

Two Hearts Beat as One

In early 2008, Maria took her 7-month-old Dayne to his pediatrician in their northern Mississippi town. Her son was fussy and sleepy, and Dayne also appeared pale and had odd breathing. From the pediatrician's office, Dayne's parents took him to a hospital in Memphis. "He was dehydrated and had no pulse or blood pressure," Maria says, "Dayne's heart was working at five percent. It was rocking, not beating." After a 12-day stay, Dayne went home with his family.

Almost two weeks after returning home, Dayne's family took him back to the pediatrician who then had the family go immediately back to Memphis. The doctors determined Dayne would require a heart transplant. Within two days of returning to Memphis, Dayne was sent to the nearest heart transplant center, Arkansas Children's Hospital, aboard an ACH helicopter to Little Rock.

In Memphis, doctors also told Maria that at ACH it was possible to support Dayne's heart using a Berlin Heart, a device that assists the heart with pumping blood. Though approved for use in other countries, the Berlin Heart is currently being tested in the US. ACH is participating in a Food and Drug Administration (FDA)-regulated investigational trial of the Berlin Heart for pediatric use having implanted its first in 2005.

"Keeping a child alive until they can get a heart is the trick," says Dr. Robert D.B. Jaquiss, a cardiovascular surgeon at ACH. If a child needs a heart transplant but may not survive until a heart is available, the Berlin Heart is an alternative to extracorporeal membrane oxygenation (ECMO). ECMO requires the patient to be bedbound needing a ventilator and heavy sedation. Although ECMO is useful for short-term cardiac support, the risks of ECMO-related complications such as stroke or life-threatening infection rise sharply beyond two weeks; the typical waiting time to receive a heart for most children who require mechanical cardiac support is actually closer to six weeks. The Berlin Heart can be used for much longer periods and, in fact, has supported children for over a year. Furthermore, children supported with the Berlin Heart do not usually require a ventilator or any sedation at all—patients are even encouraged to walk and exercise under supervision to maximize their pre-transplant rehabilitation.

Within a week of Dayne arriving at ACH, Dr. Jaquiss and the cardiovascular surgery team attached a Berlin Heart to Dayne. "At ACH, these children have access to technology that other children don't," says Dr. Jaquiss. He indicates, "At ACH our average support time on the Berlin Heart has been six weeks, far longer than the two week time frame we could have anticipated with ECMO. We believe that most of these children would have died if the Berlin Heart had not been available."

The wait for organ availability can be unpredictable, but the morning after the Berlin Heart surgery, a heart was available for Dayne. Seeing him after the surgery, Maria said the device hung to Dayne's legs like an oversized medal. "It was wild," says Maria adding, "It was amazing to see how it worked."



At ACH, Dayne (with surgeon Dr. Robert Jaquiss) had access to a Berlin Heart, which provided mechanical cardiac support until a heart was available for transplant.

So far Dr. Jaquiss and Dr. Michiaki Imamura have implanted 22 Berlin Hearts in children at ACH making it the largest pediatric Berlin Heart implant center in North America. Patients have come from around the world to have the surgery performed at ACH. As an early adopter of this technology, ACH serves as a resource for other Berlin Heart centers to get advice. "We've learned so they don't have to learn the way we did," comments Dr. Jaquiss. ACH's experience with the Berlin Heart provides insight into the benefits of its use and with improving patient management and outcomes. ACH shares all data with FDA as it determines the device's US commercial release.

Dayne's stay at ACH was 6 weeks. "They were awesome," Maria says reflecting on the ACH staff. Dr. Jaquiss affirms that it is a team effort, "We have a dedicated pediatric cardiology team that is with the families before, during, and after surgery. The team is exceptional."

Now one year old, Dayne makes regular visits to ACH following up on his transplant surgery. When Dayne is older and asks about his operations, Maria says, "I'll tell him that God saved his life, but without the Berlin Heart he wouldn't have made it."



Established in 1989, Arkansas Children's Hospital Research Institute provides an on-site research environment for faculty of the University of Arkansas for Medical Sciences working on the Arkansas Children's Hospital campus. Over 120 pediatric researchers with expertise and experience that span the breadth of medical disciplines comprise ACHRI's roster of investigators who work to fulfill its mission to improve children's health, development, and well-being through high quality research. For more information, visit <http://achri.archildrens.org>.