

Shock

Inadequate tissue perfusion to meet O₂, nutrient requirements
 → anaerobic resp'n, ↑ lactate → end-organ damage

→ Pts in shock are often hypotensive, but not always!
 (i.e. in young people, & in chronic hypertensive pts)
 → 2+ types of shock can occur simultaneously!
 → Shock and end-organ damage is self-perpetuating!
 → "Golden interval" for intervention in shock (like in trauma, stroke, or MIs): Early intervention is most effective.

Extremities Warm

(pathological vasodilation → ↓ afterload, ↓ BP)

1. Distributive shock

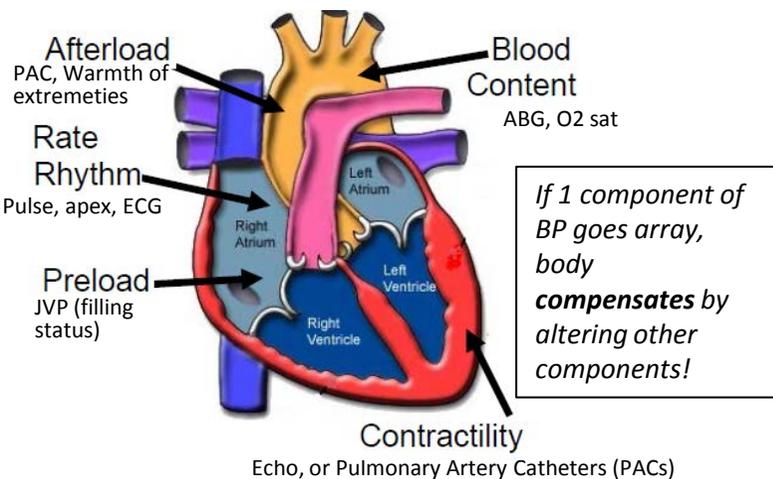
Causes: Anaphylaxis, Sepsis, Neurogenic, Adrenal Insufficiency

→ **Main problem:** generalized pathologic (often inflammatory) vasodilation → ↓ afterload, ↓ BP (reduces tissue perfusion)

→ **Compensation:**
 1) ↑ contractility (to ↑ CO)
 2) ↑ HR (to ↑ CO)
 → **Features:** Appropriate history (i.e. infection), Bounding pulses (large pulse pressure), warm extremities, tachycardic; sources of infection

BP = (HR x SV) x SVR
 = (rate, rhythm) x (contractility, preload) x afterload
 (Disturbance of any factor → inadequate perfusion)

Ways of analysing each factor:



Extremities Cool

(compensatory vasoconstriction to ↑ systemic afterload)

Low JVP

(low RH preload; low systemic blood volume)

2. Hypovolemic Shock

→ **Primary problem:** massive bleeding → ↓ preload
 → **Compensation:**
 1) Peripheral vasoconstriction (to divert blood back to vital organs & ↑ afterload → cool extremities)
 2) ↑ contractility (to ↑ CO)
 3) ↑ HR (to ↑ CO)
 → **Features:**
 -History (NSAID ingestion, H. pylori, alcohol/wretching, bleeding)
 -livedo reticularis, dry skin/mucus membranes, flat JVP

Decompensated Distributive Shock can look like Hypovolemic Shock:
 → in Sepsis, inflammation causes loss of serum from blood into tissues, also ↓ heart function, esp in kids.

→ **Compensatory mechanisms in all causes of shock:** 1) ↑ HR (to ↑ CO), 2) ↑ RR (to counteract anaerobic respiration), 3) blood diverted from non-essential places (skin) to brain, heart, lungs, kidneys.

High JVP

(high RH preload; normal systemic blood volume)

3. Cardiogenic Shock

→ **Primary problem:** LV failure (MI, dissection, or dysrhythmia)
 → ↓ contractility, ↓ heart rate/rhythm → ↓ CO, ↓ BP. Also, Blood accumulate in L-heart, ↑ L preload; backs up into lungs/veins, ↑ JVP
 → **Compensation:**
 1) Peripheral vasoconstriction (divert blood to vital organs & ↑ afterload → cool extremities)
 2) ↑ HR (to ↑ CO)
 → **Features:**
 -history
 -lung crackles (Left H. issue)
 -S3, murmurs
 -dysrhythmia (palpitations)

4. Obstructive Shock

→ **Primary problem:** PE, Tension PTX or tamponade obstructs blood flow from R to L heart → ↓ L heart pre-load → ↓ SV → ↓ BP.
 → Also, ↑ RH afterload → RH failure → ↑ RH preload/JVP
 → **Compensation:**
 1) Systemic Vasoconstriction (↑ LH afterload) → to ↑ BP
 2) ↑ HR (to ↑ CO)
 → **Features:**
 -history, Plethoric facies (red face)
 -no lung crackles
 -Muffled HS
 → **Acute Tx:** Tx underlying cause!

Pulmonary Embolism

Tension Pneumothorax
 → Unequal unilateral breath sounds

Cardiac Tamponade
 → ↓ Heart sounds
 → High JVP
 → Hypotension