

## Visibility of Pulse Pressure Variability in Spontaneously Breathing Patients

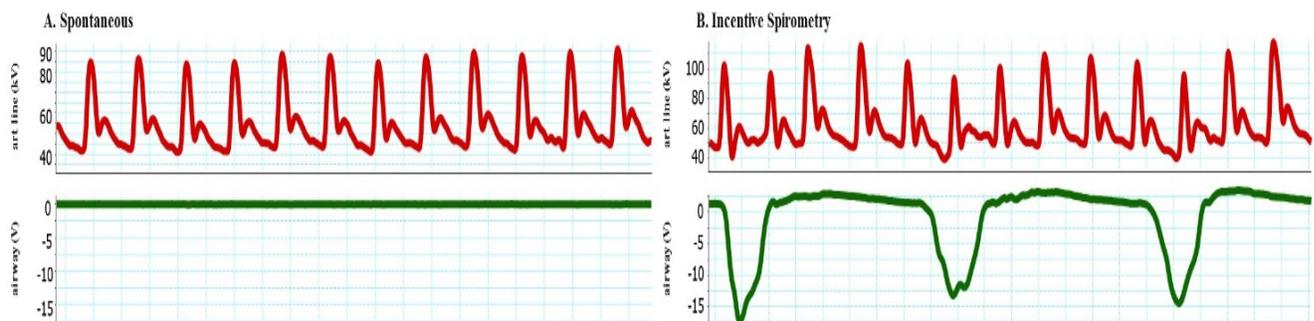
**Presenting Author:** Christopher Choi, MD, Yale-New Haven Hospital

**Co-Authors:** Aymen Alian, MD, Yale-New Haven Hospital; Kirk Shelley, MD, PhD, Yale-New Haven Hospital

**Background/Introduction:** As a clinician, assessing a patient's intravascular volume is often a challenging task. It has become clear that traditional measures such as central venous pressure and pulmonary artery occlusion pressures poorly predict one's fluid responsiveness<sup>1</sup>. Over the past decade, dynamic hemodynamic variables such as pulse pressure variation, which use heart-lung interactions, have been found to be predictive for fluid responsiveness<sup>2</sup>. However, one of the limitations of these variables is that they are accurate only under volume controlled mechanical ventilation. This brings us to the question: can we assess intravascular volume status in spontaneously breathing patients? Lung recruitment maneuvers in ventilated patients have been found to depress central hemodynamics<sup>3</sup>. Moreover, the degree of decrease in stroke volume seen is related to preexisting fluid responsiveness<sup>4</sup>. We hypothesize that incentive spirometry, a lung recruitment maneuver used widely in spontaneously breathing patients, can be a tool to assess the cardiovascular-pulmonary interaction.

**Methods:** 10 patients POD#1 from CABG surgery post-extubation were enrolled in this study. These patients were potentially hypovolemic due to IV furosemide 40-80mg administration in order to optimize extubation conditions. They were monitored with pulse oximeter, arterial, and CVP waveforms. Waveforms were recorded during both spontaneous breathing and IS. Waveform analysis was then conducted using LabChart v7.3.7 (ADInstruments).

**Results:** PPV significantly increased during IS compared to spontaneous breathing ( $p < .01$ ) by an average of 395%.



Conclusion:

Incentive spirometry, through rapid changes in intrathoracic pressure, affects venous preload<sup>5</sup>. These changes in preload throughout the cardiac cycle should result in increased dynamic indices. Our pilot data shows that incentive spirometry is a promising tool for assessing for hypovolemia in spontaneously breathing patients.

**References:**

1. Osman D et al. Crit Care Med 2007.
2. Marik PE et al. Crit Care Med 2009.
3. Nielsen J et al. Intensive Care Med 2005.
4. Biais M et al. Anesthesiology 2009.
5. Alian AA et al. Sensors (Basel) 2012.