SHOCK & VASOPRESSORS

What is Shock?

Shock is characterized by life-threatening end-organ hypoperfusion & inadequate tissue oxygen delivery.
One must rapidly recognize shock and determine its underlying cause.

Mean Arterial Pressure (MAP) = Cardiac Output (CO) X Systemic Vascular Resistance (SVR)

Type of Shock	Examples	CO	SVR	Other Findings
Distributive	Sepsis Anaphylaxis SIRS/inflammation: Burns, pancreatitis, toxins Adrenal insufficiency	↑	↓	Peripherally warm, appear well perfused
Cardiogenic	ACS Myocarditis Stress cardiomyopathy	↓	↑	Peripherally cool, features of pulmonary edema or volume overload, elevated JVP, poor urine output
Hypovolemic	Hemorrhage Diuresis GI losses	↓	↑	Peripherally cool, low JVP, poor urine output
Obstructive	Pulmonary embolism Cardiac tamponade Tension pneumothorax	↓	↑	Peripherally cool, elevated JVP, poor urine output

Identifying Shock

- Immediately **examine** ABCs and repeat vitals frequently
- Remainder of examination aimed at determining cause and severity:
  - Neuro: Level of consciousness and GCS
  - HEENT : Angioedema, stridor, tracheal deviation
  - CV: JVP elevated vs. flat, peripheries cool vs. warm
  - Resp: Equal air entry, wheeze, crackles
  - GI/GU: Determine urine output (insert Foley)
  - ID: Temperature
- Always look for peripheral mottling → This is an ominous sign!

Investigations:

- Bloodwork: CBC, lytes, Cr, liver panel, ABG or VBG, lactate, troponin
- Chest x-ray, ECG
- Bedside cardiac ultrasound if skilled provider available

Management Principles

1. Treat the Underlying Cause:

- The following aetiologies require immediate intervention and must be ruled out:
  - Cardiac tamponade, tension pneumothorax, ACS (STEMI/NSTEMI), hemorrhage, PE, anaphylaxis
- When the diagnosis is unclear, empiric broad-spectrum antibiotics should be strongly considered in case of sepsis

2. Trial of IV Fluids:

- A trial of IV fluids is warranted in most shock states unless cardiogenic shock is highly likely
- If concerned about volume overload or CHF, give small amounts of fluid quickly to assess response → E.g. Ringer's lactate 250-500mL over 15 minutes and **re-assess immediately**

Vasopressors

Vasopressor	Mechanism of Action	Use	Dosing
Norepinephrine	$\alpha >> \beta$	**Your go to infusion drug for all shock** (except anaphylaxis). Use in combination with inotropes in cardiogenic or obstructive shock.	Typical dose range: 2-40mcg/min **Starting dose:** Mild hypotension: 5mcg/min Severe hypotension: 10-20mcg/min
Phenylephrine	α	**Your quick, push dose go to drug.** Useful during initial resuscitation while infusions being prepared or during procedures requiring sedation.	Mix contents of phenylephrine 10mg vial into a 100cc mini bag of NS → Give 100-200mcg at a time (1-2mLs). If pre-mixed syringe available, typically contains 80mcg/mL or 50mcg/mL → In shock, may require 2-5mL to get an effect.
Epinephrine	$\alpha \approx \beta$	**Your big gun. Most potent infusion or push dose drug.** First-line agent for anaphylaxis*. Second or third-line agent in septic shock. Rescue drug in any refractory shock.	Typical dose range is 2-20mcg/min **Starting dose**: Mild hypotension: 1-3 mcg/min Severe hypotension: 5-10 mcg/min Push dose = 0.5-1mL of 1mg syringe in pre-arrest situations
Vasopressin	V1,V2	Second or third line agent in septic shock. Consider using in obstructive shock.	Typical dose range is 1.2-2.4U/h Mild hypotension: 1.2U/h Severe hypotension: 2.4U/h
Dopamine	Dose-dependent effects on α α,β, DA	In general, don't use dopamine unless no other options available. Renal dosing doesn't work.	Typical dose range for shock is 5-20mcg/kg/min. **Starting dose:** 10 mcg/kg/min

In an emergency:

All vasopressors can be given via peripheral IV (if it is working properly)

Try to avoid inserting central lines in an uncontrolled setting → IO is preferred

Dose ranges are suggestions only. Some centres use weight-based dosing for norepinephrine and epinephrine. **There is no maximum dose for norepinephrine or epinephrine.** Dose is titrated to effect. Patient may or may not respond to higher dosage.

*** Anaphylaxis dosing for epinephrine** is 0.3-0.5mg IM of 1:1000 concentration. Can be repeated q5-15min.