Heart Institute highlights, outcomes: 2012

Ranked in 2012 as a top pediatric cardiology and heart surgery program by U.S. News & World Report, Le Bonheur’s Heart Institute continues to improve the quality of life for hundreds of children with heart defects.

2012 highlights of the Heart Institute include:

- State-of-the-art heart catheterization labs, including the only hybrid catheterization lab in the region.
- The region’s only pediatric electrophysiologists.
- Three-dimensional reconstruction capabilities and expertise in cardiac MRI.
- Joint research with St. Jude Children’s Research Hospital to improve outcomes for children with cardiomyopathy.
- Expertise in some of the most complex heart defects, including Ebstein’s Anomaly.
- Our pediatric cardiac surgical teams performed more than 350 pediatric heart surgeries in 2012, up 48% from 2008.

Interventional cardiologists in Le Bonheur’s catheterization lab used a new technique this summer to re-route hepatic blood flow to the left pulmonary artery of an 18-year-old girl with a complex congenital heart condition – a complex single ventricle, status post bilateral cavo-pulmonary anastamoses with a Kawashima (because of interrupted IVC) with completion Fontan using an extra-hepatic conduit.

“She had developed extensive micro arterio-venous malformations (AVM) of the left lung. The AVMs formed secondary due to lack of hepatic blood flow to the affected lung and would only resolve if the hepatic blood was re-routed to the left lung. The blood from the hepatic conduit steamed preferentially to the right lung at present,” said Shyam Sathanandam, MD. “Her oxygen saturations were as low as 54 percent, and surgical conduit revision to re-route hepatic blood to the left lung carried great risk.”

The girl is a longtime patient of Le Bonheur Cardiothoracic Surgeon Chris Knott-Craig, MD, who conferred with Sathanandam about rerouting blood flow in the catheterization lab.

Sathanandam planned the procedure for months, meticulously preparing for all scenarios he might encounter during this never before done procedure in the cath lab.

In the cath lab, Sathanandam and Cardiologist Rush Waller, MD, initially stented the central pulmonary artery and dilated it to a large diameter.

After the stent was placed, the team pulled a wire through the struts of the stent from the left superior vena cava and snared it from a catheter introduced through the left hepatic vein. A wire rail was created. Incremental balloon sizes were used to dilate through the struts of the stent. Next, a Viabahn

Catheterization lab procedure lowers risk for heart patient

Cardiologists re-route hepatic blood flow to left pulmonary artery in special technique

The PHIS hospitals are 43 of the largest and most advanced children’s hospitals in America, and constitute the most demanding standards of pediatric service in America.

Comparative Case Mix Index 2010-2011, Cardiovascular Surgery Patients

Survival Rate by Procedure, 4 years

Catheterization

Cardiovascular Surgery Volumes 2008-2012

Referrals: 866-870-5570  www.lebonheur.org/ heart

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

PHIS Hospitals

Data Source: Pediatric Health Information Systems (PHIS), 2012.
Meet the Team

The Heart Institute at Le Bonheur Children’s Hospital uses the combined expertise of an advanced pediatric cardiac team to provide specialized care for children with congenital heart disease.

Pediatric cardiologists, pediatric cardiothoracic surgeons, cardiac intensivists, pediatric intensivists and anesthesiologists make up the Heart Institute. Advanced practice nurses, perfusionists, cardiac nurses, respiratory therapists and lab and imaging technicians are specially trained in pediatric cardiology care.

Leaders of the Heart Institute include:

**Thomas Chin, co-director of Heart Institute and chief of Cardiology**

Chin attended medical school at the University of Michigan and completed a fellowship in pediatric cardiology at the University of California, Los Angeles. He is board certified in pediatrics with a cardiology subspecialty. Chin is also professor and director of Cardiology at UTHSC. His patient care emphasis focuses on non-invasive imaging, fetal and developmental cardiology, cardiomyopathies and pulmonary hypertension.

**Christopher Knott-Craig, co-director of Heart Institute and chief of Cardiovascular Surgery**

Knott-Craig graduated from the University of Cape Town in South Africa and completed training in cardiovascular surgery at the Groote Schuur Hospital in South Africa. He is board certified by the South African Medical & Dental Council in cardiothoracic surgery. Knott-Craig is also a professor for UTHSC School of Medicine. His areas of special focus include pediatric/infant cardiac surgery, Ebstein’s anomaly, Ross Procedure, minimally invasive valve surgery, cardiopulmonary bypass, ambulatory thoracic surgery, hyperhidrosis and pediatric congenital heart disease.

**Mayte Figueroa, medical director of CVICU**

Figueroa is a graduate of Mount Sinai School of Medicine and completed pediatric cardiology fellowships at both Mount Sinai Hospital and the Medical University of South Carolina. Figueroa is board certified in pediatrics and has a cardiology subspecialty. She is also an associate professor at The University of Tennessee Health Science Center (UTHSC). Her areas of focus include developmental cardiology, pediatric cardiomyopathy, cardiovascular disease, non-invasive pediatric cardiology and pediatric cardiac critical care.

**Vijay Joshi, medical director of Non-invasive Cardiology**

Joshi attended medical school at the University of Vermont and completed a fellowship in pediatric cardiology at Children’s Hospital of Philadelphia. He is board certified by the American Board of Pediatrics with a cardiology subspecialty, and is also an associate professor at UTHSC. His patient care emphasis is on echocardiography, fetal echocardiography, heart operation planning and 3-D echocardiography, fetal cardiology, cardiovascular disease, non-invasive pediatric cardiology, pregnant women for fetal heart evaluations, exercise- or sports-related cardiology and cardiac MRI.

**B. Rush Waller, medical director of Catheterization Lab**

Waller studied at UTHSC and completed fellowships in pediatric cardiology and pediatric interventional cardiology at the Medical University of South Carolina. Waller is an associate professor at UTHSC and is board certified by the American Board of Pediatrics with a cardiology subspecialty. His areas of focus include interventional pediatric cardiology, including therapeutic catheterizations for critically ill neonates, critically ill preoperative patients and complex cases of adults with congenital heart disease and transcatheter closure of intracardiac shunts.

**Glenn Wetzel, medical director of Pediatric Electrophysiology, director of Fellowship Program**

Wetzel completed fellowship training in pediatric cardiology at University of California at Los Angeles. He is board certified by the American Board of Pediatrics and has a cardiology subspecialty. Wetzel is also a professor at UTHSC. His special interests include pediatric electrophysiology (arhythmias), radiofrequency ablation and cryoablation, cardiomyopathy, pediatric pacemakers and internal defibrillator devices (ICDs).

Endoprosthesis was placed through the sturt of this stent, followed by a larger diameter endoprosthesis telescoped into the first one proximally and the extra-hepatic conduit distally. This pinned both the prosthesis and made the assembly stable.

Hepatic venous blood from the liver streamed to the left superior vena cava through the two telescoped prostheses and then through the first stent in the central pulmonary artery to both lungs. This ingenious yet simple technique allowed hepatic blood to enter the right and left pulmonary arteries without needing to perform a complex operation.

One month later, the patient’s oxygen saturation was up to 94 percent, and Sathanandam expects all the pulmonary AVMs to resolve with time.

Studies show benefit of ECMO simulation

Two studies conducted by researchers at Le Bonheur Children’s aim to better prepare caregivers for high-risk emergencies in the Cardiovascular Intensive Care Unit (CVICU). Published in the latest edition of Pediatric Cardiology, both studies focus on the use of simulation-based training modules.

The first study’s findings suggest that simulation-based training is an effective method for improving the knowledge, ability and confidence levels of novice ECMO specialists and physician trainees. Currently, training for ECMO—a form of temporary cardiopulmonary support—primarily uses didactic education and occasionally includes various hands-on training modules. Simulation courses with mannequins are available at a few centers as supplemental training, but simulation-based training is not required for certification. Results from the Le Bonheur study showed the simulation-based training is helpful and improves knowledge, ability and confidence for ECMO providers.

“ECMO is a complex life-saving medical therapy requiring rapid clinical decision-making skills in the event of a technical emergency. We have developed a novel ECMO simulation training module and bedside safety checklists of common ECMO emergencies to train novice learners and to assist expert caregivers in this intricate management,” said Samir Shah, MD, a Le Bonheur intensiveivist and one of the researchers.

A second study proves that simulation-based team training is effective in increasing teamwork and collaboration among multidisciplinary teams in the CVICU during an emergency. The study’s training course simulated a post-pediatric surgery cardiac arrest, a high-risk clinical situation with high morbidity and mortality. Findings show that participation in the simulation-based training improves teamwork, confidence and communication during these high-risk events.

“We want to design innovative training for our staff that can, ultimately, improve patient safety and outcomes in the critical care environment,” said Mayte Figueroa, medical director of Le Bonheur’s CVICU and a primary researcher for both studies.
Case Study: Melody valve eliminates need for donor valve

Interventional cardiologists successfully completed Le Bonheur’s first Melody® valve procedure on May 23, 2012. Shyam Sathanandam, MD, and Rush Waller, MD, implanted the transcatheter pulmonary device in Le Bonheur’s catheterization lab in a 32-year-old adult congenital heart patient under minimal sedation.

The patient, 32-year-old Ashley Batchelor, was born with Tetralogy of Fallot and had open heart surgery soon after birth. She underwent another operation at age 5 to receive a donor pulmonary valve and then enjoyed a normal childhood despite having to limit physical activity, which caused her to feel light-headed or nauseous. Ashley married, moved to Memphis and delivered a baby, Bailey, in 2007.

Ashley continued to see cardiologists annually for her heart defect. By the time her child was 3, she grew tired and lethargic, but dismissed her symptoms as the result of juggling work and family. After struggling to conceive a second child and still not feeling like herself, Ashley’s OB/GYN recommended she see experts at Le Bonheur’s Heart Institute.

Pediatric Cardiologist Ryan Jones, MD, found that one part of her heart was enlarged, and an artery was smaller than normal. A large percentage of the blood being pumped to the lung arterioles was regurgitating back into the right ventricle, the pumping chamber for the blood going to the lungs. “It made sense why I was so tired. And why I couldn’t have a second baby,” said Ashley. “My heart couldn’t handle a pregnancy,” Jones, along with Sathanandam and Waller, thought Ashley would be a perfect candidate for the Melody valve — a new device that could help Ashley and eliminate the need for a donor valve. The Melody® valve is a valve harvested from a cow’s jugular vein and sewn into a large stent. This valved stent is then delivered through a vein in the leg or neck to the heart and then expanded and implanted with a large angioplasty balloon catheter.

It is primarily intended for use in patients who have undergone multiple surgeries that include using donor grafts to connect the right ventricle to the pulmonary arteries. The valve is indicated when these donor grafts or valves fail.

“Ashley was an excellent candidate for the Melody® valve because her donor valve was no longer functioning, her right ventricle was enlarged, she was symptomatic, and she had a good landing zone for the large stent containing the new valve,” Waller said. “This procedure prevented her from having to have open-heart surgery.”

Sathanandam added that the Melody valve gives patients “trans-catheter replacement of the pulmonary valve that requires no cutting or stitching. The patients are typically discharged home the next day.”

Since the procedure, Ashley has been doing great. She does not get short of breath and runs regularly on the treadmill for 30-40 minutes. She feels like a new person and is able to balance her life as a mom, a wife and as a pharmacist. Since Ashley’s procedure in May, Sathanandam and Waller have successfully implanted the Melody valve in several other patients — all of whom describe complete resolution of symptoms.

CVCU earns national honor

Le Bonheur’s Cardiovascular Intensive Care Unit has earned a gold-level Beacon Award for Excellence from the American Association of Critical Care Nurses. Le Bonheur is just one of a few pediatric CVICUs to receive this award.

The award recognizes unit caregivers who successfully improve patient outcomes, provide exceptional patient care and align practices with AACN’s standards for a healthy work environment.

“Our team is dedicated to providing the highest quality care and committed to achieving the best outcomes in a family-centered environment. The Beacon Award for Excellence validates our successful patient outcomes and established practices,” said Mayte Figueroa, MD, FACC, medical director of Cardiovascular Critical Care Services.

Le Bonheur joins multi-center trial studying pulmonary hypertension treatment

Le Bonheur’s Heart Institute has joined a national pharmacokinetics clinical trial aimed at finding better treatment for children between 6 months and 18 years of age with pulmonary artery hypertension.

The trial, sponsored by Eli Lilly and Co., will enroll patients to study the pharmacokinetics of the drug Tadalafil in children with pulmonary hypertension. In a subsequent phase of the trial, the safety and effectiveness of the drug in treating pulmonary hypertension in children will be determined.

Patients enrolled in this study will be under the close care of physicians and the research staff, and will be monitored with echocardiograms, exercise tests and blood testing. The principal investigator on this study in Memphis is Thomas Chin, MD, the co-investigator is Alex Arevalo, MD, and the trial coordinator is Neysa Rhoads.

Le Bonheur joins a handful of other select pediatric centers across the country, including the Children’s Hospital of Philadelphia, the Children’s Hospital of Denver, Sibley Children’s Hospital in Atlanta and Texas Children’s Hospital in Houston. Physicians interested in enrolling their patients can contact Chin at 901-287-5092.
A fter following neonates with Ebstein’s Anomaly for nearly 20 years, the surgical team at Le Bonheur’s Heart Institute has published a review of best treatments for the defect. The results were published this past year in the *World Journal for Pediatric and Congenital Heart Surgery* in “Surgical Decision Making in Neonatal Ebstein’s Anomaly.” The study presented an algorithm for choosing the best management option for neonates based on analysis of the Heart Institute’s experience.

“Our extensive work with Ebstein’s Anomaly helped us establish what we consider best practice in treating neonates,” said Christopher Knott-Craig, MD, chief of Cardiovascular Surgery and co-director of Le Bonheur’s Heart Institute.

The authors looked at 48 neonates diagnosed with Ebstein’s Anomaly, all treated between 1994 and 2011. Of these, two died before intervention and 46 were either initially managed medically or underwent surgical intervention during the neonatal period. Based on the neonates’ outcomes, researchers found that most symptomatic neonates with Ebstein’s will benefit from early surgery. Those with anatomic pulmonary atresia and mild tricuspid regurgitation may be best served initially with a modified Blalock-Taussig shunt and reduction atrioplexy.

**Book Chapters**


Ebshtein’s research helps establish best practice