Physiology and signs of Shock

- **First: recognize the presence of shock;**
- **Second: look for a cause of it while simultaneously treating it**
- **In trauma, the commonest form of shock is HAEMORRHAGIC**

Basic Physiology of cardiac output: familiar facts

- **Cardiac output = heart rate times stroke volume, in litres per minute.**
- **Stroke volume is influenced by preload, contractility and afterload.**
  - **Preload is the volume of venous return**
    - **VENOUS RETURN:**
      - **70% of the blood volume is in the venous circuit**
      - **The venous circuit is driven by pressure;**
      - **When blood volume is lost, the venous circuit suffers, and venous return is reduced.**
  - **Contractility is partially determined by preload – the Frank-Starling principle dictates that the more blood returns to the heart, the harder that blood gets pumped. So to speak.**
  - **Afterload** is the peripheral resistance of the arterial circuit.

TACHYCARDIA: earliest measurable sign of volume depletion

- **This is an attempt to maintain cardiac output (seeing as venous return decreases)**
- **Thus, you replace volume, and the heart rate reduces if you replaced enough of it.**

REPLACE VOLUME! Inotropes are useless; remember:

DEFINITION OF SHOCK IS INADEQUATE TISSUE PERFUSION (WITH OXYGEN)

Inotropes actually make the tissue perfusion worse; it's a loss of volume that's at fault, not vasodilation, so vasoconstrictors really have no role to play.

Shock in a trauma patient mandates immediate surgical involvement

Is my patient in shock?

- **TACHYCARDIA is usually the first sign**
- **CUTANEOUS VASOCONSTRICTION** is usually the next sign
  - **At this stage, the patient begins to look like a typical "shocked" person, ashen-gray and tachycardic.**

A tachycardic trauma patient with cool peripheries is in shock until proven otherwise

The elderly, who are beta-blocked or have pacemakers, wont get tachycardic. Instead their pulse pressure will narrow, indicating a reduced cardiac output.

- **HYPOTENSION is a late sign, it means compensatory mechanisms have failed;**
  - **Usually at this point 30% of the blood volume is already lost**
- **Raised ABG lactate** is nearly always useless, but gives you an idea of how long the person has been in shock, and whether your management is improving perfusion. A severely shocked patient will have a lactate rise even AFTER good resuscitation, because of "washout" of lactate from the hypoxic tissues.