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Key Words: microsimulation, aortic valve replacement, bioprosthetic valves, tissue valves, structural valve degeneration

Discussion

Dr P. Boateng *(New York, NY)*. I have 3 questions. One of the premises of microsimulation is that a primary data set has to go through a validation and sensitivity analysis, validation of internal, validation if you use your own data, and then another data set to make sure that the results actually match what you include in the microsimulation. Did you do that, and if so, what did you come up with in terms of that?

Dr Ranganath. Our model is based on a previously validated model by Grunkemeier and colleagues, but their rationale for performing sensitivity analysis was that they had heterogeneous data compiled from multiple sources. We included homogeneous long-term data from only 1 data source (Bourgignon and colleagues), and thus sensitivity analysis is not relevant to our model. We did, however, internally validate our model against our primary dataset for SVD.

Dr Boateng. My second question relates to the title of your article. You talked about bioprostheses, but the data set that you used was solely constructed from people who received the Perimount valve; that's just 1 valve type. So how do you talk to the patient who is going to get a different valve type, say a Hancock or the Mitroflow? How do extrapolate the data to the conversation with the patient going forward?

Dr Ranganath. I agree that it would be interesting to know how other valves perform within our model. We selected the Perimount valve because it had the best long-term data available, and knowing what happens 20± years after implantation is critical for an accurate simulation. One difficulty is that the new valves are coming out faster than we can collect long-term data on older valves; we really need data of 20, 25, 30 years after implantation, and new valves are coming out more quickly than that. However, we are still implanting those previous-generation valves, and many patients still have those valves in place, so we can still collect that data moving forward even though newer valves are being manufactured. Ultimately, this means that our model will not be able to simulate the newest generation of valves, because long-term data are not available for them.

Dr Boateng. My last question relates to the input of data in the microsimulation model. You mentioned in your presentation that you use an unnamed risk with no comorbidities. We know those are not real-life situations; patients have comorbidities. How do you account for not including that in your analysis?

Dr Ranganath. Unfortunately, we do not have SVD data stratified for comorbidities. Similarly, our all-cause mortality data extracted from the Social Security Administration actuarial tables are also not stratified by comorbidities. We agree that it would be interesting to know how diabetes or end-stage renal failure would affect our model, but these data are not yet available. We can, however, stratify STS mortality risk by comorbidities. Moving forward, we do plan to extend our model to incorporate the effect of comorbidities on operative mortality. Additional data will continue to make this model more accurate, and we will incorporate such data as they are published. Our goal with this project, however, was to demonstrate that microsimulation is well suited for modeling the risk of aortic valve re-replacements because of its ability to adjust hazards based on previous life events.