**APPROACH TO UNDIFFERENTIATED SHOCK** by Nick Mark MD

- Shock occurs when there is inadequate blood flow (CO) & oxygen delivery (DO2) to meet demands. Manifestations can be protean and may not initially include hypotension (cryptic shock). Identifying the etiology of undifferentiated shock is essential to determine treatment.
- Shock can be broken into 4 categories: cardiogenic, obstructive, distributive, hypovolemic.
- Multiple causes may be present (e.g. sepsis in a patient with decompensated heart failure) and some etiologies may cause mixed shock:
  - **Endocrine** (adrenal insuff., myxedema, thyrotoxicosis)
  - **Metabolic** (hypothermia, severe acidosis)

### MEDICATIONS

**HYPERTENOSIS**

- **HEMORRHAGE** (trauma, surgical, GIB)
- **SKIN LOSSES** (burns, heat stroke, etc)
- **GI LOSSES** (diarrhea, vomiting, drainage)
- **THIRD-SPACING VOLUME LOSS** (pancreatitis, low albumin, trauma)
- **RENAL LOSSES** (salt-wasting, hypoaldosteronism, diuretics)
- **LOW PO INTAKE**

**TANK PROBLEM**

- **HYPOVOLEMIC**

**PUMP PROBLEM**

- **CARDIOGENIC**
  - RATE/RHYTHM (bradycardia, VF, etc)
  - RV FAILURE (PE, PHTN)
  - LY FAILURE (MI, myocarditis, etc)
  - VALVES (wide open MR, cordae tendae rupture, etc)
  - TOXINS (CCB, B6, BRASH syndrome, etc)
  - TRAUMA (myocardial contusion)

**OBSTRUCTIVE**

- TENSION PNEUMOTHORAX
- CARDIAC TAMPONADE
- PULMONARY EMBOLISM
- OUTFLOW OBSTRUCTION (HOCM, critical AS)
- DYNAMIC HYPERINFLATION (auto-PEEP)

**DISTRIBUTIVE**

- SEPSIS (may develop low CO later)
- ANAPHYLAXIS
- INFLAMMATORY (SIRS, pancreatitis, post-cardiac arrest, amniotic/embolism, cytokine release syndrome)
- NEUROGENIC (SCI, severe TBI, effect of neuraxial anesthesia)
- LIVER FAILURE
- ENDOCRINE (adrenal insufficiency, thyrotoxicosis)
- MEDICATIONS (anesthesia, sedation)

**Exam & POCUS**

- MAP DETERMINANTS: Preload, Contractility, Afterload
  - SV
  - HR
  - CO
  - SVR

- **MAP**
  - **PRELOAD**
  - **CONTRACTILITY**
  - **AFTERLOAD**

- **Normal SVR = 800 – 1600 dyn/cm/sec**
  - **Wood units**

**Physiologic Responses to Shock Using Guyton Curves**

- **Cardiac Output**
  - **RAP**
  - **Cardiogenic/OBSTRUCTIVE**
  - With low CO, RA filling pressures rise to (partially) compensate
  - **DISTRIBUTIVE**
  - Vasodilation decreases filling, hyperdynamic CO compensates
  - **HYPOTONIC**
  - With low preload, venoconstriction increases filling pressure compensates

- **Guyton Curves** (in Shock OnePager for more)

**Calculating SVR**

- SVR can be useful to understand etiology. You can either measure CO invasively (e.g. PAC) or estimate using POCUS (e.g. LVOT VTI)

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\text{MAP} = \text{CO} \times \text{SVR}
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\text{SVR} = \frac{(\text{MAP} - \text{CVP}) \times 80}{\text{CO}}
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**Hyponatremia**

- Estimated using POCUS (e.g. LVOT VTI)

- Normal SVR = 800 – 1600 dyn/cm/sec

- (Wood units)