 5-18)\*

**50.7%**  
OF TENNESSEE CHILDREN  
WITH A DIAGNOSED  
MENTAL HEALTH  
CONDITION  
**DID NOT RECEIVE  
TREATMENT**  
IN 2020-21 (AGES 3-17)\*\*

**3RD**  
**LEADING CAUSE**  
**OF DEATH**  
FOR TENNESSEANS  
AGES 15-24 IN 2020 WAS  
**SUICIDE\*\***

MORE THAN  
**65% OF CHILDREN**  
ADMITTED TO LE BONHEUR IN  
2021 WITH  
PHYSICAL TRAUMAS  
**DIAGNOSED WITH  
ACUTE STRESS  
DISORDER,**  
THE PRECURSOR TO POST  
TRAUMATIC STRESS DISORDER

\*From 2016-2021 at Le Bonheur Children's \*\*According to the Tennessee Department of Health

question was how to do it. After receiving a grant from the Cigna Foundation, McCann built a program with the guidance of Laura Shultz, PsyD, Methodist Le Bonheur Healthcare's senior director of Ambulatory Behavioral Health, to integrate mental and behavioral health professionals within Le Bonheur's pediatric primary care practices.

The program, Le Bonheur Pediatrics Behavioral Health, provides behavioral health services, guidance and assistance to patients and families in need. Each of the six Le Bonheur Pediatrics Clinics now has a behavioral health consultant – a trained psychologist, counselor or clinical social worker – who works alongside the pediatrician as part of the patient's medical team. All behavioral

*Colby Butzon, PhD, (below) is one of six behavioral health consultants integrated in Le Bonheur Pediatrics clinics – Le Bonheur's pediatric primary care group. Butzon and her team provide behavioral health services, guidance and assistance within the clinics.*





**5,458**

RECEIVED BEHAVIORAL HEALTH SERVICES WITH LE BONHEUR PEDIATRICS

**768**

RECEIVED DIRECT BEHAVIORAL HEALTH COUNSELING SESSIONS

**978**

DETERMINED TO NEED A HIGHER LEVEL OF CARE WITH OUTSIDE BEHAVIORAL HEALTH AGENCIES

**3,712**

SCREENED FOR DEPRESSION

**CHILDREN SERVED: BEHAVIORAL HEALTH IN PRIMARY CARE IN 2022**

health consultants are supervised by Colby Butzon, PhD.

Pediatricians refer their patients to a consultant for a range of concerns, including screening for ADHD and other conditions, behavior problems, school concerns, grief, trauma, depression and anxiety.

“We see patients very quickly, often on the same day,” said Butzon. “Families have been so grateful and even surprised that they are able to get answers to their questions and steps to take to improve their lives so quickly.”

Since 2022, Le Bonheur Pediatrics Behavioral Health has provided services to thousands of children in the community, including depression screenings to more than 3,000 children.

The Behavioral Health program recently created a

*“We see patients very quickly, often on the same day. Families have been so grateful and even surprised that they are able to get answers to their questions and steps to take to improve their lives so quickly.”*

Behavioral Health Consultant Colby Butzon, PhD

dashboard to track screening scores and progress for children seen by a consultant. Using this data, the program seeks to disseminate outcome information and demonstrate the program’s effectiveness in providing mental health care to children in the primary care setting.

“Memphis has a particular need for access to behavioral health providers because we have fewer providers per citizen compared to the rest of Tennessee,” Butzon said. “Our goals are to grow the services we provide, support patients across our city and raise awareness of the need for integrated care.”

**WHEN TRAUMA STRIKES**

According to the Tennessee Department of Health, firearm deaths were the leading external cause of death among Tennessee children in 2021. In response to this uptick in violence and traumatic injuries, Le Bonheur

**EXAMPLES OF BEHAVIORAL HEALTH SERVICES**

- Parent coaching and support for behavior management
- Information on common childhood concerns, such as toileting and bedwetting
- Screening and interventions for ADHD
- Managing chronic conditions like diabetes, obesity, ADHD
- Assistance with symptoms of depression, anxiety and other mental health concerns
- Addressing habits like tobacco, drug and alcohol use
- Guidance on typical child development



created two programs to provide mental health support for children who experience physical trauma.

Thanks to a partnership with the BRAIN (Building Resilience across Ages through Integrative Neuroscience) Center at the University of Memphis, Le Bonheur began integrating mental health services into the Emergency Department and Trauma division in 2021. Through the program and under the supervision of the BRAIN Center's Clinical Director of Trauma Services at Le Bonheur Children's Kiersten Hawes, PhD, LPC-MHSP, ACS, advanced

graduate-level students in the Clinical Mental Health Counseling program at the University of Memphis provide free and unlimited counseling services to any child treated at Le Bonheur's Pediatric Trauma Center. Le Bonheur's Trauma Center is led by Medical Director Regan Williams, MD, and Trauma Program Director Anissa Cooper, MSN, RN.

"Through our partnership, we've already published a study showing that 64.8% of children at our center tested positive for acute stress disorder following a traumatic injury, which is a precursor to post-traumatic stress disorder," said

*Regan Williams, MD, medical director of Trauma Services at Le Bonheur, has worked to bring multiple programs to Le Bonheur to provide mental health services to children who have suffered a traumatic injury.*





Williams. “We have a critical need for mental health screening and counseling services at the time of an acute trauma to stop or at least minimize the negative long-term impact on these kids.”

Providers meet with children and their families as soon as possible after the trauma occurs. If not seen in the Emergency Department, mental

**“Our goal is to help children recover both physically and emotionally. By prioritizing mental health counseling, we are equipping these patients with the tools they need to thrive when they leave the hospital.”**

→ Regan Williams, MD, medical director of Trauma Services at Le Bonheur

health providers will round with the Trauma team inside the hospital to speak with any child who might benefit from their services.

But there is a particular subset of children who may require more than mental health care alone to avoid the long-term

impacts of trauma — children who are victims of violence. In response, Le Bonheur developed the program Supporting and

*Lydia Walker (right), SHIFT program manager, rounds with the Trauma team to provide wraparound services to families impacted by violence. Through the program, Walker and her team aim to help children recover physically and emotionally.*





**57**  
2022



**47**

2023 THROUGH AUGUST



**117**

TOTAL FAMILIES  
ENROLLED



## FAMILIES ENROLLED IN SHIFT

Healing Individuals From Trauma, Hospital-Based Violence Intervention Program (SHIFT-HVIP), a part of the city of Memphis' violence intervention efforts. SHIFT supports patients and families impacted by violence and provides a wide range of resources, including mental health counseling, school and court advocacy and relocation to safe housing.

"SHIFT provides wraparound services not just to the injured child, but to the entire family," said Lydia Walker, LMSW, SHIFT program manager. "Every child is part of an ecosystem of a broader family, community and social factors that impact their health, so we want to address as many of these layers as we can."

When a child comes to Le Bonheur's Emergency Department with a physical violent trauma, the SHIFT team meets with the patients and family to offer services tailored to their needs. If the family accepts services, mental health counseling is prioritized.

"Our goal is to help children recover both physically and emotionally," said Williams. "By prioritizing mental health counseling, we are equipping children and families with the tools they need to thrive when they leave the hospital."

After connecting the patient and family with a mental health counselor, SHIFT program staff assess the need for other wraparound services. SHIFT has provided families with transportation, coordinated homebound services and

education when patients must remain at home post-injury for an extended time and collaborated with schools to re-enroll children who have been out of school for long periods of time.

SHIFT works with families for six months to one year.

### EXAMPLES OF SHIFT WRAPAROUND SERVICES

- Collaboration with child's medical team
- Visits from SHIFT team at hospital and in community
- School and court advocacy
- Locating resources for family
- Mental health counseling
- Mentoring, youth development and enrichment
- Relocation to safe housing
- Utility assistance
- Tutoring and education assistance

If the family needs more assistance after that, SHIFT connects them to community resource partners like the University of Tennessee Health Science Center and the 901 BLOC Squad, a violence reduction effort in Memphis. Since 2022, more than 100 families have been enrolled in the program.

As SHIFT continues to connect families with counselors, mentors and services, Walker hopes to expand program staff





*Le Bonheur's Hope Journey leadership team (from left) is Chief Nursing Officer Hella Ewing, RN, MSM, Vice President and Chief Operating Officer Brandon Edgerson, MS, PharmD, Senior Director of Emergency Services Barbie Stewart, RN, MSN, CNL, NE-BC, and Social Worker Nakicia Smith, LCSW. Together they are working to embed mental health resources for children who present at Le Bonheur's Emergency Department in order to prevent youth suicide.*

by adding more community mentors and create more positive community programs for children to engage in, such as summer camps or job training.

“We need the children in our community to see that there is positivity and opportunity for growth beyond the world they live in right now,” said Walker. “We are all born with dreams, but it’s the possibility of attaining them that makes a difference, so it’s our charge to show them how to map out a way to get there.”

## **HOPE FOR THE HOPELESS**

As senior director of Emergency Services, Barbie Stewart, RN, MSN, CNL, NE-BC, has experienced firsthand the

effects of the mental health crisis currently plaguing youths. The recent influx of children needing psychiatric services into Le Bonheur’s Emergency Department highlighted a significant need for embedding mental health resources into the frontlines of the hospital.

“Patients were coming to us in mental health crisis, and sometimes all we could do was keep them in their room until they could be transferred somewhere else,” said Stewart. “We were inhibiting their road to recovery, and Emergency Department staff members felt that we could do more to help these patients.”

In 2022, Le Bonheur received the “Preventing Youth Suicide: A Cardinal Health Foundation National

Collaborative” grant from the Children’s Hospital Association, Cardinal Health Foundation and Zero Suicide Institute at the Education Development Center. Through this grant Le Bonheur created Hope Journey, a program to identify and care for patients in crisis and at risk of suicide. As Hope Journey Committee Chair, Stewart emphasizes the importance of early and active intervention in at-risk patients rather than waiting until a suicide attempt has been made or self-harm has occurred.

“You often hear that people contemplating suicide are selfish, but really they have lost all hope and they cannot see a day in the future that would be any better,” said Stewart. “With Hope Journey, we want to give patients a glimpse that things can be better and provide them with the hope they need to keep going.”

A new program at Le Bonheur, Hope Journey is being piloted in the Emergency Department and inpatient units. Patients ages 11 and older admitted to the Emergency Department or directly to the hospital will be screened for suicidal thoughts and depression. A medical social worker will round on patients to guide care based on screening outcomes and connect patients to outpatient counseling or inpatient psychiatric counseling as needed.

Stewart says the goal is to increase comfort level in physicians and staff to help guide patient mental health recovery plans and streamline the process of connecting families to resources through community partnerships.

## HOPE JOURNEY GOALS

- Universal screening of all patients in contact with Le Bonheur
- Staff training to help respond to mental health crises
- Formation of a behavioral emergency response team

Goals of Hope Journey also include creating a behavioral emergency response team comprised of trained physicians, social workers, nurses and child life specialists to assist with acute patient events and ultimately avoid restraining, secluding or sedating patients.

Stewart aims to expand Hope Journey and its screening protocol to all areas of the hospital and clinics to provide the most interventions possible.

“I want our Hope Journey to be all-encompassing,” said Stewart. “We provide hope in so many ways at Le Bonheur, and this program fits in perfectly with the work we already do.”

For Stewart, Hope Journey, along with Le Bonheur’s other mental health efforts, serve as spokes on the wheel of caring for children in the Memphis region. With these programs, Le Bonheur strives to care for the child as a whole, mind and body, and delivers on the promise it made to the community more than 70 years ago.

“We are choosing to tackle this problem because excellent care is part of who we are at Le Bonheur. We promise to care for all children, but if we don’t address the mental health of our patients, then we are not caring for the whole child,” Stewart said.

***“We are choosing to tackle this problem because excellent care is part of who we are at Le Bonheur. We promise to care for all children, but if we don’t address the mental health of our patients, then we are not caring for the whole child.”***

Barbie Stewart, RN, MSN, CNL, NE-BC,  
Senior Director of Emergency Services, Hope Journey Committee Chair



# Coauthor Chatbot

Le Bonheur fellow publishes journal article  
on chatbots written by ChatGPT

**The use of chatbots and natural language processing technology, such as ChatGPT, has the potential to change the future of medical writing — with some caveats — says Som Biswas, MD, a Radiology fellow at Le Bonheur Children’s Hospital and the University of Tennessee Health Science Center, in an article published in *Radiology*. The published article was written entirely by ChatGPT with editing from Biswas.**

ChatGPT is an artificial intelligence model created by the research company Open AI. Launched in November 2022, ChatGPT and AI models like it generate text by processing large datasets of text and producing similar text. ChatGPT uses natural language processing (NLP) technology, a field of computer science that develops systems to understand and generate human language. This technology has many potential uses in the field of medical writing, says Biswas. The top benefits include

automation and efficiency, such as extracting information from electronic medical records or assisting with literature searches, and improving the speed and accuracy of document creation, such as article generation and meeting summaries.

“The use of chatbots and NLP technology has the potential to change the way medical writers operate,” said Biswas. “Documents could be more accurate, more consistent and require less effort from a human medical writer.”

The article stipulates that these technologies need to evolve to be effective in the medical field and will not

***“The use of chatbots and NLP technology has the potential to change the way medical writers operate. Documents could be more accurate, more consistent and require less effort from a human medical writer.”***

Som Biswas, MD  
Le Bonheur and University of Tennessee Health Science Center  
Pediatric Radiology Fellow



Photo courtesy of the University of Tennessee Health Science Center

*Le Bonheur and University of Tennessee Health Science Center Pediatric Radiology Fellow Som Biswas, MD, recently published a journal article on the use of ChatGPT for medical writing. Biswas used ChatGPT to write the published article.*

replace human medical writers in the near future. First, language models do not have the medical expertise and specialized knowledge needed to write in depth on particular subjects. Second, ethical issues regarding plagiarism, bias and errors are a concern when using the current version of ChatGPT.

Biswas noted multiple cautions to consider when using chatbots in the medical writing process:

- **Ethics:** Potential for plagiarism and concerns about accountability
- **Legal issues:** Copyright, compliance and other medico-legal considerations
- **Innovation:** Current technology leads to repetitive text generation and lack of creativity

- **Accuracy:** Potential for AI-generated text to contain errors
- **Bias:** May perpetuate bias included in the data on which they are trained
- **Transparency:** Clarity when AI is used in the writing process

“Overall AI-powered language models are powerful tools that could assist human writers in some tasks,” said Biswas. “However, as we move forward with adopting this technology, we must consider the limitations and potential risks of using AI in the writing process.”





## Seacrest Studios opens at Le Bonheur

Le Bonheur recently welcomed Ryan Seacrest to open the doors of the state-of-the-art Seacrest Studios at Le Bonheur Children’s and host the first live show for patients and families. Seacrest Studios provides patients and families with opportunities for engagement, exploration, entertainment and education in an effort to aid in the healing process.

Seacrest Studios are broadcast media centers located inside select children’s hospitals, allowing patients to explore a new world of radio, television and new media while showing them a new realm of possibilities and potential careers.

## Sumpter named chief of Pediatric Endocrinology

Kathryn Sumpter, MD, was recently named chief of Pediatric Endocrinology at Le Bonheur Children’s Hospital and the University of Tennessee Health Science Center (UTHSC). In this role, Sumpter will provide leadership for the division, advancing the care provided for endocrinology patients. She also leads two programs for children with suboptimally managed diabetes — Fresh Start, which cares for children and families with the highest risk of diabetes-related complications, and Be Empowered Grow Intentionally Now (BEGIN), which aims to improve diabetes management through community-based interventions.



Kathryn Sumpter, MD

## Heart Institute named HCMA Center of Excellence

Le Bonheur’s Heart Institute was recently named a Recognized Center of Excellence by the Hypertrophic Cardiomyopathy Association (HCMA). To qualify as an HCMA Recognized Center of Excellence, a program must provide high-quality care to patients with hypertrophic cardiomyopathy (HCM) in accordance with guidelines and be dedicated to treatment and research in the area of HCM.



## Towbin named to Stanford’s global list of top 2% of scientists

Jeffrey A. Towbin, MD, MS, Le Bonheur Heart Institute co-director, was recognized by a Stanford University study as one of the top 2% of scientists cited in his field. To be included on the list, Stanford developed a score that focused on the number of times other authors cited Towbin’s work, rather than the total number of publications he has published, showing the impact of his research among other cardiologists and medical professionals.



Jeffrey A. Towbin, MD, MS

## Boston inducted into the Society of University Surgeons

Le Bonheur Cardiovascular Surgeon Umar Boston, MD, was inducted into the Society of University Surgeons (SUS). The SUS promotes excellence and leadership in academic surgery. Membership is given to surgeons well established in their profession with demonstrated scholarly or creative ability that positively impacts their field.



Umar Boston, MD

## Le Bonheur joins BPD Collaborative

Le Bonheur was recently named the 35th member of the Bronchopulmonary Dysplasia (BPD) Collaborative. The BPD

Collaborative serves as a catalyst for the life-long outcomes of babies who develop severe BPD by fostering interdisciplinary collaboration and innovation in the identification



and treatment of these highly vulnerable patients. Centers in the collaboration share data, develop and implement quality improvement initiatives and foster research protocols.



## Cohen receives Alumni Achievement Award from SUNY Downstate College of Medicine

Le Bonheur Radiologist-in-Chief Harris L. Cohen, MD, FACR, recently received the Alumni Achievement Award at the 140th Annual Alumni Association Reunion of the SUNY Downstate College of Medicine. He received the award for significant medical contributions to the welfare of the medical profession and humanity.



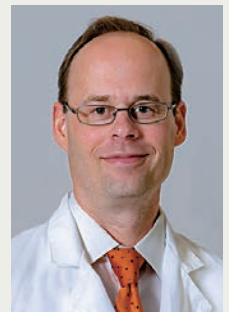
Cohen also serves as executive chair of Radiology at the University of Tennessee Health Science Center and was a Tennessee Radiology Society Councilor for the American College of Radiology's (ACR) May 2023 Annual Meeting. He is editor-in-chief of the ACR's Continuous Professional Improvement (CPI) education series, which has released 74 modules during his 13-year tenure.

## Arnold and McCullers named clinical ambassadors for CHA

Le Bonheur and University of Tennessee Health Science Center (UTHSC) Division Chief of Infectious Diseases Sandra Arnold, MD, and UTHSC Chair of the Department of Pediatrics Jon McCullers, MD, were named national clinical ambassadors for the Children's Hospital Association and American Hospital Association's COVID-19 vaccine confidence partnership with the Centers for Disease Control and Prevention. This partnership will focus specifically on pediatric vaccination through education of the hospital field, clinicians and members of the public.



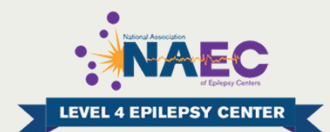
Sandra Arnold, MD



Jon McCullers, MD

## Le Bonheur's Comprehensive Epilepsy Program receives NAEC reaccreditation

The National Association of Epilepsy Centers (NAEC) recently reaccredited Le Bonheur's Comprehensive Epilepsy Program as a Level 4 epilepsy center. This is the highest level that can be awarded to an epilepsy center and designates a center that provides more complex forms of intensive neurodiagnostic monitoring, as well as more extensive medical, neuropsychological and psychosocial treatment.





## Nelson joins Le Bonheur as director of Pediatric Cardiac Critical Care, CVICU

Le Bonheur’s Heart Institute recently welcomed David P. Nelson, MD, PhD, as director of the Pediatric Cardiac Critical Care Program and Cardiovascular Intensive Care Unit (CVICU). Nelson comes to Le Bonheur from Kentucky Children’s Hospital where he was director of Cardiac Intensive Care and co-director of the University of Kentucky Congenital Heart Program. Nelson completed his residency in Pediatrics at the University of Washington. He completed fellowships in Pediatric Cardiology and Pediatric Critical Care at Harvard University, Boston Children’s Hospital. He is a member of the American Heart Association, Society of Critical Care Medicine and Pediatric Cardiac Intensive Care Society.



David P. Nelson, MD, PhD

## Klimo and Evans named as leadership of Craniofacial and Cleft Program

Le Bonheur Chief of Pediatric Neurosurgery Paul Klimo, MD, MH, was named director and Le Bonheur Plastic Surgeon Robin Evans, MD, FACS, FRCS, was named co-director of the Craniofacial and Cleft Program at Le Bonheur Children’s Hospital. Their leadership of the multidisciplinary Craniofacial and Cleft Program focuses on coordinated and integrated care, fostering improved outcomes and providing enhanced quality of life and better support for patients and their families.



Robin Evans, MD, FACS, FRCS

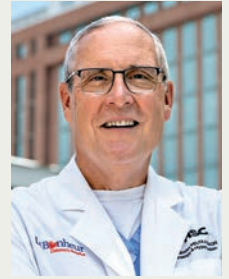


Paul Klimo, MD, MPH

The Craniofacial and Cleft Program at Le Bonheur brings together a multi-disciplinary team of skilled and experienced professionals to offer a comprehensive and specialized approach to the care of children with craniofacial differences.

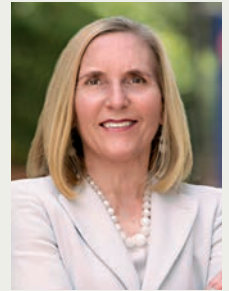
## Bissler, Finkel named MBJ Health Care Heroes Finalists

Le Bonheur Chief of Pediatric Nephrology John Bissler, MD, recently won the 2023 Health Care Hero Award in the Health Care Innovations Category from the *Memphis Business Journal*. Vice Department Chair of Clinical Affairs Terri Finkel, MD, PhD, was also named a finalist in this category.



John Bissler, MD

Bissler is also director of the Tuberos Sclerosis Center of Excellence at Le Bonheur and a professor at the University of Tennessee Health Science Center. In his years at Le Bonheur, Bissler has pioneered treatments and research for tuberous sclerosis complex (TSC) to provide better care for his patients.

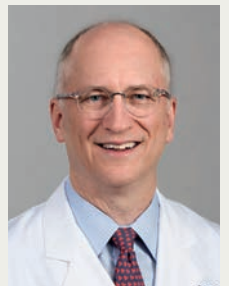


Terri Finkel, MD, PhD

Most recently, he developed a surgery designed to remove kidney cysts for TSC patients and keep cysts from returning. Finkel is also associate chair and professor at the University of Tennessee Health Science Center. Most recently, Finkel has been involved in the launch of All Kids Academy at Le Bonheur — an innovative program that delivers specialized schooling to hospitalized children.

## Waller named new chief medical officer

B. Rush Waller, MD, Le Bonheur pediatric cardiologist and medical director of Adult Congenital Heart Disease, is the new chief medical officer at Le Bonheur Children’s Hospital. He replaces Barry Gilmore, MD, who retired in June. Waller joined Le Bonheur in 1999 as the first pediatric interventional cardiologist in Memphis and led the pediatric cardiac catheterization lab as it developed as a highly regarded program. He was also the first cardiologist in Memphis certified in Adult Congenital Heart Disease (ACHD) and started the nationally accredited ACHD program in Le Bonheur’s Heart Institute.



B. Rush Waller, MD

# Ranked a “Best Children’s Hospital” Again!



For the 13th consecutive year, Le Bonheur Children’s Hospital has been recognized as a 2023-2024 “Best Children’s Hospital” by *U.S. News & World Report*. The rankings assist parents of children with rare or life-threatening illnesses and their doctors in choosing the right hospital for them. “I am proud that Le Bonheur consistently has been recognized as a ‘Best Children’s Hospital’ by *U.S. News & World Report*,” said Le Bonheur Interim President and Surgeon-in-Chief Trey Eubanks, MD, FACS. “This honor shows that Le Bonheur continues to be the best place for kids in our city, region and beyond. We are proud to display the *U.S. News & World Report* badge as a symbol of excellence that reminds parents that their children are in the best hands.” Le Bonheur has been included in the prestigious list with recognition in five specialties; Cardiology & Heart Surgery, Gastroenterology & GI Surgery, Neurology & Neurosurgery, Pulmonology & Lung Surgery and Urology.







## Le Bonheur attains national surgery verification from the American College of Surgeons

Le Bonheur Children's Hospital has been verified as a Level I Children's Surgery Center by the American College of Surgeons Children's Surgery Verification Quality Improvement Program (ACS CSV). Le Bonheur is the first hospital in Tennessee to achieve this designation.

The ACS CSV program was developed to improve the quality of children's surgical care by creating a system that allows for a prospective match of every child's individual surgical needs with a care environment that has optimal pediatric resources. Verified centers must meet criteria outlined in the standards document, *Optimal Resources for Children's Surgical Care 2015*. CSV standards ensure that children facing surgery receive care under a multidisciplinary program with quality improvement and safety processes, data collection and appropriate resources provided to them as patients at the hospital.

Le Bonheur's commitment to excellent care begins with appropriately trained staff and leadership from surgeons who participate in meetings throughout the year to review the center's surgical outcomes. The surgical team seeks continuous improvement



to enhance the structure, process and outcomes of the center.

To become a verified center, Le Bonheur met essential criteria for staffing, training, facility infrastructure and protocols for care, ensuring its ability to appropriately care for children who are surgical patients. The center also participates in a national data registry that yields semiannual reports on the

quality of its processes and outcomes, thus identifying opportunities for continuous quality improvement.

"I am proud that Le Bonheur has received Level I Children's Surgery Verification from the American College of Surgeons, the first in Tennessee to achieve this recognition," said Le Bonheur Children's Interim President/CEO and Surgeon-in-Chief Trey Eubanks, MD. "This is a testament to the high quality and patient-centered care we provide and shows the commitment Le Bonheur has made to providing quality care before, during and after a procedure, helping restore children to optimal health."

