Predicting Recurrent Coarctation of the Aorta in Infants with Single Ventricle Heart Disease Using Home Monitoring Data

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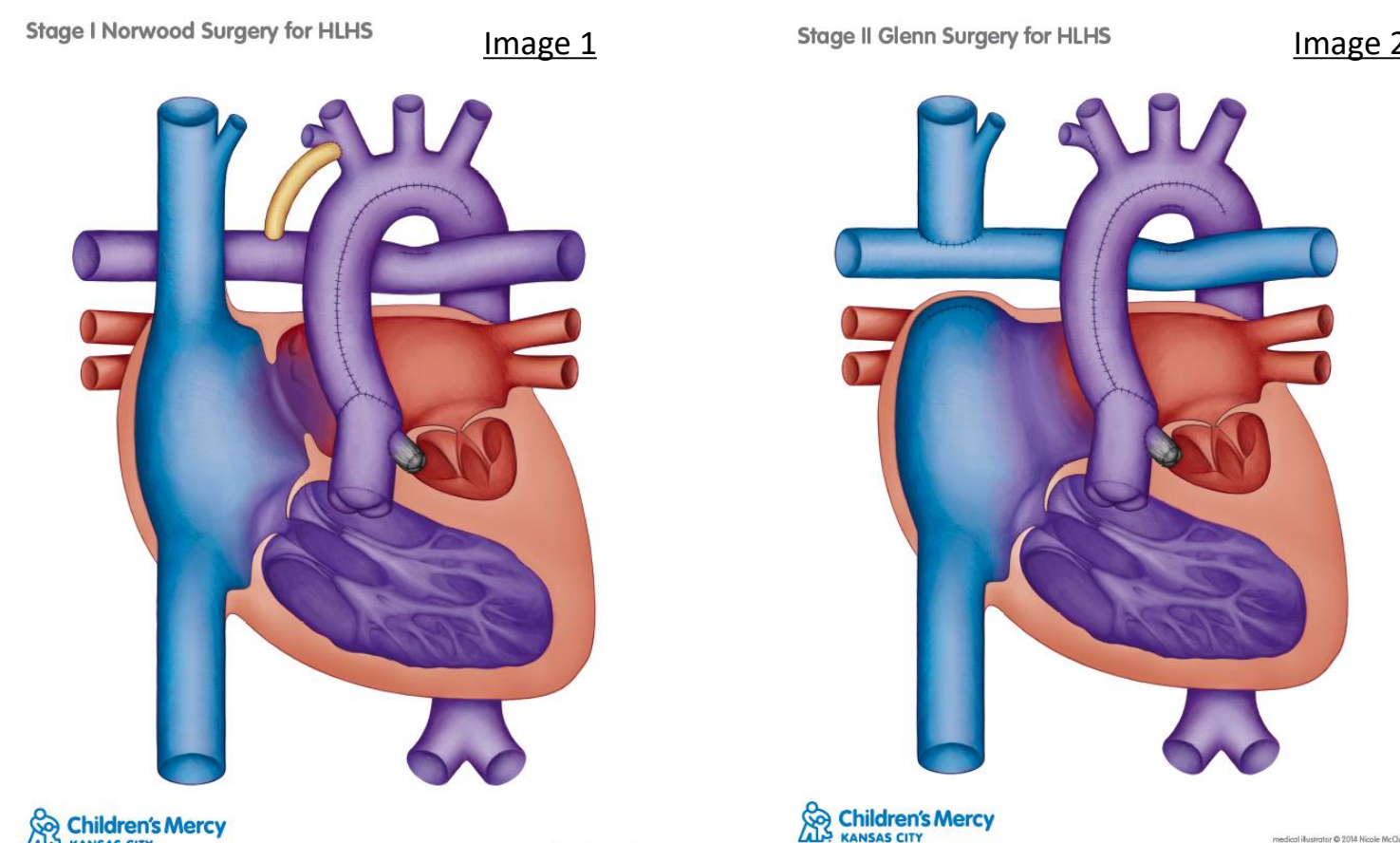[4]Children's Mercy Kansas City

Background

❖ The interstage period between the first and second palliation for hypoplastic left heart syndrome (HLHS) is a high-risk period [Images 1&2].

❖ Recurrent coarctation of the aorta (RCoA) is a common complication with an incidence of approximately 10-20%.

❖ Early recognition of RCoA following the Norwood operation may prevent significant interstage morbidity and mortality.

❖ Cardiac High Acuity Monitoring Program® (CHAMP) is a mobile home monitoring application enabling caregiver-acquired home physiologic data and videos to be instantly relayed to the clinical team.

❖ Aim: Investigate if caregiver-entered data results in earlier identification of patients requiring interventional catheterization for RCoA.

Methods

❖ Retrospective home monitoring data was extracted from 5 high-volume CHAMP-affiliated centers, defined as contributing >20 patients to the registry, between 2014-2021 after IRB approval.

❖ In the 14-days prior to hospital readmission for RCoA intervention, caregiver-recorded heart rate (HR), oxygen saturation (SpO2), weight, videos, and 'red flags' (qualitative signs such as feeding difficulties, increased work of breathing, etc.) were collected.

❖ Metrics were independently fit to a logistic model, adjusting for sex, shunt type, ICU discharge day-of-life, patient race, and readmission age. A 10,000-iteration bootstrap estimated the directionality and magnitude of associations between each factor and incidence of RCoA catherization during readmission.

Results

❖ Relationships assessed at 90% confidence given the exploratory nature of the work and small sample sizes.

❖ 45 of 167 patients who underwent cardiac catherization had RCoA interventions.

❖ For the 20 patients with multiple readmissions, only data prior to the first was included for analysis. Each patient's condition in the 7-days prior to readmission was reviewed by measures of adherence and summary statistics of vital signs.

Image 1 — Stage I Norwood Surgery for HLHS

Image 2 — Stage II Glenn Surgery for HLHS

❖ In the 7-days prior to readmission, associations with higher odds of catherization included the following *(mean bootstrap coefficient, [90% CI])*:

❖ Increased **adherence for vitals** [percentage of days with vitals, videos, and weight recordings] (0.336, [0.009-0.697]), **weight** (0.406, [0.056-0.794]) and **video recordings** (0.666, [0.322-1.042])

❖ The **total number of 'red-flags'** (0.354, [0.032-0.708])

❖ Standard deviation (0.381, [0.047-0.742]) and range of **heart rate** (0.412, [0.070-0.787])

❖ Mean (0.443, [0.101-0.814]) and IQR of **SpO2** (0.377, [0.032-0.716])

❖ Positive associations between change in **heart rate measurements** and **odds of catherization** (0.377, [0.032-0.716]) were noted between the 7-days prior to readmission and the week prior.

Conclusion

❖ Results highlight several notable associations of home monitoring data with catherization during the readmission.

❖ Interstage patients with RCoA had increased caregiver-entered home monitoring data, total red flags, and HR and SpO2 changes.

❖ Identification of these items by home monitoring teams may be beneficial in clinical decision-making for the evaluation and/or catheterization of these high-risk patients.

❖ Knowledge of a high potential for recurrent coarctation may allow for better counseling of parents prior to clinic appointments where a cardiac catheterization may be discussed.

References & Funding

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