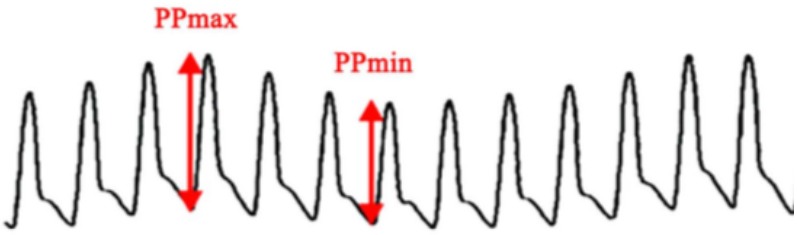
Pulse Pressure Variation (PPV) for Goal-Directed Fluid Therapy



PPV > 13% : likely fluid responsive
PPV < 9% : not fluid responsive
9% < PPV < 13% : "gray zone"

PPV is a dynamic marker of a patient's position on the Frank-Starling curve – predictor of fluid responsiveness

- Requires arterial BP monitoring
- Can be displayed on most OR and ICU monitors
- With positive-pressure inspiration, ↑intrathoracic pressure initially causes ↑LV preload, ↓LV afterload → cardiac output/↑SBP
  - ↑intrathoracic pressure also results in ↓RV preload, which eventually leads to ↓LV preload → cardiac output/↓SBP
- Opposite occurs during expiration

$$PPV = \frac{PP_{max} - PP_{min}}{PP_{mean}} \times 100$$

Limitations

- Extreme bradycardia or high RR
- Arrhythmia/irregular HR (e.g. atrial fibrillation)
- ↑intra-abdominal pressure (e.g. pneumoperitoneum)
- Open thorax
- Spontaneous ventilation, low tidal-volume ventilation
- Low arterial compliance (high-dose vasopressors, severe atherosclerosis/PVD)
- RV and/or LV failure

References
Miller's Anesthesiology 8th ed. 2015
Michard F, Anesthesiology 2005