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DEPARTMENT OF PEDIATRICS  
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**Title:** Prospective Multicenter Analysis of Extubation Failure after Neonatal Cardiac Surgery

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**Abstract**

**Background:** For neonates undergoing surgery for congenital heart disease, mechanical ventilation represents an important component of their postoperative management. In some neonates, initial attempts at extubation and liberation from mechanical ventilation fail, and these failures can be a source of considerable postoperative morbidity. We aimed to describe the epidemiology of extubation failure and identify risk factors for its occurrence in a multicenter population of neonates undergoing surgery for congenital heart disease.

**Methods:** We conducted a prospective observational study of neonates  $\leq$  30 days of age who underwent cardiovascular surgery at seven tertiary care referral centers within the United States in 2015. Extubation failure was defined as reintubation within 72 hours of the first planned extubation. Risk factors were identified using multivariable logistic regression analysis and reported as odds ratios (OR) with 95% confidence intervals (CI).

**Results:** We enrolled 283 neonates, of which 39 patients (14%) were born prematurely, 41 (14%) had genetic abnormalities, and 93 (33%) had single ventricle anatomy. Thirty-five patients (12%) failed their first extubation attempt, median time 8 hours (range: 1-70 hours). In a multivariable logistic regression model, use of uncuffed endotracheal tubes (OR: 4.3; 95% CI: 1.7-10.7) and open sternotomy of 4 days or more (OR: 4.2; 95% CI: 1.2-14.7) were independently associated with extubation failure. Extubation failure was also independently associated with worse clinical outcomes, defined as hospital length-of-stay in the upper 25% or operative mortality (OR: 5.1; 95% CI: 2.0-12.8).

**Conclusions:** In this prospective multicenter analysis, extubation failure occurred in 12% of neonates who underwent surgery for congenital heart disease and had a negative effect on clinical outcome. Use of uncuffed endotracheal tubes and prolonged open sternotomy were identified as independent and potentially modifiable risk factors for the occurrence of this precarious postoperative complication.