

## **Plethysmography Variability Index: A New Fluid Responsiveness Parameter**

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### **Introduction**

New predictors of fluid responsiveness have been obtained from plethysmographic waveforms displayed on pulse oxymeters. However, they require recordings on a PC and offline operator-dependent analysis. A new parameter called the plethysmography variability index (PVI) has been proposed by a pulse oxymetry manufacturer to be used for the purpose of fluid responsiveness. Its advantage is that it can be automatically calculated and displayed on the screen of the pulse oxymetry monitor. The aim of the study is to test the accuracy of this parameter to predict fluid responsiveness in critically ill patients.

### **Methods**

Inclusion criteria were septic shock patients fully adapted to their respirator and on sinus rhythm. Methods involved simultaneous recording of the following tracings: invasive blood pressure, plethysmography pulse oximeter (Philips™), ECG, airway pressure and digit values inscribed on the device (Masimo™). Echocardiography was used to calculate the velocity–time integral (VTI). We infused fluid (500 ml saline) in patients with pulse pressure variation ( $\Delta PP$ )  $\geq 15\%$  and performed passive leg raising (PLR) in patients with  $\Delta PP < 15\%$ . We compared the PVI with  $\Delta PP$  and with the variability of pulse oximeter wave amplitude ( $\Delta P_{pleth}$ ) and sought the best threshold PVI value that predicted  $\Delta PP > 15\%$ . Patients who increased their VTI by more than 15% in response to fluid or to PLR were defined as responders. The significance of the PVI threshold to distinguish between responders and non-responders was examined.

### **Results**

In the first step 25 patients were enrolled. Fifty paired values were analysed. The  $r^2$  coefficients between  $\Delta PP$ –PVI,  $\Delta P_{pleth}$ –PVI and  $\Delta PP$ – $\Delta P_{pleth}$  were 0.81, 0.79 and 0.74, respectively. A threshold PVI value of 20 identified patients with  $\Delta PP > 15\%$  with a sensitivity of 84% and specificity of 90%. In a second step 18 other patients were enrolled. All patients with PVI  $> 20$  ( $n = 8$ ) were fluid responders and 10 patients with PVI  $< 20$  were PLR non-responders.

### **Conclusion**

The PVI automatically obtained from a pulse oxymetry device seems an accurate index of fluid responsiveness. The numerical value of 20 distinguished responders from non-responders with good sensitivity and specificity.