Children's Mercy KANSAS CITY

TECHNOLOGY IMPROVES OUTCOMES FOR INTERSTAGE SINGLE-VENTRICLE PATIENTS

CHAMP DECREASES MORTALITY RATE THROUGH CAREFUL HOME MONITORING

Until recently, as many as 20 percent of babies with single-ventricle heart defects died between their first and second surgeries. To improve outcomes for these patients during that critical interstage period, Girish Shirali, MBBS, FACC, FASE, Division Director of Cardiology at Children's Mercy Kansas City, led a team that designed and launched the Cardiac High Acuity Monitoring Program (referred to as CHAMP). This program offers home monitoring of these babies by a multidisciplinary team, supported by the proprietary CHAMP app, which is connected to a central database. In the four years since the launch, the mortality rate for all babies being monitored via CHAMP has been reduced to 2.4 percent.

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A study published in the *World Journal of Pediatric and Cardiac Surgery*[1] in April 2018 confirmed additional benefits. The study compared traditional three-ring binder home monitoring of interstage patients to monitoring via the CHAMP app during a three-year period, and showed:

- Fewer unplanned intensive care unit days per 100 interstage days
- Shorter delays in care
- Lower resource utilization at readmissions
- Lower incidence of interstage growth failure
- Preferred by a majority of caregivers

CREATING A MORE FLEXIBLE EXPERIENCE FOR PARENTS

Initially the CHAMP app was developed on a single mobile platform. To create a more consumer-friendly approach, work is underway today to create a platform-agnostic model of the app. By summer 2019, the CHAMP app will be available on all commonly used mobile platforms including Apple, Android and Windows. From a parent's perspective, this development offers several key benefits:

- It eliminates the potential need to learn new technology in the midst of a stressful health situation. Parents can use whatever device they already have.
- Parents can use their own cellular data plan or Wi-Fi to access the app.
- The updated app will work on smartphones, too. Phones are less bulky than tablets, and most parents are more comfortable using their phones.
- Adherence to the monitoring protocol will be simplified.

SHARING CHAMP NATIONALLY

From the outset, Dr. Shirali and his team planned to share CHAMP with other hospitals who also cared for patients with single-ventricle defects.

Joining the Children's Mercy CHAMP team pictured above, nine additional sites are utilizing the CHAMP app which translates into 280 babies being monitored via CHAMP.

In 2016, Lori Erickson, APRN, CHAMP Clinical Program Manager, led the effort to begin bringing additional sites on board with CHAMP. Today, nine additional sites are utilizing the CHAMP app, and babies in 17 states are being followed. That translates into 280 babies who have been monitored via CHAMP so far – 130 at Children's Mercy and another 150 from the other nine sites combined.

CREATING A FOUNDATION FOR RESEARCH

Children's Mercy has also developed a database to collect information on single-ventricle patients. The database tracks more than 400 data variables per child, in addition to the information parents enter via the app. To date, more than 275 families have signed up to allow their babies' data to be included, and the database holds 217,000 data points from the active hospitals.

Sites that implement CHAMP sign a master research agreement to participate in this nationwide database. Its infrastructure was designed to support research studies, and individual teams will eventually have the ability to write a proposal that, if approved, would grant them access to all details in the database for the purposes of research projects.

THE FUTURE OF CHAMP

For Dr. Shirali and his team, CHAMP is a proof of concept. Now that its effectiveness is understood, the team is considering ways to extend the technology to help babies with other high-risk conditions that require careful monitoring.

Another goal is to ensure CHAMP becomes smarter and quicker at alerting care teams to problems, even before they occur. For example, today CHAMP monitors babies' oxygen saturation levels and triggers alerts for the care team when levels are out of range. Using artificial intelligence, the team plans to "teach" the app to anticipate potential risks so they can be avoided altogether.

SOURCES

[1] Interstage Outcomes in Infants With Single Ventricle Heart Disease Comparing Home Monitoring Technology to Three-Ring Binder Documentation: A Randomized Crossover Study. Bingler M, Erickson L, Reid K, Lee B, O'Brien J, Apperson J, Goggin K, Shirali. G. *World Journal for Pediatric and Congenital Heart Surgery* (May 2018); https://doi.org/10.1177/2150135118762401.

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