**Pleth Variability Index to Monitor the Respiratory Variations in the Pulse Oximeter Plethysmographic Waveform Amplitude and Predict Fluid Responsiveness in the Operating Theatre.**

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## Background

Respiratory variations in pulse oximetry plethysmographic waveform amplitude (ΔPOP) can predict fluid responsiveness in mechanically ventilated patients but cannot be easily assessed at the bedside. Pleth variability index (PVI) is a new algorithm allowing for automated and continuous monitoring of ΔPOP. We hypothesized that PVI can predict fluid responsiveness in mechanically ventilated patients under general anaesthesia.

## Methods

Twenty-five patients were studied after induction of general anaesthesia. Haemodynamic data [cardiac index (CI), respiratory variations in arterial pulse pressure (ΔPP), ΔPOP, and PVI] were recorded before and after volume expansion (500 ml of hetastarch 6%). Fluid responsiveness was defined as an increase in CI > or =15%.

## Results

Volume expansion induced changes in CI [2.0 (sd 0.9) to 2.5 (1.2) liter min(-1) m(-2); P<0.01], ΔPOP [15 (7)% to 8 (3)%; P<0.01], and PVI [14 (7)% to 9 (3)%; P<0.01]. ΔPOP and PVI were higher in responders than in non-responders [19 (9)% vs 9 (4)% and 18 (6)% vs 8 (4)%, respectively; P<0.01 for both]. A PVI >14% before volume expansion discriminated between responders and non-responders with 81% sensitivity and 100% specificity. There was a significant relationship between PVI before volume expansion and change in CI after volume expansion (r=0.67; P<0.01).

| | Area under the curve | Standard error | Asymptomatic 95%confidence interval | | P-value | Cutoff | Sensitivity (%) | Specificity (%) |
|---|---|---|---|---|---|---|---|---|
| | | | Lower bound | Upper bound | | | | |
| ΔPP | 0.938 | 0.046 | 0.847 | 1.028 | ,0.001 | 12.50% | 87 | 89 |
| ΔPOP | 0.944 | 0.042 | 0.861 | 1.028 | ,0.001 | 12% | 87 | 89 |
| PPV | 0.941 | 0.044 | 0.854 | 1.028 | ,0.001 | 10.50% | 87 | 89 |
| PVI | 0.927 | 0.051 | 0.828 | 1.026 | ,0.001 | 14% | 81 | 100 |
| CVP | 0.417 | 0.12 | 0.182 | 0.651 | 0.497 | 12.5 mm Hg | 44 | 78 |
| PCWP | 0.396 | 0.12 | 0.161 | 0.631 | 0.396 | 14.5 mm Hg | 50 | 67 |
| CI | 0.556 | 0.118 | 0.324 | 0.787 | 0.651 | 2.8 litre min21 | 44 | 89 |
| PI | 0.438 | 0.131 | 0.181 | 0.694 | 0.61 | 1.43% | 94 | 22 |

Areas under the ROC curves and cutoff values of various parameters for the prediction of fluid responsiveness. ΔPP, respiratory variations in arterial pulse pressure; ΔPOP, respiratory variations in plethysmographic waveform amplitude; PPV, automated pulse pressure variations; PVI, pleth variability index; CVP, central venous pressure; PCWP, pulmonary capillary wedge pressure; CI, cardiac index; PI, perfusion index. Adapted from Cannesson et al. Br J Anaesth. 2008 Aug;101(2):200-6.

## Conclusions

PVI, an automatic and continuous monitor of ΔPOP, can predict fluid responsiveness non-invasively in mechanically ventilated patients during general anaesthesia. This index has potential clinical applications.