



Heart to Heart Global Cardiac Care

SITE: SAENZ NATIONAL
CHILDREN'S HOSPITAL
LOCATION: SAN JOSE, COSTA RICA
COLLABORATION LAUNCHED: 2021

Measurably Expanding Access Since 1989

NOVEMBER 3–7, 2021
MARCH 8–19, 2022
CARDIAC TRAINING MISSIONS
FOCUS: ROSS PROCEDURE, AVSD REPAIRS



Costa Rica This small Central American country of 5M contains more than 5% of the world's biodiversity. San Jose, the nation's capital, has a population of 330,000 and is home to Saenz National Children's Hospital, the only institution in the country where children born with heart defects can undergo open heart surgery.

EXPANDING ACCESS TO CARDIAC CARE IN CENTRAL AMERICA

In Latin America, where 9% of the world's population resides, access to treatment for any form of heart disease is limited. For children born with congenital heart defects (CHD), access is extremely limited or non-existent. There are 183M people living in Central America, the region of Latin America encompassing Guatemala and Belize from the north and stretching down to the southern tip of Panama, which connects to South America. In this region there are fewer than five pediatric cardiac centers at varying stages of development. By contrast, in Northern California alone, home to 15M people, there are five well established centers. This means that many children with CHD in Central America go undiagnosed or untreated, and, as a result, thousands die of highly treatable heart conditions.

Approximately 700 babies are born with CHD in Costa Rica annually. At least 350 of these children will require open heart surgery, including 70 who will require surgery in the newborn period (first 30 days of life). Currently, the country's sole pediatric cardiac team is able to perform about 200 open heart surgeries per year. As a consequence, each year dozens of children join the waiting list of more than 100.

Heart to Heart is collaborating with Costa Rican specialists to change this: we are excited to be embarking on a multiyear educational collaboration with the Carlos Saenz Herrera National Children's Hospital. Our shared vision is that all children in Costa Rica will have access to life-saving cardiac care.



Olga Arguedas, MD
Medical Director,
Saenz National Children's Hospital



Ronald Quintana, MD
Chief, Cardiovascular Surgery



Margarita Camacho, MD
Lead Surgeon, Cardiac Surgery



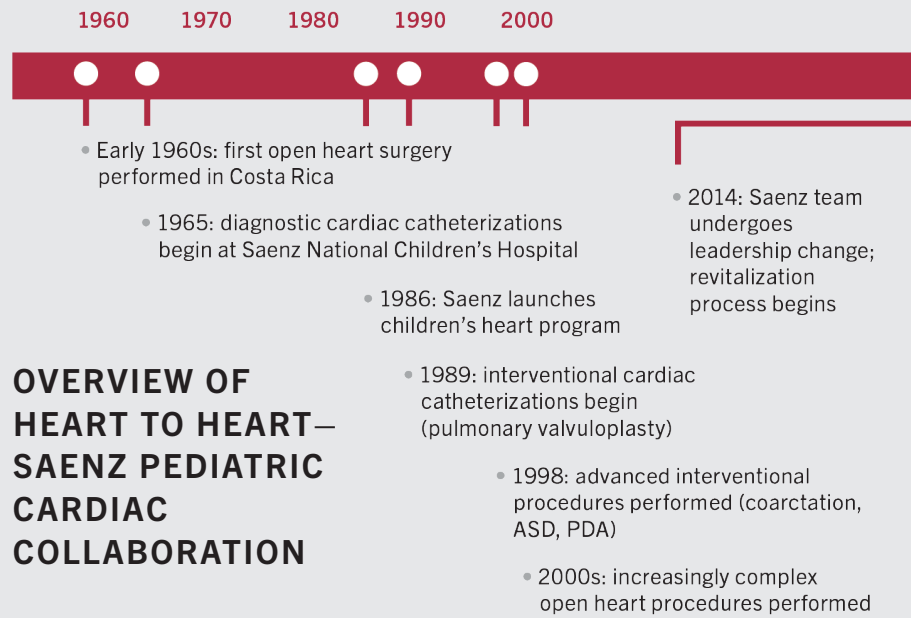
Carlos Mas, MD
Coordinator, Specialized Technical
Commission for Cardiac Surgery Program



Rafael Gutierrez, MD
Chief, Cardiology



Rocio Porras, MD
Chief, Intensive Care Unit



OVERVIEW OF HEART TO HEART—SAENZ PEDIATRIC CARDIAC COLLABORATION

Our Partners in Costa Rica

Located in the country's capital, San Jose, the Saenz National Children's Hospital is the largest public hospital and serves the nation's 1.5M children. Like many children's heart programs in areas of need around the world, initial efforts to treat children born with heart defects grew out of an adult cardiac program. The cardiac program at Mexico Hospital (located near Saenz) was established in 1980 to treat adults with acquired heart disease. Over the course of several years, leaders there became increasingly aware of the need to treat children and felt a growing sense of urgency. In 1986, they transferred two of their surgeons to the Saenz National Children's Hospital to help establish the country's first pediatric cardiac program.

The successful transfer of knowledge and experience to medical communities in underserved areas is key to reducing the global burden of heart disease.

Throughout the 1990s and 2000s, the country's first pediatric cardiac program made inspiring advances in treating children born with heart defects. However, overall there was consensus that surgical outcomes needed improvement; this raised tensions and contributed to the program reaching a plateau and remaining there for some years.

Revitalizing a High-Impact Program

Fast forward to 2014: new leadership at Saenz began to revitalize the pediatric cardiac program with the help of many young specialists who trained abroad. Under the direction of Ronald Quintana, MD, the children's heart program was able to increase patient volume, performing operations five days a week. To more effectively air interdepartmental issues in a professional manner, the team formed a special commission (headed by Carlos Mas, MD) made up of members representing each of the pediatric cardiac subspecialties. Dr. Quintana also successfully spearheaded an effort to routinely conduct M&M conferences, an important best practice.

As with any evolving program, the Saenz pediatric cardiac team continues to face challenges. For example, there is no formal educational pathway within the country for a physician to gain specialization in pediatric cardiac surgery, intensive care, anesthesia, perfusion, or in pediatric cardiology. Many young physicians train in different countries, returning home to practice pediatric cardiac medicine after spending years abroad at established children's heart programs. Upon their return, integrating these highly trained specialists into an under-resourced program is complicated due to varying depths of knowledge and experience within each subspecialty and among the team at large.

Additionally, the hospital houses the country's only pediatric intensive care unit (PICU): a 27-bed unit which must accommodate any Costa Rican child who requires intensive care — not just those recovering from open heart surgery. Over the last two years, due to the Covid-19 pandemic, the cardiac team could not operate on as many children as they had in previous

2010

2020

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- 2015: Heart to Heart begins researching Latin American cardiac landscape and reaches out to programs-in-development in the region
 - 2015-2019: Heart to Heart launches *Going Global Campaign* and begins conducting site assessment visits and cardiac missions to Peru, Paraguay, Mexico, and Guatemala
 - 2019: Doctors Margarita Camacho and Carlos Chacon assume surgical leadership of the Saenz team
 - Oct and Nov 2019: Heart to Heart conducts two site assessment trips to Costa Rica
 - Dec 2019: Heart to Heart's *Into the Russian Heartland Campaign*, 2002-2019 successfully concludes—more than 25,000 children saved!
 - Feb 2020: Heart to Heart conducts a third on-the-ground site assessment trip to Costa Rica
 - Mar 2020: due to Covid-19 pandemic, Heart to Heart's first cardiac training mission to Costa Rica is postponed
 - Nov 2021: first Heart to Heart on-the-ground cardiac training mission in Costa Rica—didactic focus on Ross Procedure and AVSD
 - Mar 2022: second mission—surgical focus on Ross Procedure
 - TBC Fall 2022: third mission—interventional cath and ICU focus
 - TBC Spring 2023: fourth mission—surgical focus to be determined

years. The increased strain on the hospital's PICU meant that PICU beds which had been reliably available for postoperative cardiac patients had to be used for children with severe Covid-19 infections. Without PICU beds, heart surgeries had to be postponed. Unfortunately, during this time the waiting list of children grew by over 10%.

In 2019 and 2020, Heart to Heart conducted three site assessment visits to Costa Rica. During discussions with Saenz team thought leaders, we learned about their revitalization initiatives and discussed the viability of a long-term educational collaboration. Our on-the-ground findings led us to believe that the Costa Rican medical community is ready for a comprehensive transfer of knowledge in pediatric cardiac medicine. Together, the Heart to Heart and Saenz teams — with the support of the Costa Rican medical community and other community leaders — can have a profound impact, saving the lives of thousands of children!

Where to Begin?

To successfully guide a partner site to excellence Heart to Heart must first understand the team's level of knowledge and technical proficiency at the beginning of the collaboration. Determining the Saenz team's baseline level of performance enables our medical volunteers to choose appropriate educational starting points in each subspecialty: (1) surgery (including anesthesia and perfusion); (2) cardiology (including clinical, catheter-based, and electrophysiology); and (3) intensive care. By analyzing the Saenz team's per patient surgical outcomes data and through

direct observation while on the ground, we can determine where to begin teaching and training in each subspecialty concurrently along three pathways: didactic education, hands-on clinical skills training, and integration of best practices.

Back on the Ground in Costa Rica

Throughout the pandemic Heart to Heart has remained in close contact with our Saenz cardiac colleagues to deepen our understanding of how to best support the advancement of their evolving program. Our objective was to meet the team where they are – in other words, to come to a shared understanding of the program's strengths and weaknesses and jointly develop an action plan, providing support where needed as soon as possible. Through data sharing and an analysis of backlogged patient cases, Saenz and Heart to Heart team leaders agreed on an educational focus for our first on-the-ground training mission, initially scheduled for March 2020. The rescheduled mission — our first in-person training mission! — took place in November 2021. Led by doctors Kirk Kanter, Beth Wilson, and Frank Cetta, lectures and patient case discussions were focused on the diagnosis and treatment of children requiring the Ross Procedure or AVSD surgical repair.



Heart to Heart medical volunteers and Saenz team members in action Left: Kavitha Pundi, MD, examines a newborn baby in the NICU while Saenz colleague Carlos Mas, MD, briefs her on the patient's medical history. Right: Hernan Carcamo, MD interprets for Heart to Heart and Saenz team members as a patient is settled into the PICU immediately after being transported from the operating room.

“Progress includes plateaus, it’s not a nice straight line. Successfully performing the Ross Procedure marks a meaningful milestone for the Costa Rican team. It’s great for the patients; it’s also very important for the surgical, cardiology, and ICU teams to feel like they can take on that level of care successfully. A nice accomplishment for a first cardiac training mission – kudos to the team.”

– NILAS YOUNG, MD, FOUNDER & MEDICAL DIRECTOR, HEART TO HEART
CHIEF EMERITUS, CARDIOTHORACIC SURGERY, UC DAVIS MEDICAL CENTER

Second On-the-Ground Mission: Four Open Heart Operations Performed

After our didactic training mission, Heart to Heart was delighted to return to Costa Rica in March 2022 with a full pediatric cardiac team to diagnose, perform open heart surgery, and provide postoperative intensive care side-by-side with our Saenz colleagues. It was also our first opportunity to provide clinical skills training in all three subspecialties: cardiology, surgery, and intensive care.

The Heart to Heart team was made up of 10 pediatric cardiac specialists as well as four administrative support staff. Additionally, two Heart to Heart board members joined our medical volunteers on the ground to see Heart to Heart's mission in action! (See back cover for team rosters.)

Teamwork began several days in advance of the operating week with a joint case conference to review the diagnostic images and medical profiles of each surgical candidate. Many children presented with valvular conditions — requiring repair and/

or replacement of one or more of their heart valves. Valvular heart disease is more prevalent among adults than children, however an estimated 25% of all children with CHD have valve pathologies. Throughout childhood the heart is continuously growing; for this reason, it is generally recommended to wait as long as possible before replacing a child's native heart valve. Waiting too long to replace a valve, however, may cause additional health issues with a child's heart or other vital organs.

Our team shared insights regarding intraoperative and postoperative patient management techniques and patient selection. Choosing the right operation for the right patient at the right time is critically important in pediatric cardiac medicine — in fact, patient selection is a major determinant of program success or failure. Therefore, during a cardiac training mission, the types of surgical cases selected are far more important than the number of operations performed.



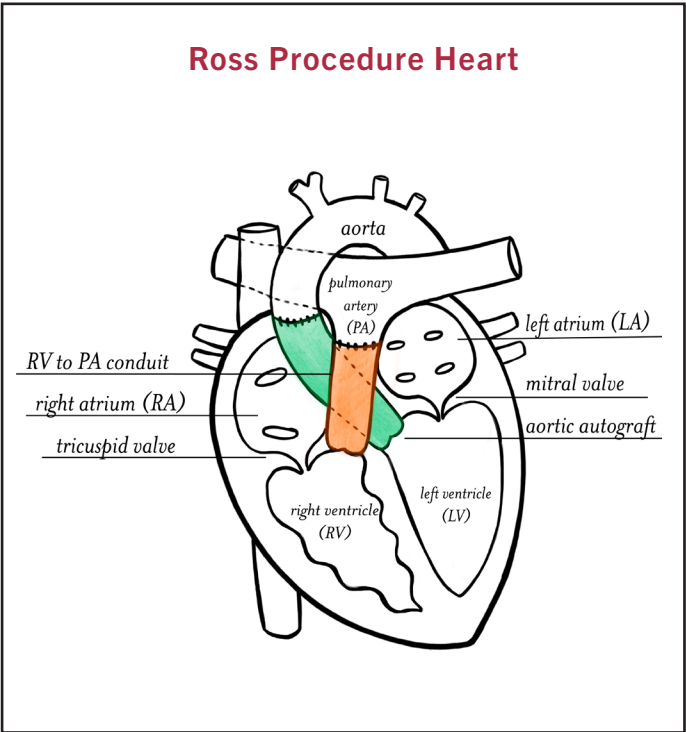
In the operating room Margarita Camacho, MD, leads her first Ross Procedure as Heart to Heart’s Kirk Kanter, MD, assists and advises her each step of the way. In the foreground, Saenz and Heart to Heart surgical technicians hand instruments to the surgeons, open packets of sutures, and prepare saline syringes.

Over the course of seven in-hospital working days, the Heart to Heart-Saenz team examined or discussed the cases of more than 40 children. Additionally, we jointly performed four open heart surgeries and provided postoperative care to children in the PICU. Heart to Heart specialists participated in daily PICU rounds, patient case conferences, and conducted cardiology and PICU educational workshops for local specialists and medical students. Two of the surgical patients selected by the Heart to Heart-Saenz team underwent the Ross Procedure, the educational focus of our November mission. (Read about Ross patients Camil and Alonso on page 6.)

Saenz lead pediatric cardiac surgeon Margarita Camacho led both Ross Procedures with Heart to Heart surgeon Kirk Kanter guiding her throughout the long, complicated operations. During both surgeries, Dr. Kanter explained the sequencing of steps as well the nuances of the techniques required to successfully perform this innovative and extensive surgical repair. Performing two Ross Procedures consecutively enabled Dr. Camacho to gain valuable hands-on clinical skills – surgical building blocks which she can apply to repair many different types of heart defects to save the lives of hundreds of babies and children. This kind of clinical mentoring is key to the development of a cardiac surgeon’s technical skills.

After the Heart to Heart-Saenz surgical team finished their work in the operating room, patients were transferred to the PICU where they were cared for by a team of intensivists and nurses 24/7. Heart to Heart PCICU nurses Eric Egger and Torryn Jennings-Hill and pediatric cardiac intensivist Asaad Beshish worked side-by-side with their Saenz counterparts to

care for 10 patients, four of whom were operated on by the joint surgical team. In addition to clinical work, Heart to Heart PCICU specialists led workshops to a wide audience of Saenz intensive care nurses, physicians, and residents on a range of topics. We are especially grateful for the opportunity to begin building a strong relationship with the Saenz PICU specialists – an indispensable part of every children’s heart team!





Ross patients Six-year-old Camil and seven-year-old Alonso were both diagnosed at birth with aortic stenosis, a rare form of CHD. Aortic stenosis is characterized by obstruction of the blood flow from the heart to the body. Children born with the condition are predisposed to congestive heart failure and, eventually, risk of sudden death. First performed by Donald Ross in 1962, the Ross Procedure is very technically demanding and not all pediatric cardiac surgical centers perform it.

About the Ross Procedure

The Ross Procedure is an open heart surgical procedure performed to treat aortic valve disease. The operation involves replacing the patient’s aortic valve with their own pulmonary valve. This allows the pulmonary (now aortic) valve to grow as the patient’s heart grows — an important factor to consider for pediatric patients whose hearts are not yet finished growing. Using a patient’s native valve also circumvents the need to rely on anticoagulation medications for life. Once a child grows to reach adult size, if valve replacement becomes necessary, the native valve can then be replaced with a mechanical or bioprosthetic valve.

CHD and Valvular Conditions

A life-threatening valvular condition can strike at any age: a baby can be born with a heart valve defect or with an anatomical valve abnormality which predisposes to disease later in life; or a person can acquire heart disease affecting one or more heart valves in midlife or later. Worldwide, 1% of all babies are born with CHD — more than 1.3 million children each year. Approximately one-quarter of their cases involve life-threatening valvular conditions. For these babies, prompt diagnosis and access to treatment is critically important; most children diagnosed with congenital valve abnormalities require early surgical intervention in order to live.

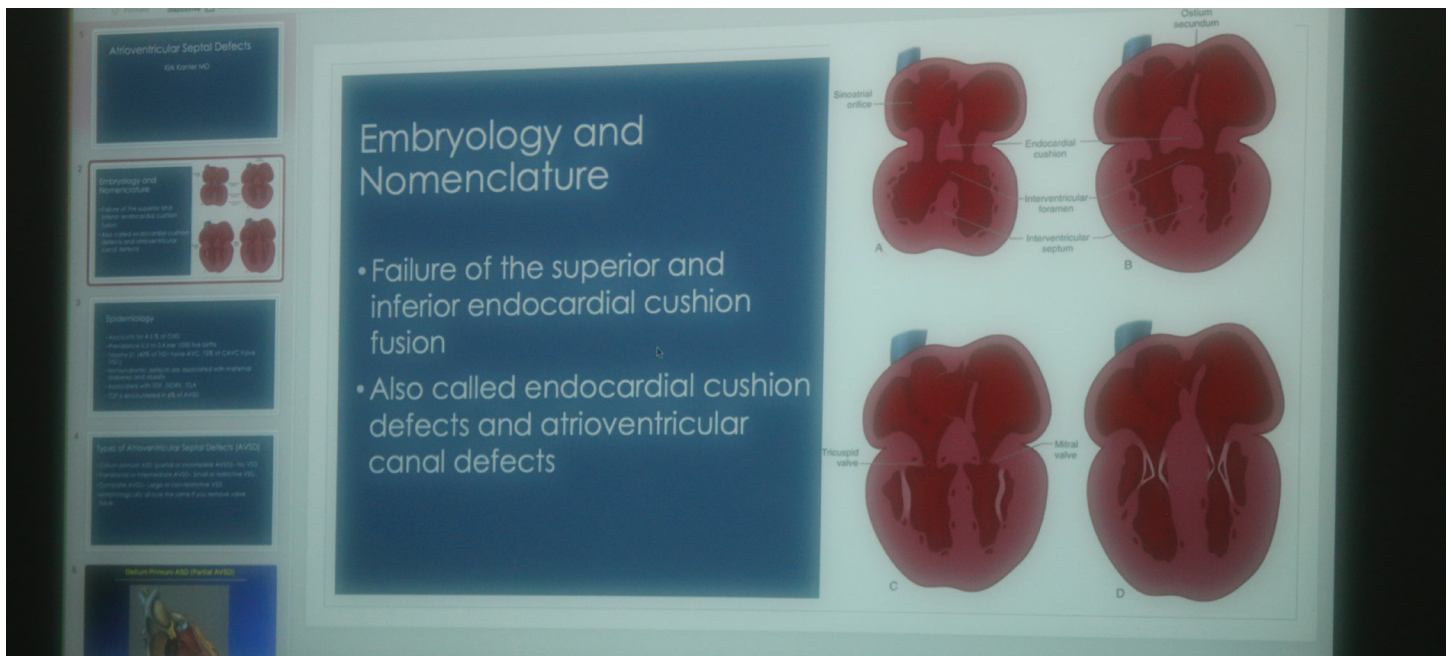
Meet the Children

Camil P. Camil lives with her mother, father, and two siblings in Coto Brus, Costa Rica, a six-hour drive from the capital city of San Jose. She was diagnosed with aortic stenosis at the Saenz National Children’s Hospital soon after a heart murmur was detected at the time of her birth. Her mother describes feeling “a terrible anxiety...the first thing I thought was that she would die.” Throughout the first few years of Camil’s life, the family would make the 12-hour round trip to San Jose every month so she could receive cardiac care.

On March 14, 2022, high-spirited Camil became the first surgical patient of the Heart to Heart-Saenz team collaboration. She was the first Ross Procedure patient for the Saenz team’s lead surgeon, Margarita Camacho.

Alonso A. Alonso is nine years old and lives in San Jose, Costa Rica with his parents and twin brother, Andres. His mother, Rebeca, is a stay-at-home mom and his father, Marvin, a surgical assistant in ophthalmology.

Alonso was diagnosed with aortic stenosis just two days after he and his twin brother were born through an emergency Cesarean. Although his parents try not to let Alonso’s condition hold him back, they see him tire out quickly when playing with his brother and know that he can’t play sports like he wishes he could. After years of waiting, on March 15, 2022, Alonso finally underwent open heart surgery, the Ross Procedure. Alonso recovered quickly after his surgery, and his prognosis is good. He left the hospital by the end of the week, excited to return home to play with his twin brother.



Teaching and training Didactic education provides teams-in-training the foundational knowledge to understand advanced cardiac pathophysiology, anatomy, and standardized approaches for treating patients with CHD. Hands-on training brings these concepts to life through working jointly to diagnose, perform open heart surgery and catheter-based procedures, and provide postoperative intensive care to children with CHD. (Shown here: a slide from a lecture given by cardiac surgeon, Kirk Kanter, titled Atrioventricular Septal Defects.)

“The experience the Heart to Heart team brings is great. It’s always good to have respectful scientific discussions about how things can be done differently. Our team can establish not only a better surgical process, but also a better way to manage patients day to day. We’ll learn how to implement protocols and improve the whole program – ICU, cardiology, and cardiac surgery – so that we can do more and more complex surgeries by ourselves.”

– JORGE GONZALEZ, MD, PEDIATRIC INTENSIVIST
SAENZ NATIONAL CHILDREN’S HOSPITAL

Heart to Heart medical volunteers were overjoyed to have had the opportunity to help the Saenz team save the lives of Camil and Alonso, as well as two other children.

We are excited at the prospect of watching these young children grow as we move forward in our collaboration to expand access to life-saving cardiac care for all children in Costa Rica.

Striving for Excellence

Over the last two years, during the Covid-19 pandemic, the Heart to Heart and Saenz teams have been steadily building trusting collegial relationships. We are excited to be back on the ground and in-person to help elevate the Saenz program to new heights!

In the next year of our collaboration, we plan to conduct two on-the-ground training missions to Costa Rica to continue providing advanced cardiac education and hands-on clinical skills training. We also look forward to sponsoring Saenz team

members to travel to the U.S. to observe the day-to-day best practices of established teams at world class heart programs.

Heart to Heart acknowledges the difficulty of establishing and growing a children’s heart program with limited resources in an area of need. We hold deep admiration for the Saenz team’s efforts in their reach for excellence and are honored to hold their trust and to be part of the revitalization of their high-potential program. ¡Pura vida!



PROCEDURES PERFORMED
November 2021 & March 2022

Patient exams, echo studies, and consultations (51)	15,300
Open heart surgeries (4)	194,380
Intraoperative TEE studies and readings (4)	4,800
Anesthesia (4)	49,828
Perfusion (4)	13,800
Post-op exams and readings (4)	1,536
PICU post-op care, MD (10)	21,480
RN/tech support (PICU + OR)	13,948
Professional consulting + lectures	28,125
Total In-Kind Medical Services	\$343,197

FINANCIAL OVERVIEW
July 2021 – June 2022

In-kind support

In-kind medical services	343,197
Non-medical in-kind (see Expenses below)	10,910
Total In-kind Support	\$354,107

Total program value

Donated medical services	343,197
Expenses (excl. non-medical in-kind)	336,032
Non-medical in-kind donations	10,910
Total Program Value	\$690,139

Expenses

Airfare, in-kind	2,850
Ground transportation, in-kind	2,400
Interpreters, in-kind	1,100
Meals, in-kind	1,760
Program supplies	1,015
Pre- and post-trip coordination and logistics	156,889
Travel	49,764
Travel insurance, in-kind	2,800
Year-round program development	128,364
Total Expenses	\$346,942

Data compilation as of May 23, 2022, projected through June 30, 2022.

LASTING LEGACY: *Would you like to ensure that life-saving heart care is available to children around the world? Join Heart to Heart supporters in making legacy gifts, such as a bequest in your will or trust. Your legacy gift will expand access to cardiac care, saving children's lives for generations to come. We welcome gifts in any amount. For more information, contact josie@heart-2-heart.org*

Thank you to our sponsors, whose continued support fuels our progress!



HEART TO HEART COSTA RICA TEAMS

November 2021 *Children's Healthcare of Atlanta:* Dr. Kirk Kanter, pediatric cardiac surgeon; Dr. Beth Wilson, pediatric cardiac anesthesiologist; *Mayo Clinic:* Dr. Frank Cetta, pediatric cardiologist; *Heart to Heart:* Dr. Teresita Alfonso,* medical interpreter; Dr. Hernan Carcamo,* lead medical interpreter; Lucie Everett,* interviewer/interpreter; Albina Popova, program director.

March 2022 *Children's Healthcare of Atlanta:* Dr. Asaad Beshish, pediatric cardiac intensivist; Michele Harris, surgical technician; Marney Moore, perfusionist; Dr. Kirk Kanter, pediatric cardiac surgeon; Dr. Cori Van Gorkom, pediatric cardiac anesthesiology fellow; Dr. Beth Wilson, pediatric cardiac anesthesiologist; *Mayo Clinic:* Dr. Frank Cetta, pediatric cardiologist; Eric Egger, PICU nurse; *UC Davis Medical Center:* Torryn Jennings-Hill, PICU nurse; *UCSF Children's Hospital:* Dr. Kavitha Pundi, pediatric cardiologist; *Heart to Heart:* Dr. Hernan Carcamo,* lead medical interpreter; Lucie Everett,* interviewer/interpreter; Reuben Holland, communications/photography; Albina Popova, program director; Shalu Saluja*, board chair; Chester Zelaya*, board member.

**Spanish-English bilingual*