Accuracy of Plethysmographic Indices as Predictors of Fluid Responsiveness in Mechanically Ventilated Adults: A Systematic Review and Meta-Analysis.

Purpose

To systematically review the accuracy of the variation in pulse oxymetry plethysmographic waveform amplitude (ΔPOP) and the Pleth Variability Index (PVI) as predictors of fluid responsiveness in mechanically ventilated adults.

Methods

MEDLINE, Scopus and the Cochrane Database of Systematic Reviews were screened for clinical studies in which the accuracy of ΔPOP/PVI in predicting the hemodynamic response to a subsequent fluid bolus had been investigated. Random-effects meta-analysis was used to summarize the results. Data were stratified according to the amount of fluid bolus (large vs. small) and to the study index (ΔPOP vs. PVI).

Results

Ten studies in 233 patients were included in this meta-analysis. All patients were in normal sinus rhythm. The pooled area under the receiver operating characteristic curve (AUC) for identification of fluid responders was 0.85 [95 % confidence interval (CI) 0.79-0.92]. Pooled sensitivity and specificity were 0.80 (95 % CI 0.74-0.85) and 0.76 (0.68-0.82), respectively. No heterogeneity was found within studies with the same amount of fluid bolus, nor between studies on ΔPOP and those on PVI. The AUC was significantly larger in studies with a large bolus amount than in those with a small bolus [0.92 (95 % CI 0.87-0.96) vs. 0.70 (0.62-0.79); $p < 0.0001$]. Sensitivity and specificity were also higher in studies with a large bolus [0.84 (95 % CI 0.77-0.90) vs. 0.72 (0.60-0.82) (small bolus), $p = 0.08$ and 0.86 (95 % CI 0.75-0.93) vs. 0.68 (0.56-0.77) (small bolus), $p = 0.02$], respectively.

Conclusions

Based on our meta-analysis, we conclude that ΔPOP and PVI are equally effective for predicting fluid responsiveness in ventilated adult patients in sinus rhythm. Prediction is more accurate when a large fluid bolus is administered.