

Research Explained: Risk Factors for Unanticipated Readmissions During the Interstage: A Report From the National Pediatric Cardiology Quality Improvement Collaborative

Background

The National Pediatric Cardiology Quality Improvement Collaborative (NPC-QIC) had an initial primary goal of reducing the number of children with Hypoplastic Left Heart Syndrome (HLHS) and other similar conditions who die between the first and second surgeries (interstage). This study is one of the various quality improvement projects NPC-QIC has undertaken to improve the care of these babies.

The NPC-QIC gathers a lot of data about HLHS patients that can be analyzed to make sense of certain things about the interstage experience. In this particular study, the NPC-QIC was interested in understanding the unplanned hospitalization rate for babies after initial discharge following the first stage surgery (S1P) which was either Norwood Surgery or Hybrid-procedure. This study looked at information from 815 patients at 50 different hospitals over the course of five years to determine the risk factors for unplanned interstage readmission.

How was the study was done and what it shows

The NPC-QIC accessed a database of patients that had previously consented to participate in the study to find out how many babies were readmitted during the interstage period and why. They removed those patients who had a planned admission, for example for a scheduled catheterization or MRI. The researchers looked at several risk factors such as ventricular function and the use of certain medications along with other characteristics such as the size of the hospital and how parents were prepared to go home. The researchers used many different analysis techniques to determine how often readmission occurred based on these factors and how likely different factors were to predict readmission. All of these factors were narrowed down to include a final list of eight factors for further analysis. Of these eight factors, six were considered statically significant meaning that there are six factors that stand out as being important predictors of being readmitted to the hospital between surgeries. Those six factors are: presence of a genetic syndrome; center volume (how many HLHS infants the center cares for each year); type of surgery - Norwood vs. Hybrid; presence of ventricular dysfunction before surgery; tricuspid regurgitation; and duration of circulatory arrest.

Of the 815 patients in the study, 73% were readmitted at least once and 66% were readmitted unexpectedly. On average, the unexpected readmissions happened 29 days after initial discharge from the hospital. More than half of the readmissions were due to red flags including feeding difficulties (36%); breathing issues (33%); decreased oxygen saturations (38%); poor weight gain (15%); vomiting or diarrhea (28%); fever (11%); and fussiness (14%). Only 6% of the readmissions were for major events: four were due to shunt occlusion; two due to seizures; one due to stroke; nine due to cardiac arrest; and six due to aspiration. Readmissions did not occur more frequently on the weekends as previously reported. On average, the total time in the hospital was 2 days for red flag events and nine for major adverse events. Similar to other reports from NPCQIC, there were differences with the likelihood of readmission based on hospital, with larger volume hospitals generally having lower rates of unexpected readmission.

The bottom line is that readmission is common, expected, and frequently occurs in the first month during the interstage period. While certain risk factors (for example ventricular dysfunction, genetic syndrome), make readmission more likely, most of the time readmission were for short duration. This paper doesn't tell us whether or not readmission is necessary in preventing more serious issues, or if some of these readmissions captured more significant cardiac problems leading to surgical or catheter-based procedures (for example, aortic arch obstruction) More work is needed to understand serious cases of readmission and how certain hospitals choose who to readmit.

Limitations of the Study

The NPC-QIC dataset shows information from the past that is reported from participating programs. Information is voluntarily submitted from programs participating in the improvement collaborative. Any time data is self-reported, limitations can include a bias in what patients were selected to be included, and information missing from the database.

Some centers keep babies in the hospital during interstage and are not included in this data. Additionally, this report is only focused on reasons why a patient got readmitted but does not included what happened during that admission. A significant number of these "red flag admissions," were likely important clinical changes, which led to change in management, interventions and procedures, however, the outcome of the readmission is not included in this report.

What it all Means

Readmission, though likely, is usually for a short duration and for relatively minor issues. More information on best practices for readmission and how centers are preventing adverse events is needed.