

# **Trends in the Timing of Stage II Single Ventricle Palliation from 2009 to 2014: A Study from the National Pediatric Cardiology Quality Improvement Collaborative**

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## **Background**

Management of infants with complex single ventricle requires a staged surgical approach, beginning with the Norwood operation in the neonatal period. However, optimal timing of Stage II surgery, the bidirectional cavopulmonary connection, is unknown.

## **Objective**

To examine current timing of stage II palliation and to determine factors associated with earlier stage II in patients enrolled in the National Pediatric Cardiology Quality Improvement Collaborative (NPC-QIC).

## **Methods**

A retrospective analysis was performed in patients enrolled in the NPC-QIC registry from 2009 to 2014. Patients were grouped into the following eras based on their stage II surgical date: 2009-2011 and 2012-2014. The primary outcome was age at stage II palliation. Continuous variables were tested for an association with age at stage II palliation by using Spearman's nonparametric correlation. Categorical variables were tested for an association with age at stage II palliation by using a nonparametric Wilcoxon (2 levels of categorical variable) or Kruskal-Wallis test. We also examined variables that may have predicted earlier surgical dates for stage II palliation in the two cohorts.

## **Results**

Between 2009 and 2011, 184 patients underwent stage II palliation. The median age at stage II palliation for this group was 150 days (82-384). In the 2012-2014 era, 204 patients underwent stage II palliation at a median age of 153 days (74-384). Between the two eras, no statistically significant difference was observed for the age at which stage II palliation was performed. Comparison of the length of stay (LOS) following stage II, showed 8 days for the earlier era compared to 9 days in the latter era ( $p=0.3423$ ). Evaluation of variables that influenced the timing of stage II demonstrated a statistically significant difference in the age at which stage II palliation was performed in those using home surveillance compared to those without home surveillance; the median age for patients without home surveillance was 167 days versus 147 days for those who were using home surveillance ( $p=0.0086$ ). This finding was observed in the earlier era only as the latter era utilized home monitoring for all except one patient. There was no difference in the timing of stage II palliation when comparing type or frequency of home monitoring, or if a red flag action plan was in place.

## **Conclusion**

The age at which stage II palliation is performed for the functional single ventricle has not changed over time. As well, the hospital LOS following stage II palliation has not changed over time. The incidence of home monitoring has increased over time, and stage II palliation tended to occur earlier in those who had home surveillance compared to those without.