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EDITORIAL COMMENT

Frailty Scores and the Writing on the Wall*

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The recent interest in frailty as a predictor of poor outcomes after invasive procedures derives partly from the increasing use of transcatheter aortic valve replacement (TAVR) in the treatment of elderly high-risk patients with aortic stenosis. Historically, many of these patients were either never referred for therapy, primarily surgical aortic valve replacement, or were summarily turned down after failing the surgeon's personal "eyeball" test of operability. That frailty is now such a hot topic speaks to the fact that the less-invasive nature of TAVR is bringing more of these patients into the clinic for evaluation and therapy. Unfortunately, even

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though TAVR is truly less invasive and provides excellent hemodynamic results, many patients survive the early postoperative period only to die within the first year. In the Cohort A TAVR subset of the PARTNER (Placement of AoRTic TraNscathetER Valve) trial, an additional 18.5% of patients that survived the early operative period were dead within 1 year (1). The concept of frailty and its impact has been advanced as a possible explanation for the attrition in survival that occurs after seemingly successful procedures. In an effort to be more discriminative with regard to which patients to offer TAVR, clinicians are attempting to conceptualize the many previously recognized stigmata of frailty in this elderly population.

In this issue of *JACC: Cardiovascular Interventions*, Stortecky et al. (2) describe the use of multidimensional geriatric assessment (MGA) as a tool to predict mortality and morbidity in a population of 100 patients undergoing TAVR. Sixty-three patients had a Medtronic CoreValve (Medtronic, Minneapolis, Minnesota), and 37 patients had an Edwards Sapien valve (Edwards Lifesciences, Irvine, California) implanted. The MGA consisted of several components designed to assess cognitive and functional capacity such as a Mini Mental State Examination, Mini Nutritional Assessment, Timed Get Up and GO, Basic Activities of Daily Living (BADL), Instrumental Activities of Daily Living, and intensive interrogation with regard to mobility. These tests were then made bimodal by inserting arbitrary cut points that classified test results into probable or improbable findings of cognitive impairment, malnutrition, or immobility. A numerical value was then assigned to the outcomes of each test, which were then summed to provide a combined measure called the frailty index. This index ranged from 0 to 7 points, with ≥3 designating probable frailty.

Additionally, patients had a Society of Thoracic Surgeons Risk Score (STS Score) and a logistic EuroSCORE calculated. Patients were stratified on the basis of their risk score. Higher-risk patients had an STS Score ≥5% and a logistic EuroSCORE ≥15%. Lower-risk patients had an STS Score <5% and a logistic EuroSCORE <15%. Outcomes were then evaluated on the basis of predicted risk score and results of the frailty instruments and frailty index.

Stortecky et al. (2) found that the STS Score showed a strong association with all-cause mortality and major adverse cardiac and cerebrovascular events (MACCE) at 30 days and 1 year after TAVR. This outcome is somewhat unanticipated, because the authors make the case for the inclusion of frailty testing when evaluating patients for TAVR primarily because the commonly used risk scoring algorithms can be relatively inaccurate in this population. The EuroSCORE was only found to be associated with 1-year mortality and MACCE and then only when used as a linear measure. Of the MGA tests, Mini Mental State Examination, Mini Nutritional Assessment, Timed Get Up and GO, BADL, and the frailty index demonstrated an association with all-cause mortality and MACCE at 30 days and 1 year. These various tests were found to be similar in predictive power to the commonly used risk algorithms. In this study, only 56% of the patients had an STS Score of >5%, which many would consider only moderate risk at best. This is also reflected in the fact that less than one-third of the patients had cognitive impairment or at least 1 limitation of any BADL. Unknown is how many patients could be considered high-risk (STS Score ≥8% to 10%) and whether the impact of frailty scoring is even more predictive in this cohort of patients. Additionally, it would be instructive to know whether any 1 of the tests was more specific to predicting outcomes depending on whether TAVR was performed transapically or transfemorally—especially because these tend to be different groups of patients in terms of risk factors and outcomes. Further examination of these assessments on a larger cohort of patients in a multicenter study will be critical to answering some of these questions.

It is acknowledged that aging and some degree of frailty generally go hand in hand. It is important to emphasize, however, that frailty and disability are not synonymous—

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one can be disabled without being frail, and vice versa. The implications of aging, however, are more than just a numbers game. The ability of a patient to tolerate operative stress depends on many variables, including comorbid illness, lifelong health habits, nutritional reserve, economic resources, and psychological resiliency. Many of these combine to account for the intrinsic vigor of patients and their overall suitability for procedures. Frail patients tend to have several characteristics in common that directly affect their ability to recover from surgery: diminished skeletal muscle mass, poor nutrition, low activity levels, and poor endurance. These factors can predispose patients to numerous post-operative complications, such as pneumonia or urinary tract infections. Objectifying these components is the key to using frailty as a tool for operative decision making.

Incorporating a frailty evaluation into an assessment of patient risk of morbidity or mortality with surgery promises to improve patient selection for TAVR. One of the strengths of the approach taken by Stortecky et al. is that it tests all the common parameters associated with poor physiologic reserve—nutrition, cognitive ability, and physical disability. In contrast, other authors (3) have focused predominately on measures of physical disability. Incorporating these tests or other measures of frailty into the assessment of patients presenting for TAVR offers the ability to be more discriminate with the technology. Unknown, however, is what weight to apply to these tests when evaluating patients. In this study, 49% of the patients were considered frail by the frailty index of the authors, but the 1-year mortality was only 19%. Therefore, most patients considered frail did well with surgery and were alive at 1 year. This highlights the challenge with any scoring method, in that they are useful for gauging risk for large groups, but each patient has to be assessed individually. In actual practice, frailty scores are more often used to justify TAVR rather than conventional surgery. Using frailty scores to steer patients from conventional surgery to TAVR is likely to be more effective than using them to deny treatment. Denying treatment that has been shown to be superior to medical therapy in this population is one of the more difficult decisions made by clinicians. It generally incorporates numerous factors, including risk scores, center or operator experience, and also subjective assessments such as the "eyeball" test. Whether any patient would be refused a procedure purely on the basis of a frailty score is unknown at this point.

The work of Stortecky et al. (2) demonstrates the promise of frailty scoring in predicting outcomes in a small population of patients undergoing TAVR. The limits of TAVR continue to be explored, particularly with regard to which patients are too sick or frail for the technology. Frailty assessment promises to be a key component of either risk stratification or possibly risk calibration in the evaluation of these patients.

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Key Words: frailty scores ■ geriatric assessments ■ patient outcomes ■ transcatheter aortic valve replacement (TAVR).