Inevitability or opportunity?

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Despite continued improvements in cardiac surgical outcomes,¹ the invasiveness of surgical aortic valve replacement (SAVR) remains consequential, particularly in subsets of vulnerable patient populations. In this publication, Gaudiani and colleagues² demonstrated 2 critical findings. The first was that in high-risk patients with aortic stenosis, those undergoing SAVR have a 2-fold greater rate of mortality compared with those undergoing transcatheter aortic valve replacement (TAVR; 7.9% vs 4%, $P = .025$) that accounts for the difference in survival that persists to 2 years. The second was that differential mortality occurred in a finite period between 31 and 120 days but was equivalent in earlier or later periods.

These outcomes are attributed to clinical and subclinical complications of the procedure itself or to the inability to reverse underlying pathology (“failure to treat and recover”) that are consequential particularly in these at-risk patients. The interactions and impact of cardiovascular pathology, coexistent morbidities, and frailty on outcomes are not understood fully and are assumed to be nonlinear interdependent covariants. Accurately estimating their combined effects remains at the core of clinical decision making. As surgeons who actively participate and lead patient screening, assessments, and therapies (with both SAVR and TAVR), these sobering findings represent an opportunity to redirect a needed dialogue. Instead of casting this and other studies as an overly simplistic binary indictment or supremacy of one treatment modality over another (TAVR vs SAVR), we should embrace these therapeutic options as a complementary continuum of therapies.

Recommendations require dynamic reassessments that reflect the evolution of technologies as well as the changing specific needs of individual patients at different phases of well-being, age, activity, and disease. Future investigations should refocus on whether current outcomes and vulnerabilities are inevitable and the best we can achieve or, alternatively, whether these represent opportunities for clinically relevant improvements.

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Central Message

Outcomes of surgical aortic valve replacement and transcatheter aortic valve replacement in high-risk patient populations could be improved by refocusing future investigations on early recognition of physiological and physical dysregulations and prompt referral for therapy.

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Several areas of inquiry that aim to improve outcomes are evident:

1. *Improved routine objective discernment of frailty.* High-risk patient populations are not characterized fully by the Society of Thoracic Surgeons or European System for Cardiac Operative Risk Evaluation Predicted Risk of Mortality algorithms. Physical (such as frailty and limited mobility) as well as neurologic and psychosocial challenges (such as cognitive deficits, depression, lack of autonomy, and family support) equally are impactful and relevant. When these conditions are present, TAVR should be considered strongly in an attempt to limit ANY short-term disability with its potential major adverse consequences. At its extremes of immobility, frailty, and deconditioning, these may represent hallmarks of futility. Formal routine assessment and documentation of these vulnerabilities are essential and may have broader benefit much beyond this proscribed patient population.
2. *Addressing Delayed Therapy.* Despite improvements in both open surgical and catheter-based treatment options, these are still perceived by patients and referring

physicians as aggressive, invasive, and morbid. Delays in diagnosis and referral lead to physiologic decompensation and acceleration of baseline disabilities. Increased New York Heart Association class and deconditioning that progress from activity and autonomy to frailty and eventual disability significantly impact short-term risk (increased mortality by 3-fold) as well as long-term outcomes and potential benefits.^{3,4} Attention to ANY change in activity level and the addition of more nuanced physiological and imaging parameters of dysregulation (such as brain natriuretic peptide and left ventricular strain) to the current reliance on symptomatic indications for referral to therapy may be beneficial and impactful.^{5,6} Educational initiatives are necessary to reverse the assumption that indolence and delays in referral are safe and inconsequential.

3. *Reversing frailty.* Frailty and debility have been assumed to be progressive, intricately linked to underlying cardiovascular pathology and inevitable. The benefit of exercise-based physical cardiac rehabilitation (CR) has been well documented in the treatment of coronary artery disease with a reduction in cardiovascular mortality and rehospitalization.⁷⁻¹⁰ CR typically targets patient populations after a cardiovascular event (such as an myocardial infarction or cardiac surgery). Few studies focus on the impact of CR on valve pathology. Paradoxically, in patients with coronary artery disease, the frailest and most deconditioned (debilitated) patients, although they had the least improvement in objective measurements of physical well-being (smallest delta from baseline) compared with their more active peers, had the greatest improvement in cardiovascular mortality. Is it possible that brief, tailored physical therapy programs before a procedure (termed prehab) can improve short- and long-term outcomes regardless of the therapy used (SAVR or TAVR)?

This publication is an opportunity for our cardiovascular community to better assess and individualize valve therapies, consider the consequence of delayed therapy, and challenge the prevailing notion of the inevitability of significant morbidity and mortality from physiological and physical dysregulation in the high-risk patient.

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