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INVITED COMMENTARY

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In this issue of *The Annals of Thoracic Surgery*, Malvindi and colleagues[1] are to be congratulated for their brave, insightful, and yet puzzling exercise to systematically review reported outcomes after bioprosthetic mitral valve replacement.

Why is it brave? Because of the complexity of the topic—mitral valve replacement, unlike aortic valve replacement, is not a golden standard but is reserved for patients in whom repair is not possible, which is a heterogeneous group. In addition, during the long time span of the study—over 35 years—mitral valve surgery practice dramatically changed, as did patient profile and life expectancy in all parts of the world. Add the multiple bioprostheses that were investigated, and the major methodological challenges that we still face when trying to assess their durability, and that makes this systematic review a brave exercise indeed.

Why is it insightful, yet puzzling? The study provides an in-depth overview—both historical and more contemporary—of both patient survival and freedom from structural valve deterioration (SVD) for different mitral valve bioprostheses. The main message from this study is that the data suggest both superior survival and freedom from SVD in patients receiving the Mosaic valve. But why would patients with a Mosaic valve live longer? Is this due to patient selection, optimal valve hemodynamics, or a combination? And why would these longer-living Mosaic patients experience less SVD? Patient mortality and SVD are competing risks, and in a population with a low mortality rate usually SVD occurrence will be higher compared with populations with a higher mortality rate.[2] Is it because the Mosaic valve is extremely durable, even in "very durable" patients? Or is it because the mean follow-up duration of 3 of the 4 included Mosaic studies is less than 3 years? Perhaps the methodological flaws that are inherent to systematic reviews of mainly retrospective observational and heterogeneous data play an important role. Or is it in the employed definition of SVD? The authors report that only 23 of the 40 included papers reported SVD according to the Akins guidelines for mortality and morbidity after cardiac valve intervention.[3] A closer look at the interpretation of these guidelines in the 23 individual papers that report to follow the Akins guidelines (in their Supplemental Table 2) reveals that some use SVD diagnosis, some use SVD reoperation, and some use SVD reoperation and SVD at autopsy. These different interpretations of SVD can result in different SVD outcomes estimates. SVD reoperation for example can be viewed as a "hard" endpoint, but actually it is not an endpoint and is instead a clinical decision that was based on a diagnosis and the consideration of other clinical factors (and hopefully patient preferences), and not all patients with diagnosed SVD will undergo reoperation. SVD diagnosis on the other hand might not necessarily be considered an endpoint because the measurement of valve dysfunction can vary over time, and it should ideally be modeled using longitudinal modeling techniques.[3]

Malvindi and colleagues in their brave attempt to give an overview of outcomes after bioprosthetic mitral valve replacement have succeeded in painting a historical and contemporary picture, and at the same time have left us with many missing puzzle pieces to be found.

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0003-4975/$36.00
https://doi.org/10.1016/j.athoracsur.2019.08.053