Shock Review & Vasopressors

Type of Shock	Common Examples	Right heart filling	Left heart filling	Cardiac output	Afterload	Treatment
		CVP	PCWP	CI	SVR	
Hypovolemic	• Hemorrhage • Intravascular volume loss	↓	↓	↓	↑↑	Fluids +/- vasopressors to temporize
Cardiogenic	• Cardiomyopathy • MI/ischemia • Valvular lesions • Arrhythmia	↑	↑	↓	↑↑	inotropes +/- vasopressors
Distributive	• Sepsis • Anaphylaxis • Adrenal insuff. • Neurogenic shock	↓	↓	↓vs.↑*	↓	Fluids + vasopressors (rarely inotropes)
Obstructive	• PE** • Cardiac tamponade • Tension PTX	↑	PCWP ↑ ↓	↓	↑↑	Fluids + vasopressors (occasionally inotropes for R heart failure)

*distributive shock often presents with low cardiac output at the onset, but may become a high cardiac output state once adequately fluid resuscitated

**PE's is the most common example of an obstructive shock and is used to fill out the hemodynamic table.

Shock definition: insufficient blood flow to the tissues

- First: try and identify the type of shock
- Second: tailor your treatment to the PRIMARY PROBLEM (black box) of that particular shock state
    - **hypovolemic** shock = treat with **fluids**
        - **Crystalloids** (Ringer's Lactate is preferred)
            - SMART-MED and SMART-SURG 2018 → Ringer's Lactate reduced rate of death, need for dialysis, lower rates of AKI when compared to Normal Saline
        - **Colloids**
            - **Albumin 5%** 500 mL → results in an increase in intravascular volume of ~500 mL x 12-24h (1:1) → more immediate effect
            - **Albumin 25%** 100 mL → results in an increase in intravascular volume of ~450 mL x 12-24h (1:4.5) → slower effect, use if fluid overloaded but intravascularly dry
            - Blood → typically reserved for anemia; transfusion trigger of 70 g/L in a stable, non-bleeding patient
            - AVOID starches → increased risk of AKI + need for dialysis
    - **cardiogenic** shock = **increase cardiac output** with inotropes (may need vasopressors to **support BP**)
        - **inotropes**

- dobutamine 0-20 ug/kg/min
- milrinone 0.25-0.75 ug/kg/min → slow onset, 6hr duration, more likely to cause hypotension, use with caution in renal failure
- epinephrine 0-10 **ug/min**
- digoxin load

- **distributive** shock = **hypovolemia** due to vasodilation + vasopressors to counter **vasodilation**
  - if using CVP, aim for 8-12 mm Hg if not intubated, 12-15 mm Hg if intubated
  - remember that vasopressors also raise CVP, so if the patient is in their "CVP target" but on vasopressors, they may still benefit from more fluid
- obstructive shock (**PE**) = fluids (CVP is high, but LV is under filled), vasopressors to support BP, inotropes if RV is failing, consider **thrombolysis** if:
  - hemodynamically UNSTABLE
  - stable patients IF:
    - severe or worsening RV dysfunction
    - cardiac arrest due to PE
    - extensive clot burden
    - free-floating RA or RV thrombus

Vasopressors

Drug	Dose	Notes
Norepinephrine (Levophed)	0-30 ug/kg/min	• often **1st line vasopressor** • can go up to 1 ug/kg/min in refractory shock
Vasopressin	0-2.4 u/hr	• often added as a **2nd vasopressor** if on high doses of Norepinephrine • still effective when acidotic and hypothermic whereas other vasopressors may not be
Phenylephrine	0-360 **ug/min**	• **useful** when you want to avoid b-agonism, e.g. **rapid a-fib/flutter** and hypotensive • not as potent → can be a significant volume load when running at high doses • watch for hyponatremia when mixed in D5W and running at high doses
Dopamine	0-20 ug/kg/min	• 0-3 ug/kg/min = "renal dose", doesn't prevent AKI • 3-10 ug/kg/min = primarily b-agonism (inotropy) • > 10 ug/kg/min = progressive alpha-effect (vasoconstriction)
Epinephrine	0-10 **ug/min**	• Drug of choice for **anaphylaxis** • Watch for tachycardia/arrhythmias