

Response by Shimura *et al.* to the letter regarding article “Calculated plasma volume status and outcomes in patients undergoing transcatheter aortic valve replacement”

We thank Aleksandra Goch *et al.* for showing interest in our literature and for providing additional comments regarding the limitations of our paper.¹

Regarding the first limitation on calculated plasma volume status (PVS) value used in the first model, as she pointed out, the Optimized CathEter vAlvular iNtervention (OCEAN)-transcatheter aortic valve implantation (TAVI) registry cohort is divided into quartiles as follows: PVS < 5.5%, 5.5% < PVS < 13.5%, 13.5% < PVS < 21.0%, PVS > 21.0%. However, this is not a cut-off value for PVS, but a simple quadrant of the OCEAN-TAVI registry cohort. The purpose of the first model was to demonstrate that the prognosis worsens with increasing PVS. In effect, the prognosis of post-TAVI patients worsened with increasing PVS.¹

The best discriminated cut-off value of all-cause mortality was PVS 19.0% in the OCEAN-TAVI registry. We identified this cut-off value by using the survival classification and regression tree (CART) method. Conversely, Maznyczka *et al.* used Youden's index for predicting the best cut-off value of PVS 0%. Youden's index is an index based on the sum of sensitivity and specificity.² If the sum of the sensitivity and specificity is high, the diagnostic performance seems adequate. However, the required magnitude of sensitivity and specificity varies depending on the purpose of the study; therefore, it seems a little rough to mechanically use a high Youden's index as the optimal cut-off. In addition, the cut-off value of PVS for all-cause mortality varies greatly depending not only on the number of patients but also on race, patient size and background, and post-treatment medication and follow-up methods. As mentioned in our paper, the PVS of 19.0% is only a rough guide. It is also information obtained by using the specific old-age Asian cohort. In addition, the most important point is that an increase in PVS can be an

indicator of worsening prognosis, and this fact was stated in both papers.^{1,2}

I also agree with Aleksandra Goch *et al.* that PVS calculated by the Duarte formula should be considered in addition to the Kaplan–Hakim formula. However, both the Kaplan–Hakim formula and the Duarte formula only predict PVS. Just because it is a prediction it does not mean it is as good as the actual value. It is more important to examine the correlation with the actual PVS. As shown in the text, there are reports that only a moderate correlation between the calculated PVS and actual PVS can be obtained.³ A more sensitive index to assess congestion in heart failure may allow better management of heart failure patients.

Again, the most important consideration regarding PVS and prognosis in post-TAVI patients is that elevated preoperative PVS may be an indicator of all-cause mortality and worsening prognosis, including heart failure hospitalization. We hope that, over time, appropriate therapeutic interventions based on the assessment of PVS will improve patient outcomes.

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