

### Surgeon Volume and Operative Mortality in Congenital Heart Surgery

Welke, Karl F.; Karamlou, Tara; He, Xia; Jacobs, Marshall L.; Jacobs, Jeffrey P.; and Pasquali, Sara K.

Children's Hospital of Illinois, Peoria, IL, UC-San Francisco, San Francisco, CA, Duke Clinical Research Institute, Durham, NC, Cleveland Clinic Foundation, Cleveland, OH, Congenital Heart Institute of Florida, Tampa, FL, University of Michigan Congenital Heart Center-C.S. Mott Children's Hospital, Ann Arbor, MI  
CVS

While the relationship between hospital volume and mortality related to congenital cardiac surgery has been established, the influence of surgeon volume is less certain. We sought to determine the association between surgeon volume and mortality in a national clinical database.

Congenital cardiac operations performed on patients 18 years of age or under between 2005 and 2010 were identified in the Society of Thoracic Surgeons Congenital Heart Surgery Database (71,745 patients from 197 surgeons at 84 hospitals). Hospitals were grouped by annual congenital cardiac surgical volume (low, <150; medium, 150-249; high, > or = 250 cases per year). Surgeons were similarly categorized (low, <75; medium, 75-124; high, > or = 125 cases per year). We used logistic regression to examine the relationships between operative mortality and annual surgeon volume and hospital volume. Models were adjusted for patient characteristics and operations were stratified by mortality risk.

Surgeon volume was inversely associated with operative mortality for both low mortality risk ( $p = 0.001$ ) and high mortality risk ( $p < 0.001$ ) procedures and for the Norwood operation ( $p < 0.001$ ). The adjusted odds ratio for death (for patients operated on by a low vs. high volume surgeon) varied from 1.34 for low mortality risk procedures to 2.44 for the Norwood operation. Surgeon volume accounted for the largest proportion of the apparent effect of hospital volume in low volume centers (49% for low mortality risk procedures, 53% for high mortality risk procedures, and 56% for the Norwood operation). Similarly, the influence of surgeon volume was moderated by hospital volume, more so for low volume surgeons. In general, mortality was highest among low volume surgeons regardless of the surgical volume of the hospital in which they operated.

Both hospital and surgeon volume were associated with mortality after congenital cardiac surgery. Although patient factors account for the majority of an individual's mortality risk, patients may improve their odds of survival by choosing a high volume surgeon, even at a high volume hospital.