Hypotension / Shock

Shock:
Inadequate cellular perfusion and inadequate oxygen delivery for existing metabolic demand

Mean Arterial Pressure:
Cardiac Output $\times$ Total Peripheral Resistance

- Stroke Volume $\times$ Heart Rate
- Venous Return (Blood Volume)
- Contractility

Heart rate
Blood volume
Contractility
Peripheral vascular resistance

MAP falls if

Clinical Manifestation of Shock
Compensatory Mechanism (Adrenergic Mediators)
- Tachycardia
- Diaphoresis, anxiousness, nausea, vomiting, diarrhoea
- Cool and moist skin
- Oliguria

Decompensating
- Altered mentation
- Myocardial ischaemia

Hypotension / Shock Algorithm

- Assess danger / responsiveness
- Call for help / defibrillator
- Assess ABCs
- Administer Oxygen
- Establish IV
- ECG monitoring

- Assess vital signs
- Record history
- Perform physical examination
- Do 12 Lead ECG
- Do portable CXR

What is the nature of the problem

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Hypotension / Shock Algorithm
**Hypotension**

18 April 2011

IV Dopamine 5-20 μg/kg/min
Add IV Noradrenaline 0.5 to 30 μg/min
if Dopamine>20μg/kg/min

IV Dopamine 2-20 μg/kg/min
IV Dobutamine 2.20 μg/kg/min

What is the blood pressure?

**SBP<70 mmHg**
Signs and symptoms of shock

**SBP 70-100 mmHg**
Signs and symptoms of shock

**Systolic BP 70-100 mmHg**
No signs and symptoms of shock

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**Volume / Vascular resistance problem**

Fluid / blood transfusion
Consider vasopressor (vascular resistance problem)
Cause-specific intervention

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**Pump Problem**

What is the blood pressure?

**First line Actions**
- Frusemide IV 0.5-1.0mg/kg
- Morphine IV 1-3 mg
- Nitroglycerin S/L
- Oxygen / Intubation CPAP/PEEP

**Second line Actions**
- Nitroglycerine IV or nitroprusside IV or dobutamine IV if SBP > 100 mmHg
- Dopamine of BP < 100 mmHg

**Third line Actions**
- Thrombolytic therapy (if not in shock)
- Angioplasty
- IABP, Surgery (valves, CABG)

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**Pulmonary Oedema**

Cardiogenic pulmonary oedema: Increased pulmonary venous pressure (LVEDP ≥18 mmHg) due to altered pump function, rhythm or excess fluid

Non-cardiogenic pulmonary oedema: normal pulmonary venous pressure due to altered permeability of alveolar or pulmonary capillary endothelium

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**Acute Pulmonary Oedema Algorithm**

- Assess danger / responsiveness
- Call for help / defibrillator
- Assess ABCs
- Perform physical examination
- Elevate legs dependent
- Do 12 Lead ECG
- Do portable CXR
- Establish IV
- Review history
- Do portable CXR

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**Management of Acute Pulmonary Oedema (I)**

1. **Loop diuretics**
   - Immediate decrease in venous tone (increase in renal capacitance)
   - Increase in renal water excretion, reaches a peak in 30 minutes
   - Rapid onset of actions (5 to 10 minutes)

2. **Morphine**
   - Central sympatholytic effect causing peripheral vasodilation
   - Decrease preload
Management of Acute Pulmonary Oedema (2)

3. Nitrates
   - Potent venodilatory (low dose)
   - Dilate arterial resistance vessel (high dose)

4. Positive pressure ventilation
   - Useful in non-cardiogenic pulmonary oedema
   - Respiratory insufficiency

Search for underlying causes of HF

- event precipitating acute decompensation
  - eg: AMI, salt overload,
  - medication non-compliance,
  - NSAIDs, arrhythmia

Scenario

55 years old man presented after 2 hours of severe substernal chest pain and discomfort in his left arm

Non-responsive

Vital signs BP 50/30, pulse 40/min, RR 16/min

Inferior & RV infarct

- Is there a rate problem?
- Is there a pump problem?
- Is there a volume problem?
- How would you treat this patient?

Definitive treatment with a transvenous pacemaker depends on the type of block

- Sinus or first-degree needs no pacing
- Second-degree type I (usually nodal) possibly needs temporary pacing
- Second-degree type II (usually infranodal) has unpredictable need for pacing
- Third-degree (usually infranodal) generally needs pacing
**Scenario**

62 year old Indian man
Complained of chest tightness, giddiness and sweating

- Cold and clammy, conscious but drowsy
- Raised JVP
- HR 48/min, BP 84/40 mmHg
- Heart S1 S2 S4 gallop
- Systolic murmur at left parasternal edge
- Lungs were clear
- Liver 3 cm

ECG as shown
Raised CKMB and troponin T

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**Inferior, lateral & RV infarct**
Complicated by complete heart block and hypotension

- RV pump failure, suboptimal heart rate
- Congested right heart
- Diminished LV filling and low C.O
- No significant pulmonary congestion

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**Treatment**

- Oxygen
- IV fluid infusion
- IV dopamine, IV atropine
- May need temporary cardiac pacing
- Avoid over zealous use of diuretics
- Avoid vasodilators
- Aspirin, plavix, s/c heparin + revascularization