

Editorial



Risk Stratification Models for Adults with Congenital Heart Disease

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▶ See the article “External Validation of 3 Risk Scores in Adults with Congenital Heart Disease” in volume 49 on page 856.

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Conflict of Interest

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Assessment of clinical risks are important for clinical decision making and improvement of performance of healthcare providers. For pediatric patients undergoing cardiac operations for congenital heart disease (CHD), a number of risk stratification models have been developed. Risk Adjustment for Congenital Heart Surgery scoring system (RACHS-1) and Aristotle Complexity Score were developed based on expert opinion. An evidence-based risk stratification system, STAT Mortality Categories have been developed based on Congenital Heart Surgery Database of European Association for Cardiothoracic Surgery and Society of Thoracic Surgeons (STS). These risk models have been validated and widely employed for congenital cardiac surgery.

In this issue, Ramchandani et al. studied the performance of three surgical mortality risk models, RACHS-1, Aristotle Complexity Score, and European System for Cardiac Operative Risk Evaluation (EuroSCORE) using their institutional patient cohort, a single-center cohort of 608 adult patients with CHD.¹⁾ All three risk scores showed a fair discrimination without any statistically significant differences. The RACHS-1 and the Aristotle scoring system were well calibrated, whereas there was lack of calibration in EuroSCORE. The STAT Mortality Category was not tested in the study because the number of missing values was too large. The authors concluded that among three scoring systems, the RACHS-1 was best scoring system for predicting in-hospital mortality. The EuroSCORE is a model which is designed to predict hospital mortality in adults with acquired cardiac disease. Using risk variables presented by the patient, the model provides the likelihood of death for any individual. Results in this study demonstrated that the pediatric mortality risk stratification scores have better performance for adults with CHD. Also, it also demonstrated that in adults with CHD, type and extent of the surgical procedure is the key determinant of the surgical mortality rather than the patient's comorbidities.

Nonetheless, application of pediatric mortality risk stratification scores for adults have suboptimal prognostic value. The RACHS-1 and the Aristotle Basic Scores have low predictive value for mortality when applied for adult patients.²⁻⁴⁾ Evidence based risk assessment model, STAT score, showed better performance as it is in the range of useful prediction.³⁻⁵⁾ Adult with CHD have different clinical characteristics from pediatric patients. For similar CHD, the adult population tend to have different severity of disease and comorbidities. They often have post-repair residual lesion and sequelae such as heart failure, arrhythmia, pulmonary hypertension

and others. Acquired lesions with aging such as hypertension, diabetes mellitus, and obesity negatively influence on original cardiovascular disease. Moreover, metabolic syndrome is more common among adult CHD than in the general population.⁶⁾ Varied preoperative conditions may be related to diverse clinical outcomes after cardiac procedures, and these might result in suboptimal performance of the pediatric risk stratification model in adult population.

As the population of adults with CHD and cardiac operations for these patients are increasing, need for well-designed risk stratification model is rapidly growing. New risk stratification models for estimating mortality risk in adults with CHD was proposed. Adults Congenital Heart Surgery score is procedure-specific mortality rate estimates for adults patients.⁵⁾ It was developed using a cohort of only adult patients in STS-Congenital Heart Surgery Database. Grown-up with congenital heart disease scoring system proposed by Hörer and colleagues incorporate the procedure-related risk from STAT score and comorbidity-related risk (Aristotle Comprehensive Score) and age of the patients.⁴⁾ Internal validation demonstrated better prediction power for surgical mortality, but still external validation is limited. Large multi-institutional databases will serve to develop or refine risk stratification models for adults with CHD.

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