Optimizing Fluid Management in Sepsis Patients

What is fluid responsiveness?
- Fluid responsiveness is the positive or negative response of cardiac stroke volume to moderate intravascular fluid administration to assess the benefit of fluids on circulation and perfusion.

Why check fluid responsiveness? Why does this matter?
- Especially in the initial treatment of sepsis, adequate volume resuscitation can help prevent organ damage.
- Finding the physiologically appropriate balance of fluids for each patient is a challenge. Patients with too little volume resuscitation do not perfuse their organs; however, too much fluid causes third spacing of fluids and secondary damage to tissues.
- These techniques help identify patients who are on the ascending portion of their Frank-Starling curve and will have an increase in stroke volume in response to fluid administration. Once they reach optimal volume the curve flattens, and volume is no longer beneficial.
- Fluid responsive patients have “preload reserve” and will have an increase in stroke volume (and usually cardiac output) when fluid is administered. See also Fluids in Sepsis.

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How to Assess Optimal Fluids

Static vs Dynamic Assessments

Static Assessments

- **Static Clinical Endpoints**: heart rate, blood pressure, collapsed veins, capillary refill time, urine output
  - not sensitive and poor inter-observer reliability
- **Central Venous Pressure (CVP)/Pulmonary Capillary Wedge Pressure**
  - require invasive lines and are poor predictors of volume status
- **Chest x-ray (looking for pulmonary edema)**
  - unreliable and a late sign

Dynamic Assessments (more sensitive and specific than static tests)

- **Fluid Bolus Challenge**
  - A fluid bolus challenge is a rapid infusion of 250 mL or 500 mL of normal saline or lactated Ringers over five to 10 minutes to test for fluid responsiveness
  - Assessment can be with change in pulse pressure, ultrasound of the vena cava collapsibility, bedside echocardiogram, non-invasive cardiac output monitor, carotid doppler flow or capnography (if ventilation and metabolic status are constant)

- **Passive Leg Raise (PLR)**
  - A PLR transiently increases venous return in patients to test for fluid responsiveness, acting as a pseudo-bolus of the patients’ lower extremity blood to see the effect of increased volume on the work of the heart without having to give additional fluids.
  - This technique is contraindicated in patients with lower extremity amputations, significant peripheral vascular disease and pregnancy. Always monitor for patient tolerance and stop for discomfort or respiratory distress.

- **PLR Technique**:  
  1. Raise patient’s head of bed to 45 degrees for five minutes  
  2. Lower patient’s upper body to horizontal while passively raising their legs up to 45 degrees for 30-90 seconds.  
  3. Assess for at least a 10 percent increase in stroke volume by cardiac output monitor or using a surrogate such as change in ultrasound of the vena cava collapsibility, bedside echocardiogram, non-invasive cardiac output monitor or carotid doppler flow. If using capnography assess for a five percent increase of etCO₂.
References


• Préau, S., Saulnier, F., Dewavrin, F., Durocher, A., & Chagnon, J. L. (2010, March). Passive leg raising is predictive of fluid responsiveness in spontaneously breathing patients with severe sepsis or acute pancreatitis. Critical Care Medicine, 38(3), 819-825. doi: 10.1097/CCM.0b013e3181c8fe7a


