DEFINITIONS:
- Fluid resuscitation can be beneficial when required or harmful in excess. Methods to predict fluid responsiveness enable parsimonious administration of fluids, resulting in reduced fluid balance, shorter duration of vasopressors, and lower risk of renal failure.
- Fluid responsive (FR) a 10-15% increase in cardiac output (CO) when fluid administered; fluid responsiveness does not mean fluid is “needed” only the CO will increase with volume.
- Importantly, only about 50% of septic patients are FR can be assessed in most pts.
- Clinical parameters (hourly UOP, MAP) tend to lag and do not reliably predict FR.
- Fluid tolerance (FT) the absence of harm (e.g. pulmonary edema) when fluid administered

**TYPES OF FLUID RESPONSIVENESS TEST:**

Some MEASUREMENTS predict FR in isolation (respiratory variation in PPV or LVOT VTI); others must be combined w/ a CHALLENGE maneuver (NICOM or ETCO2 with PLR). The level of evidence varies for each combination →

**MINIMALLY INVASIVE**
- **PULSE OXIMETRY WAVEFORM ANALYSIS**

Principle: analysis of the plethysmographic waveform is analogous to PPV measurement using arterial line: a high degree of respiratory variation predicts FR.

**END TIDAL CO2**

Principle: An increase cardiac output causes increases delivery of CO to the lungs, increasing exhaled CO2.

**PULSIVE EXasperation**

**PASSIVE LEG RAISE (PLR)**

Principle: positioning a patient flat (0°), then raising legs to 45°) quickly (30-90 sec) returns a reservoir of ~300 ml of venous blood to the central circulation. Patient must be able to (painlessly) elevate legs

**NEONATAL**

Principle: observation of the hemodynamic response to the rapid infusion of a small volume 50-100ml of fluid can predict the response to a larger bolus

**MINI-BOLUS & MICRO BOLUS**

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**HIGH PEEP CHALLENGE**

Principle: for patients on MV increasing PEEP can identify FR by detecting a decrease in MAP.

**END EXPIRATORY OCCLUSION (EEO)**

Principle: For MV patients, each breath increases intrathoracic pressure & impedes venous return. Interrupting MV at end expiration transiently increases preload. Decrease in CO during a 15 sec expiratory hold maneuver predicts FR.

**BIOREACTANCE/NICOM:**

Principle: detection of blood flow in the chest by application of an external electric field. Averages blood flow over 8-30 seconds. Combine with a challenge (PLR, microbolus) to measure ΔSV.

**END TIDAL CO2**

Principle: An increase cardiac output causes increases delivery of CO to the lungs, increasing exhaled CO2. Interpretation: increase in SV predicts FR

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