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EDITORIAL COMMENTARY

Risk models for pediatric and congenital cardiac surgery

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See related article on pages 2201-6.

The Japan Congenital Cardiovascular Surgery Database (JCCVSD) is to be congratulated for their important contribution to congenital and pediatric cardiac care in

the domains of outcomes analysis and quality improvement.¹ The authors have described the development of sophisticated congenital cardiac surgical risk models for short-term and mid-term outcomes based on integrated data from nationwide hospitals in Japan, using JCCVSD. This contribution is important because it describes the development of congenital cardiac surgical risk models that add to extant risk models by both the incorporation of several patient-specific variables and increased duration of follow-up.

JCCVSD uses the same nomenclature (International Pediatric and Congenital Cardiac Code) and data standards that are used in the Society of Thoracic Surgeons Congenital Heart Surgery Database (STS-CHSD) and the European Association for Cardio-Thoracic Surgery Congenital Heart Surgery Database (EACTS-CHSD).

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STS-CHSD and EACTS-CHSD hope to follow the lead of JCCVSD and expand their methodology of risk modeling to incorporate patient-specific variables and increased duration of follow-up.

The most common form of risk adjustment used by STS-CHSD and EACTS-CHSD is based mainly on the estimated risk of mortality of the primary procedure of the operation, as defined by the Society of Thoracic Surgeons (STS)–European Association for Cardio-Thoracic Surgery Congenital (EACTS) Heart Surgery Mortality Categories (STAT Mortality Categories).² Because of the increased availability of robust clinical data, it is now possible to add a variety of specific patient characteristics to pediatric and congenital cardiac surgical risk models.³ Beginning in January 2015, STS-CHSD plans to begin voluntary public reporting of programmatic congenital cardiac surgical outcomes using a new risk model that includes both procedural risk as defined by STAT categories and several patient-specific characteristics including prematurity, chromosomal abnormalities, syndromes, noncardiac congenital anatomic abnormalities, and preoperative factors.⁴ The *2014 STS-CHSD Mortality Risk Model* includes primary procedure, STAT Mortality Category, age, prior cardiothoracic operation(s), any noncardiac congenital abnormality, any chromosomal abnormality or syndrome, important preoperative factors (mechanical circulatory support, shock persisting at time of surgery, mechanical ventilation, renal dysfunction, and neurologic deficit), prematurity (neonates and infants), and weight (neonates and infants). Ultimately, the assessment of congenital and pediatric cardiac surgical performance will likely be based on a composite model of multiple domains including risk-adjusted mortality²⁻⁴ and risk-adjusted morbidity,⁵ with risk adjustment based on both procedural and patient characteristics.

In addition to the incorporation of patient-specific variables into congenital cardiac surgical risk models, JCCVSD has expanded the duration of follow-up of patients undergoing congenital and pediatric cardiac surgery. The length of follow-up in STS-CHSD and EACTS-CHSD is defined by the term operative mortality. Operative mortality is defined in all STS databases as (1) all deaths, regardless of cause, occurring during the hospitalization in which the operation was performed, even if after 30 days (including patients transferred to other acute care facilities); and (2) all deaths, regardless of cause, occurring after discharge from the hospital, but before the end of the 30th

postoperative day.⁶ Several potential strategies can facilitate longitudinal follow-up with STS-CHSD, EACTS-CHSD, and JCCVSD, including the development of clinical longitudinal follow-up modules within these databases themselves, and linking these databases to other clinical registries, administrative databases, and national death registries. The ultimate goal of achieving lifelong multi-institutional follow-up of patients undergoing congenital and pediatric cardiac surgery is challenging but achievable.

The science of assessing the outcomes and improving the quality of congenital and pediatric cardiac care continues to evolve. The assessment of variation in outcomes across pediatric and congenital cardiac surgical programs requires adjustment for differences in case mix across hospitals. The importance of this concept is magnified in the current era of public reporting of outcomes. Public reporting without risk adjustment is misleading and can lead to risk aversion, with efforts made to avoid caring for the sickest of patients who might benefit the most from cardiac surgery. Ideally, risk adjustment includes both incorporation of procedure and patient-specific variables as well as longitudinal follow-up. JCCVSD is to be congratulated for advancing the standard of congenital and pediatric cardiac surgical risk models in both of these domains: longitudinal follow-up and the incorporation of patient-specific variables in risk models.

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