See Article page 2095.

Commentary: Appropriate frailty measures should be incorporated into the development of accurate risk calculation models for evaluation of transcatheter aortic valve replacement candidates

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The European System for Cardiac Operative Risk Evaluation score and the Society of Thoracic Surgeons (STS) risk score are the most widely used risk scores to predict operative mortality in patients undergoing cardiac surgery. However, these models are substantially limited in application to patients who are candidates for transcatheter aortic valve replacement (TAVR).¹ The European System for Cardiac Operative Risk Evaluation II score typically overestimates perioperative risk, whereas the STS risk score typically underestimates perioperative risk in frail patients.^{2,3} A general shortcoming of these risk scores is the omission of several important risk factors such as frailty, malnutrition, and history of delirium. Accordingly, both risk scoring systems lack sufficient power to optimize patient selection and predict short-term outcomes.⁴ To establish appropriate TAVR-specific risk models and predict early and late outcomes, several important articles have recently been published.³⁻⁷

van der Wulp and colleagues⁸ offer a carefully conducted study to identify geriatric assessment tools designed to predict postoperative delirium and long-term mortality after TAVR. These preoperative comprehensive assessment tools included the mini-mental state exam, basic and instrumental

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CENTRAL MESSAGE

Incorporation of properly selected frailty indices into conventional risk models is required to improve early and late survival and reduce delirium episodes in geriatric patients who undergo TAVR.

activities of daily living, gait speed and/or timed up and go test, and mini-nutritional assessment or serum albumin assessment. Along with other studies,^{6,7} their results further confirmed that impaired preoperative mobility was among the strongest predictors of postoperative delirium and 1- to 2-year mortality in patients who underwent TAVR.^{8,9}

It remains unknown how many frailty indices should be incorporated into conventional risk scores to develop an ideal prognostic model with good discrimination and calibration.⁴ Up to this point, the STS risk score (version 2.9) and STS/American College of Cardiology Transcatheter Valve Therapy Registry (version 2.1) have included 5-m gait speed in the patient-related factors. However, the inclusion of 1 easily measured mobility index alone may not be sufficient to capture the true influence of frailty on postoperative delirium or early and late survival and quality of life after TAVR.

An ideal risk scoring system should be easy to perform on hospital wards or in an outpatient clinic. At the same time, it must have good discrimination and calibration power to reliably predict both short- and long-term outcomes. Greater implementation of easily measurable frailty indices such as mobility (gait speed and timed up and go test), the Clinical Frailty Scale, malnutrition (serum albumin level and body mass index),^{10,11} sarcopenia (psoas muscle area determined by computed tomography scan),¹² cognitive impairment (mini-mental state exam),^{8,9} anemia

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Disclosures: The author reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

Received for publication April 11, 2020; revisions received April 11, 2020; accepted for publication April 13, 2020; available ahead of print May 5, 2020.

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J Thorac Cardiovasc Surg 2021;161:2103-4

0022-5223/\$36.00

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<https://doi.org/10.1016/j.jtcvs.2020.04.107>

(hemoglobin level),¹⁰ and history of delirium^{8,13} may be necessary to achieve the goal of establishing the most reliable risk prediction model.

Once an externally validated, reliable risk model is established, it can be used to select appropriate patients for pre-rehabilitation and choose an appropriate postoperative cardiac rehabilitation program according to the frailty of each patient. Moreover, careful analysis of predisposing factors for delirium before and after TAVR may facilitate prevention and postoperative treatment of this formidable complication in geriatric populations.

This will not be an easy task. However, a comprehensive surgical quality program based on machine learning and artificial intelligence may eventually achieve this goal.¹⁴

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