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# Sepsis in Children: Hemodynamic Management

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# **Pediatric Shock: Definition**

## **Definition of shock**

**“Circulatory system failure to supply oxygen and nutrients to meet cellular metabolic demands”**

**Oxygen supply  $\neq$  Oxygen demand  
(Oxygen delivery)**

# Principles of shock management

- **Increase O<sub>2</sub> delivery**
  - Optimize O<sub>2</sub> content
  - Improve cardiac output
- **Decrease O<sub>2</sub> demand**
- **Correct metabolic derangement**

# Oxygen delivery ( $DO_2$ )

- $DO_2 = CO \times CaO_2 \times 10$ 
  - Remember: CO depends on HR, preload, afterload, and contractility
- $CaO_2 = Hgb \times 1.34 \times SaO_2 + (PaO_2 \times 0.003)$ 
  - Remember: hemoglobin carries more than 99% of oxygen in the blood under standard conditions

One of the goals of treatment is to restore cardiac output

## **Sepsis in children: Hemodynamic changes (Flow, pressure, resistance)**

- **Flow: Decreased Cardiac output (CO)**
- **Pressure: Decreased Blood pressure (Decreased Perfusion pressure)**
- **Resistance: increased (high SVR) or decreased vascular Tone (low SVR)**

**Goal of septic shock treatment is to restore effective tissue perfusion and to normalize cellular metabolism.**

**Tissue perfusion is a function of both pressure (BP) and flow (CO).**