Shock

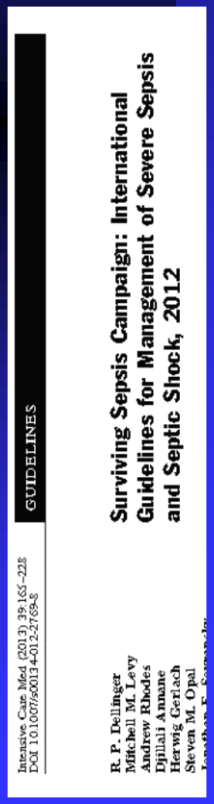
- what is shock
- how to recognise shock
- how to treat shock

Shock: definition

- inadequate perfusion of the tissues with oxygenated blood

or

- failure of certain vital organs to utilise oxygen



Sepsis is a systemic, deleterious host response to infection leading to severe sepsis (acute organ dysfunction secondary to documented or suspected infection) and septic shock (severe sepsis plus hypotension not reversed with fluid resuscitation). Severe sepsis and septic shock are major healthcare problems, affecting millions of people around the world each year, killing one in four (and often more), and increasing in incidence [1–5]. Similar to polytrauma, acute myocardial infarction, or stroke, the speed and appropriateness of therapy administered in the initial hours after severe sepsis develops are likely to influence outcome.

Shock: definition

- Clinical syndrome → *Clinical Diagnosis*
- Acute disruption of
  - microcirculatory function
  - macrocirculatory function

⇒ general insufficiency of → *Laboratory confirmation*

  - tissue perfusion
  - O_2 utilization
  - cellular energy production

⇒ deranged homeostatic mechanisms

⇒ irreversable cellular damage

Shock: Types

- Hypovolemic
- Cardiogenic
- Distributive
- Obstructive
- Dissociative

- hemorrhagic
- gastro-intestinal loss
- skin
- polyuria

- congenital heart failure
- metabolic/toxic heart failure
- infectious heart failure
- ischemic heart failure
- tachy-arrhytmic heart failure

- anaphylaxis
- septic vasoplegia
- toxic vasoplegia
- neurologic vasoplegia

- tension pneumothorax
- tamponade
- PE

- Profound Anemia
- CO intoxication
- MetHgb

Shock: Types

Clinical features

- Hypovolemic
- Cardiogenic
- Distributive
- Obstructive

- tachycardia
- tachypnoea
- oliguria
- weak pulsations
- prolonged capillary refill
- cold moist skin
- collaps superficial veins

- tachycardia
- tachypnoea
- oliguria
- weak pulsations
- prolonged capillary refill
- cold moist skin
- ↑ CVP

- tachycardia
- tachypnoea
- oliguria
- strong pulsations
- normal/prolong capillary refill
- warm skin

- tachycardia
- tachypnoea
- oliguria
- ↑ CVP
- deviation trachea
- asymmetrical breath sounds
- muffled heart sounds

Table 1 Diagnostic criteria for sepsis

Infection, documented or suspected, and some of the following:

General variables
- Fever (>38.3 °C)
- Hypothermia (core temperature <36 °C)
- Heart rate >90 min^{-1} or more than two SD above the normal value for age
- Tachypnea
- Altered mental status
- Significant edema or positive fluid balance (> 20 mL/kg over 24 h)
- Hyperglycemia (plasma glucose >140 mg/dL or 7.7 mmol/L) in the absence of diabetes

Inflammatory variables
- Leukocytosis (WBC count >12,000 μL^{-1})
- Leukopenia (WBC count <4,000 μL^{-1})
- Normal WBC count with greater than 10 % immature forms
- Plasma C-reactive protein more than two SD above the normal value
- Plasma procalcitonin more than two SD above the normal value

Hemodynamic variables
- Arterial hypotension (SBP <90 mmHg, MAP <70 mmHg, or an SBP decrease >40 mmHg in adults or less than two SD below normal for age)

Organ dysfunction variables
- Arterial hypoxemia (PaO_2/FiO_2 <300)
- Acute oliguria (urine output <0.5 mL kg^{-1} h^{-1} for at least 2 h despite adequate fluid resuscitation)
- Creatinine increase >0.5 mg/dL or 44.2 μmol/L
- Coagulation abnormalities (INR >1.5 or aPTT >60 s)
- Ileus (absent bowel sounds)
- Thrombocytopenia (platelet count <100,000 μL^{-1})
- Hyperbilirubinemia (plasma total bilirubin >4 mg/dL or 70 μmol/L)

Tissue perfusion variables
- Hyperlactatemia (>1 mmol/L)
- Decreased capillary refill or mottling

Shock: Progressive syndrome

Non-Progressive

Progressive

1. Compensated Shock (↓ ECF < 25 %)

Defending the blood pressure → Intact oxygenation

2. Uncompensated Shock (↓ ECF > 25 %)

Failing oxygenation → Lactic Acidosis

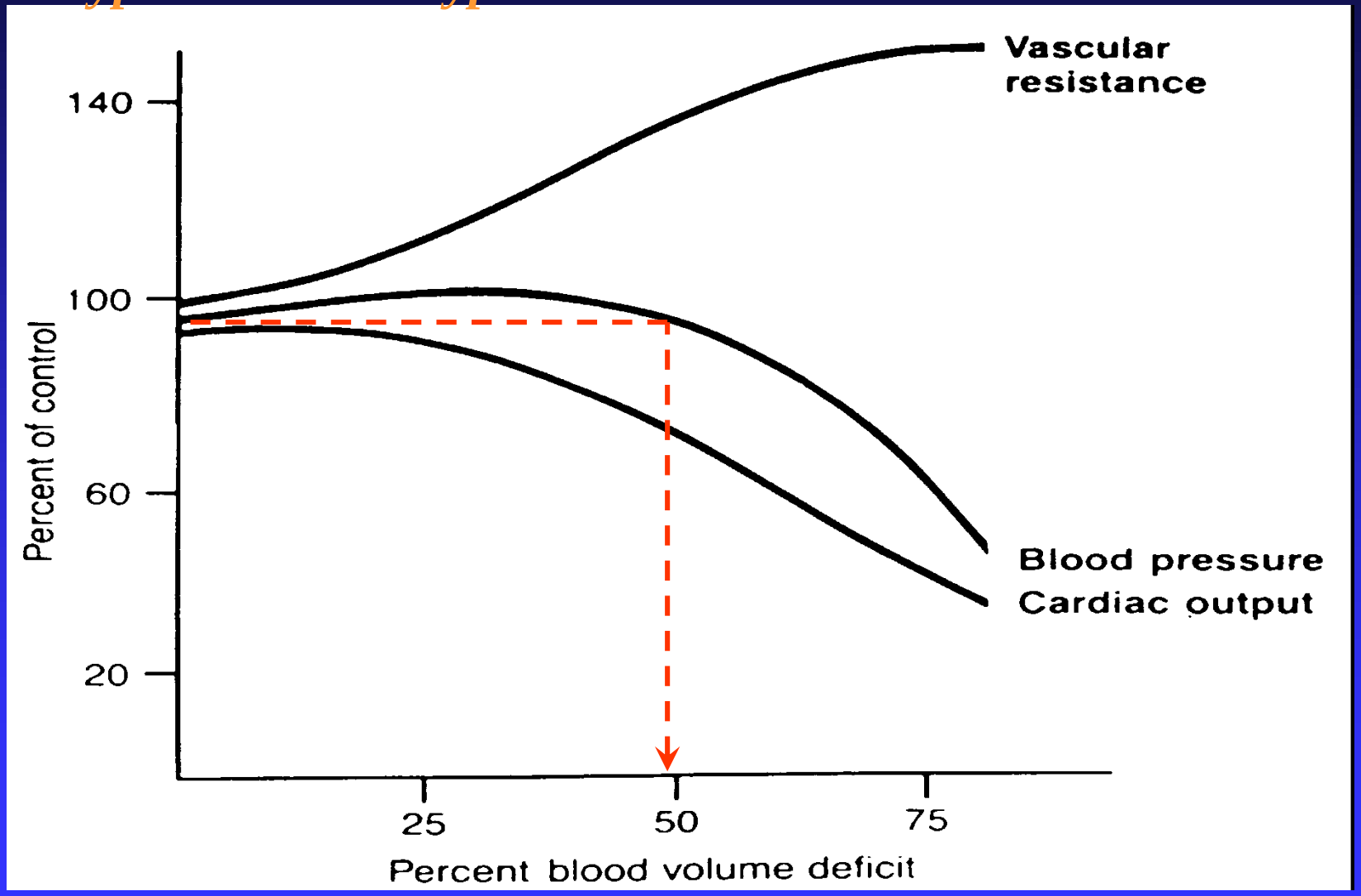
Failing oxygenation → Failing Defence

3. Irreversible Shock ← Failing Defence

ATP degradation → Cell/tissue/organ/body death

Shock: clinical consequences

Hypovolemia ≠ Hypotension



Shock: Progressive syndrome