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EDITORIAL COMMENT

Surgical and Transcatheter Mitral Valve Interventions in Older Adults

"Measure Twice, Cut Once"

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Ralph Waldo Emerson's words, "As we grow old, the beauty steals inward," remind us that the essence of successful aging lies not in outward appearance but in the quiet accumulation of wisdom, resilience, clarity, and inner strength. For older adults living with advanced valvular heart disease such as severe mitral regurgitation (MR), the "inward" priorities that matter most center on maintaining independence, minimizing symptoms of heart failure, and enjoying days at home away from hospital. Within this context, surgical and transcatheter mitral valve therapies can be considered "successful" only if they not only restore normal mitral valve function but also preserve the essential elements of healthy aging. Accordingly, a complete evaluation of older adults with severe MR must extend beyond routine valvular assessment to include a comprehensive appraisal of frailty, cognitive function, mobility, nutrition, polypharmacy, and social vulnerability. Despite broad recognition of this basic principle, systematic integration into clinical practice has yet to be realized.

KEY FINDINGS

In this issue of *JACC: Cardiovascular Interventions*, Kundi et al[1] analyzed 172,478 Medicare beneficiaries (≥65 years of age) who underwent mitral valve interventions between 2017 and 2022, representing the largest contemporary outcomes study in this space. Over the study period, volumes of mitral valve transcatheter edge-to-edge repair (M-TEER) and transcatheter mitral valve replacement (TMVR) nearly doubled, while surgical volumes declined by 16%. Indexed use rates per 100,000 Medicare Part A beneficiaries increased by 9.2%. In-hospital mortality was highest for surgery (6.9%), followed by TMVR (4.0%) and M-TEER (1.5%). Length of hospital stay and cost followed a similar gradient, but long-term outcomes were reversed: 5-year mortality was 40% for surgery, 55% for TMVR, and 62% after M-TEER. Frailty, as measured using the Hospital Frailty Risk Score, emerged as a strong, independent predictor of 5-year mortality with a clear dose-response relationship across treatment groups. Social vulnerability index was also strongly associated with 5-year mortality. In multivariable analysis, metastatic cancer, high frailty risk, lymphoma, renal failure, and weight loss emerged as the top 5 independent predictors of all-cause mortality. The study has major limitations, most notably the use of administrative claims data, which lack granular clinical and anatomical detail, and reliance on the Hospital Frailty Risk Score and a county-level social vulnerability measure, each of which cannot replace bedside frailty testing and detailed patient-level evaluations of social determinants of health. It is also notable that although mitral valve procedural volume varied widely across centers, median site volume was only 11 cases/y. This serves as a sobering reminder of the limited mitral valve experience across many centers in the United States, which contrasts sharply with established evidence linking low procedural volume to higher in-hospital mortality.[2] Nonetheless, the study's main findings reinforce the complex

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interplay between mitral regurgitation, heart failure, cardiovascular aging, frailty and social determinants of health.

CLINICAL IMPLICATIONS

So what can we learn from this study? First, the investigators are to be commended for linking frailty and social vulnerability to long-term mitral valve procedural outcomes at scale. Their findings extend well beyond the 1-year follow-up typical of registry data, such as the Society of Thoracic Surgery/American College of Cardiology TVT (Transcatheter Valve Therapy) Registry.[3] Importantly, the less favorable long-term outcomes observed after transcatheter therapies should not be misconstrued as procedural inferiority, as they appear to reflect patient selection. Patients undergoing transcatheter interventions were older, frailer, and more socially vulnerable than those treated with surgery. In the setting of advanced geriatric syndromes, it is well established that surgery is often declined in favor of less invasive transcatheter approaches.[4] The investigators rightly refrain from asserting causal inference across treatment modalities, and readers should do the same. The key insight provided from this study is that frailty and social vulnerability independently predict long-term survival following mitral valve interventions, irrespective of treatment. This recognition has direct implications for heart teams evaluating geriatric patients referred for mitral valve interventions.

Tailors often advise, "measure twice, cut once." In the context of mitral valve therapy, the first "measure" is well established: the use of imaging modalities such as echocardiography and computed tomography to define valve anatomy, disease severity, and procedural suitability. The second "measure," however, must extend beyond this. It requires a comprehensive assessment of geriatric syndromes: a set of conditions that defy a single disease category yet profoundly shape outcomes. Geriatric syndromes include frailty (defined as decreased physiological reserve and an increased vulnerability to stressors[5]), cognitive impairment and delirium, limited mobility and fall risks, malnutrition and weight loss, sarcopenia, depression and mood disorders, incontinence, polypharmacy, pressure ulcers, sensory impairment and sleep disorders.[6] Superimposed on these are key social determinants of health, including the home environment, caregiver support, and access to transportation and pharmacy that also influence a geriatric patient's recovery following invasive cardiovascular procedures.

Integrating assessment of geriatric syndromes into structural heart program workflows is not straightforward. This requires a recognition of its value and the use of standardized, reliable, and reproducible assessments by the multidisciplinary heart team.[7] Heart teams should have access to comprehensive geriatric medicine consultation, and although no uniform standards exist, several practical screening tools are available.[4] Frailty can be rapidly assessed using the Clinical Frailty Scale, gait speed, the Short Physical Performance Battery, and the Essential Frailty Toolset. Cognitive status can be evaluated using the Mini-Cog or Montreal Cognitive Assessment[2] and mobility using the timed up-and-go test. Nutritional risk and sarcopenia can be screened using weight loss history or the SARC-F (strength, assistance with walking, rising from a chair, climbing stairs, and falls) questionnaire. Polypharmacy, caregiver support, transportation, and home environment should also be reviewed. Integrating the relevant data from a comprehensive geriatric evaluation into multidisciplinary heart team deliberations is paramount. This empowers the heart team to render individualized patient shared decision making that accounts for a patient's baseline status, the risks vs benefits of a procedure, short- and long-term prognosis, and health values. In general, when physiological reserve is preserved, surgical repair or replacement is a viable option. When reserve is limited or borderline, (ie, advanced frailty, slow gait, weight loss, orthostasis, or cognitive impairment) transcatheter therapies may be more appropriate. Regardless of treatment modality, optimal guideline-directed medical therapy and cardiac rehabilitation are essential.[8] The ongoing challenge is to define the minimum testing required to assess geriatric syndromes in a manner that is not too burdensome to patients and heart teams and scalable across all heart programs.

FUTURE DIRECTIONS

There is an urgent need to embed comprehensive geriatric evaluation within routine multidisciplinary heart team workflows. As most centers lack access to specialized geriatric consultation, testing algorithms must be efficient and easily applied. Prospective, multicenter studies evaluating bedside measures of geriatric syndromes and linking these to long-term outcomes are needed to help discern which domains independently influence outcomes and guide clinical decision making. Equally important is the collection of patient-centered outcomes that matter most, including quality of life, days at home away

from the hospital, independence, cognition and mobility. Pragmatic study designs may layer data collection on existing databases, such as the TVT Registry, to help limit patient and heart team burden. Until best practices are identified, heart teams should use the tools and expertise that are locally available. Finally, given that patient outcomes are influenced by other social factors (health care and pharmacy access, transportation, home health services, and caregiver support), immediate attention to these domains is also warranted.

CONCLUSIONS

To care for older adults with severe MR requires "measuring twice"—through precise valve assessment and comprehensive geriatric evaluation—and "cutting once" with the most appropriate valve repair or replacement procedure. Measuring twice in this context allows heart teams to better balance risks and benefits and align treatment recommendations with a patient's health values and the outcomes that matter most. The study of Kundi et al[1] serves as a stark reminder that standardized assessments of geriatric syndromes must become a core component of comprehensive heart programs evaluating older adults with advanced valvular heart disease. Embedding these principles into practice will take us one step closer to fulfilling Emerson's vision that "as we grow old, the beauty steals inward."

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