P.A. is a speaker for Medtronic and Edwards Lifesciences.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

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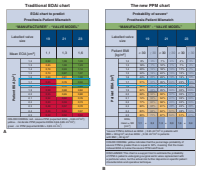
https://doi.org/10.1016/j.jtcvs.2020.12.041



REPLY FROM AUTHORS: THE PPM CHART: A NEW TOOL TO ASSESS PROSTHESIS-PATIENT MISMATCH PROBABILITY BEFORE AORTIC VALVE REPLACEMENT

Reply to the Editor:

We thank Vriesendorp and colleagues[1] for their letter discussing prosthesis-patient mismatch (PPM) after aortic valve replacement and the new PPM Chart proposed by the European Association for Cardio-Thoracic Surgery-Society of Thoracic Surgeons-American Association for Thoracic Surgery Valve Labelling Task Force.[1] They raise important issues that require attention.

First, it is important to outline the fundamental differences between traditional indexed effective orifice area (EOAi) charts and the new PPM Chart. Traditional EOAi charts calculate the mean expected EOAi to classify expected PPM as severe (typically red fields), moderate (yellow fields), or absent/mild (green fields), based on this value falling under or above a predefined cutoff. This seemingly attractive simplicity comes with a serious and established tradeoff in terms of reliability.[2,3] In contrast to traditional EOAi charts, the new PPM Chart proposed by the Valve Labelling Task Force provides the calculated percent probability of expected severe PPM based on the distribution of normal reference effective orifice area (EOA) values. By providing a percent probability, the new PPM Chart is meant to correct, at least in part, the inaccuracy of traditional EOAi charts, which classify expected PPM merely as a binary outcome (present vs absent). However, we agree with Vriesendorp and colleagues[1] that because PPM charts are based on in vivo reference EOAs, characteristics of the population in which these EOA values were determined could influence their accuracy.

Second, Vriesendorp and colleagues[1] question the validity of current definitions for PPM, which are based on EOAi cutoffs.[4,5] Although these cutoffs might be challenged,[6] it is logical that the assessment of PPM after aortic valve replacement employs EOAi cutoffs determined by echocardiography[4,5,7] because the severity of native aortic stenosis is also assessed using similar, echocardiography-derived criteria.[8,9] The mandate of the Valve Labelling Task Force was not to challenge or revise existing PPM definitions, but rather help surgeons to estimate the risk of severe PPM at the time of a procedure, while highlighting the limitations of PPM prediction using reference EOAs.

Finally, Vriesendorp and colleagues[1] discuss the potential danger of unnecessary aortic annulus enlargement procedures due to expected PPM based on the new PPM Chart suggested by the Task Force. Indeed, traditional EOAi charts (Figure 1, *A*) could potentially push surgeons to perform preventive procedures during AVR if the patient falls into the red areas (ie, severe PPM), although these procedures may not always be necessary nor justified. The new PPM Chart proposed by the Valve Labelling Task Force provides percent probability of severe PPM. These charts are thus more granular and far less categorical and dictatorial than traditional EOAi charts (Figure 1, *B*). We believe that these new charts can help surgeons to make more balanced and better informed decisions when selecting prosthetic valves or choosing a treatment strategy for their patients.

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Traditional EOAi chart

EOAi chart to predict Prosthesis-Patient Mismatch				
"MANUFACTURER" - "VALVE MODEL"				
Labelled valve size		19	21	23
Mean EOA [cm^2]		1,1	1,3	1,6
Patient BSA [m^2]	1,2	0,92	1,08	1,33
	1,3	0,85	1,00	1,23
	1,4	0,79	0,93	1,14
	1,5	0,73	0,87	1,07
	1,6	0,69	0,81	1,00
	1,7	0,65	0,76	0,94
	1,8	0,61	0,72	0,89
	1,9	0,58	0,68	0,84
	2,0	0,55	0,65	0,80
	2,1	0,52	0,62	0,76
	2,2	0,50	0,59	0,73
	2,3	0,48	0,57	0,70
	2,4	0,46	0,54	0,67
	2,5	0,44	0,52	0,64

COLOR CODING: red - severe PPM (expected EOAi ≤ 0,65cm^2/m^2); yellow - moderate PPM (expected EOAi 0,66-0,85 cm^2/m^2); green - no PPM (expected EOAi > 0,85 cm^2/m^2)

A

The new PPM chart

Probability of severe* Prosthesis-Patient Mismatch							
"MANUFACTURER" - "VALVE MODEL"							
Labelled valve size		19		21		23	
Patient BMI [kg/m^2]		< 30	≥ 30	< 30	≥ 30	< 30	≥ 30
Patient BSA [m^2]	1,2	9%	3%	7%	4%	4%	3%
	1,3	16%	7%	12%	7%	7%	4%
	1,4	25%	12%	18%	10%	11%	7%
	1,5	34%	18%	24%	15%	15%	10%
	1,6	43%	25%	29%	19%	19%	13%
	1,7	51%	31%	35%	24%	23%	16%
	1,8	58%	38%	40%	29%	28%	20%
	1,9	64%	44%	45%	33%	32%	23%
	2,0	69%	50%	50%	37%	35%	27%
	2,1	74%	55%	54%	41%	39%	30%
	2,2	77%	60%	58%	45%	42%	33%
	2,3	80%	64%	61%	48%	45%	36%
	2,4	83%	68%	64%	51%	48%	39%
	2,5	85%	71%	67%	54%	51%	41%
	EOA, mean ± SD [cm^2]	1,1 ± 0,2		1,3 ± 0,3		1,6 ± 0,4	

*severe PPM is defined as iEOA: ≤ 0.65 cm^2/m^2 in patients with BMI < 30 kg/m^2; and as iEOA: ≤ 0.55 cm^2/m^2 in patients with BMI ≥ 30 kg/m^2

COLOR CODING: yellow indicates that the percentage probability of severe PPM is greater than or equal to 50%, meaning that the mean indexed EOA is below the severe PPM cutoff level.

DISCLAIMER: This chart is a support tool to estimate the probability of PPM in patients undergoing surgical aortic valve replacement with a particular valve, but the actual risk further depends on specific patient characteristics and operative technique.

B

FIGURE 1. Assessing expected prosthesis-patient mismatch (*PPM*) using traditional indexed effective orifice area (*EOAi*) charts and with the new PPM Chart. Example charts for the same valve model. A, Traditional EOAi charts are trichotomous (*red = severe PPM*, *yellow = moderate PPM*, and *green = no PPM*) and categorize expected PPM as a binary outcome (present or absent). B, The new PPM chart provides the percent probability of expected severe PPM. Note the differences in how expected PPM is expressed with the traditional EOAi chart and with the new PPM chart, for a patient with a body surface area (*BSA*) of 1.7 m^2 (*light blue boxes*). Using percent probability to describe expected PPM highlights the limitations of using reference effective orifice areas in PPM prediction and could lead to better-informed decisions when considering annular enlargement procedures. *BMI*, Body mass index.

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The authors reported no conflicts of interest.

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