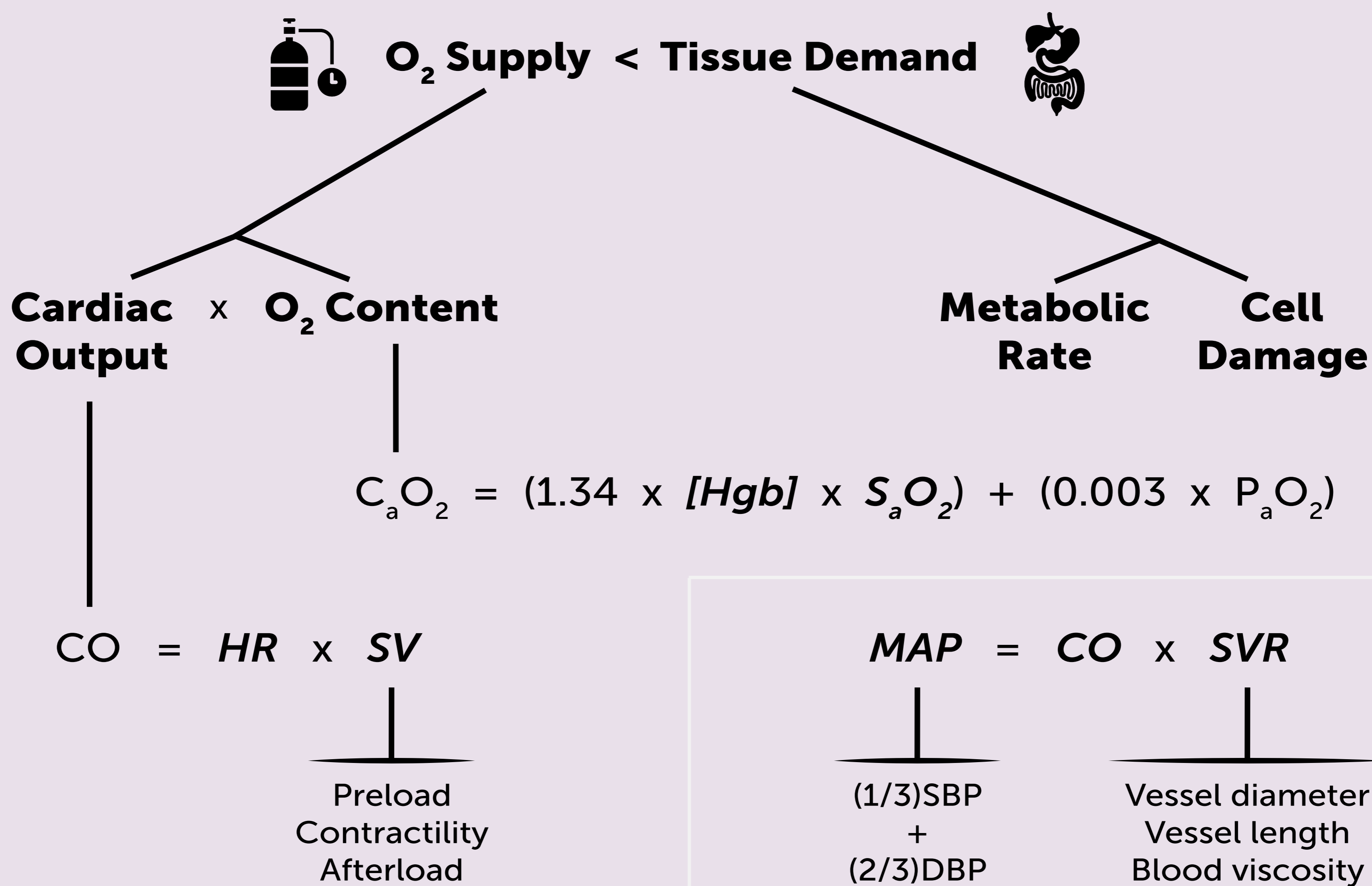


# Shock

A state of **tissue hypoxia** due to decreased or dysregulated oxygen delivery or extraction, resulting in **end-organ damage** and often occurring in the setting of **hypotension**

Shock can develop in the setting of **increased** tissue demand, **decreased** O<sub>2</sub> supply, or both. While initially reversible, it rapidly progresses: cell death → end-organ dysfunction → multiorgan failure → death



## Common Clinical Manifestations

- Neuro:** altered mental status
- CV:** hypotension (SBP < 90 mmHg or ↓ > 40 mmHg from bl) wide **vs.** narrow pulse pressure
- Pulm:** resp. alterations (tachypneic/↑ MV **vs.** somnolent/depressed)
- Renal:** metabolic acidosis, oliguria (< 0.5 mL/kg/hr)
- Ext:** warm **vs.** cold (feel shins and up)  
dry **vs.** wet (dependent areas, back of thigh/flank edema)

## Initial Workup

- VS - they're probably bad, so go see the pt!**
- Ensure adequate access!!!**
- Ensure airway is protected - if not, call for help!**
- CBC, CMP, Mg, PO<sub>4</sub>, and LA is a good start
- ABG/VBG, Trop, BCx, depending on clinical scenario
- EKG, CXR, bedside TTE/FAST (if able)

Etiology	Pathophysiology	Causes	Basic Management
<b>Distributive</b>	Decreased SVR and altered O <sub>2</sub> extraction	<b>Inflammatory</b> infectious (sepsis) or not (pancreatitis, post-arrest) <b>Reactionary</b> anaphylaxis, toxins/meds <b>Other</b> AI, thyroid dz, liver failure, neurogenic/spinal	<b>Sepsis:</b> ABX! (see separate sepsis handout for more) <b>Adrenal Insufficiency (AI):</b> 100mg HCT bolus. Follow w/ stress dose 50mg HCT q6h initially <b>Anaphylaxis:</b> Epi 0.3-0.5 mg IM q5-10min <b>Toxins/Meds:</b> ID offending agent; call tox if necessary; supportive care +/- reversal agents, dialysis, etc., if indicated
<b>Hypovolemic</b>		<b>Hemorrhagic bleeding out</b> (trauma, GI, post-partum) <b>bleeding in</b> (trauma, hemothorax, RP bleed) <b>Hypovolemic GI</b> (vomiting/diarrhea) <b>renal</b> (over-diuresis, dialysis/CRRT, post-ATN, post-obstructive polyuria) <b>surgical</b> (burns, open abdomen/wound, drains)	<b>Hemorrhagic:</b> Transfuse! Control bleeding if able; may need GI, IR, or surgery <b>Hypovolemic:</b> Fluids! Be thoughtful, crystalloids (preferably isotonic) to start, but albumin may be indicated in cirrhotic pts (HRS, SBP, etc.). Pay attention to pt's sodium to avoid correcting hyper/hypoNa too rapidly!
<b>Cardiogenic</b>	Low CO and therefore inadequate O <sub>2</sub> delivery	<b>MI</b> <b>Heart Failure</b> <b>Severe Valve Dz</b> <b>Myocarditis</b> <b>Arrhythmias</b>	Diuresis is generally the mainstay of HF tx, but may need to augment w/ inotropes to facilitate (see separate handout on pressors/inotropes); if pt is too sick, may need to call for further interventions w/ devices (balloon pump, ECMO, etc.)
<b>Obstructive</b>		<b>PE</b> <b>Tension ptx</b> <b>Tamponade</b>	<b>PE:</b> If primary cause of shock, the PE is considered "massive" and lytics are indicated <b>Tension ptx:</b> If you are the only person available, needle decompression is necessary, but CALL your friendly ICU fellow or surgeon to help you with pigtail catheter/chest tube placement (ultimate mgmt.) <b>Tamponade:</b> If primary cause of shock, pericardiocentesis may be indicated; CALL your friendly ICU fellow/cards fellow for assistance!

## Management Considerations

- Is there someone you need to call urgently?** E.g. tox for overdose, IR for brisk bleed, cards for mechanical support, etc.
- Ventilatory Support:** If your pt needs to be intubated, call for help, and be sure to have access and pressors ready - just in case!
- Fluid Resuscitation:** Balanced crystalloids (ie., LR, PlasmaLyte) compared to NS a/w ↓ mortality and ↓ renal dysfxn.  
Fluid responsiveness is difficult to assess, but improvements in BP, mental status, UOP, & lactate are generally good signs. Measurements of fluid responsiveness such as straight leg raise, pulse-pressure variation, etc., should be done correctly if done at all, w/ results taken in context of the full clinical picture, and not used independently to guide treatment. Remember, less fluid may be indicated in pts esp. at risk of volume overload (ie., pt's w/ HF, cirrhosis, etc.).
- Pressors/Inotropes:** MAP goal > 65 mmHg using Levophed is generally a good start for most patients and common scenarios. Although, you may be starting w/ inotropes for cardiogenic shock; see our separate pressor/inotrope handout for details.
- Antibiotics:** If septic shock is on the differential, get cultures STAT and start broad spectrum antibiotics without delay.
- Steroids:** For refractory shock, or esp. if known AI or chronic steroid use, consider stress-dose steroids; generally HCT 50mg q6h.