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The Clinical Utility of Respiratory Variation in Inferior Vena Cava Diameter for Predicting Fluid Responsiveness in Spontaneously Ventilating Patients

To the Editor: We thank Drs Bortolotti, Colling, and Preau for their considered response to our systematic review and meta-analysis (1). They contend that respiratory changes in inferior vena cava (IVC) diameter are a useful and reliable tool in routine clinical practice at the patient's bedside to guide fluid therapy in spontaneously ventilating patients. The authors base this view on their research (2), published after our systematic review and meta-analysis, and partly based on concerns regarding the methodology of some of the studies included in our systematic review.

The first point Drs Bortolotti, Colling, and Preau make is that two of the studies included in our review used inaccurate techniques for the assessment of fluid responsiveness (non-invasive blood pressure and bioreactance). We concur that noninvasive blood pressure is not an accurate reference standard to measure fluid responsiveness (3), though we believe bioreactance has been well validated (4).

The second point Drs Bortolotti, Colling, and Preau make is that one of the pilot studies ($n = 14$) included in our review used a threshold value for IVC collapsibility of >15%, rather than >50%, which would correspond to more conventionally reported threshold values, and would improve the test characteristics of IVC ultrasound for predicting fluid responsiveness (5). Our rationale was that this was the only reported threshold that reached statistical significance, though this probably reflects the small study size rather than a threshold with better test characteristics.

The third point Drs Bortolotti, Colling, and Preau make is that the inclusion of their study in the calculation of pooled test characteristics for the ability of respiratory variability in IVC diameter to predict fluid responsiveness yields better test characteristics than those found in our review. This study by Preau et al. makes up roughly half of the patients used in their calculation ($n = 90$), thereby significantly skewing the result toward the findings of their study. Importantly, their study included the use of a ''standardized inspiratory maneuver'' using buccal pressure manometry, which improved the test characteristics of IVC ultrasound for predicting fluid responsiveness by standardizing one variable that contributes to its inaccuracy. It is unclear if this technique can be applied to every patient being considered for fluid bolus therapy, including children, those who are critically ill, or those with altered conscious state. In addition, IVC ultrasound is a primary interest of their research group, improving the accuracy of this operator-dependent technique in their setting, but perhaps requiring validation before generalizing their results to other settings. Lastly, the pooled test characteristics reported do not address the quality of included studies. Our review found that all included studies met the Cochrane Systematic Reviews of Diagnostic Test Accuracy criteria for high risk of bias, and that funnel plot asymmetry suggested underreporting of negative studies. This should be taken into account when interpreting the results of both our systematic review, and the pooled test characteristics presented by Drs Bortolotti, Colling, and Preau.

It is good to have this important new study (2). However, the current evidence supporting respiratory variability in IVC diameter as a predictor of fluid responsiveness is still limited, particularly in spontaneously ventilating patients. We believe that the key messages for bedside clinicians when considering the use of IVC ultrasound to predict fluid responsiveness are to recognize the limitations of this test, particularly the limitations of a negative test, and to consider the clinical context when using IVC ultrasound to make treatment decisions.

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