

Anaphylaxis and shock

Anaphylaxis

- Risk factors for severe anaphylaxis
 - Asthma
 - Medication
 - β blocker (May need Glucagon 1 mg IV)
 - Angiotensin converting enzyme inhibitors, NSAID
 - Acute respiratory infection
 - Mastocytosis
 - Alcohol, emotional stress, fever

Anaphylactic shock

- Call for help
 - Atypical presentation during anaesthesia
- Check A, B , C
- High flow O2 (100% O2)
- CPR if required
- Stop giving the triggering drug
 - Latex, Food, blood products

Anaphylaxis

- Recent drug therapy
- Food allergy
- Insect stings

Anaphylactic shock

- Adrenaline
 - As early as possible
 - 0.5- 1 mg IM (repeat 5 minutes)
 - or 300 mcg IM self inject
 - 50-200 mcg IV increments
- IV fluid
- Legs elevated, or recovery position

History of severe allergic type reaction with respiratory difficulty or hypotension, especially if skin changes present

Oxygen

Stridor, wheeze, respiratory distress, or clinical signs of shock¹

Adrenaline (epinephrine)^{2,3} 1:1000 solution
0.5 ml (500 µg) intramuscularly

Repeat in 5 minutes if no clinical improvement

Antihistamine (chlorpheniramine)
10-20 mg intramuscularly or slowly intravenously

In addition

For all severe or recurrent reactions and patients with asthma give hydrocortisone 100-500 mg intramuscularly or slowly intravenously

If clinical manifestations of shock do not respond to drug treatment give 1-2 l of fluid intravenously⁴
Rapid infusion or one repeat dose may be necessary

1. Inhaled β_2 agonist such as salbutamol may be used if bronchospasm severe and does not respond rapidly to treatment
2. If profound shock immediately life threatening give cardiopulmonary resuscitation or advanced life support if necessary. Consider giving adrenaline 1:10 000 solution slowly intravenously. Hazardous and recommended only for experienced physician. Note different strengths used for intramuscular and intravenous routes
3. If treated with Epipen, 300 µg will usually be sufficient. A second dose may be required. Half doses of adrenaline may be safer for patients taking tricyclic antidepressants or β blockers
4. Crystalloid may be safer than a colloid

Anaphylactic shock

- Second line treatment
 - Antihistamine
 - Chlorphenamine 10 mg IV or IM
 - Hydrocortisone 200 mg IV
 - Bronchodilator
- Catecholamine infusion
- Check Arterial blood gases
- Check airway oedema

Anaphylactic shock

- Bronchospasm
 - Salbutamol (nebulizer or IV)
 - Ipratropium
 - IV Aminophylline or Magnesium sulphate
- Observe for delayed problems (Bi-phasic)
- Oral antihistamine & corticosteroid 3 days
- Arrhythmias,
- Coronary spasm, ACS
- Further investigation (allergy diagnosis)
- Incident reporting

General Investigations

- Bedside
 - ECG
 - Haemoglobin
 - Arterial blood gases,
 - Lactate
 - Ultrasound,
 - Echocardiogram

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General Investigations

- Laboratory
 - Full blood count
 - Coagulation, D dimer
 - U & E
 - LFT
 - Cardiac enzymes
 - Cultures (urine, blood, sputum)
 - Toxicology

General Investigations

- Radiology
 - CXR
 - Abdominal X ray
 - Trauma series radiology
 - CT scan
 - Angiography

General Management of Shock

- Supply Oxygen
- Vascular access
- Volume resuscitation
- Vasoactive drugs
- Manage precipitating illness/ injury
- Monitoring§

Fluid responsiveness

- Static measure
 - Intra cardiac pressure
 - CVP (Limitation)
 - Pulmonary artery occlusion pressure
 - Cardiovascular volume
 - Echo – LVEDV
 - Oesophageal Doppler
 - Corrected Flow time
 - Peak velocity

Fluid responsiveness

- Dynaemic measure
 - Responsive to fluid challenge
 - Passive leg raising test
 - Aortic flow
 - Pulse pressure
 - Response to IPPV
 - Systolic pressure variation
 - Pulse pressure variation
 - Stroke volume variation

CVP

- Frank Starling law
- CVP does NOT indicate volume status
- Normal CVP does not exclude hypovolaemia
- High CVP
 - May need fluid, may respond fluid challenge
- Trend may be useful

Other tools to assess Volume status

- Non-invasive cardiac output
 - Pulse contour analysis
 - Oesophageal doppler
 - Thoracic bio-impedance
- Systemic arterial –venous CO₂ difference
- Ultrasound, Echocardiogram

Shock

- **Definition**

Shock is defined by low blood pressure (systolic BP <90 mmHg or fall in systolic BP of >40 mmHg with evidence of tissue hypoperfusion (confusion, cold clammy extremities and oliguria).

Causes of shock

- Cardiac Pump failure
- Hypovolaemia
- Systemic vasodilatation
- Obstructive
- Anaphylaxis
- others

Differential diagnosis of shock

- Cardiac pump failure
 - Myocardial infarction
 - Dissection of thoracic aorta
 - Cardiac dysrhythmias
 - Acute valvular regurgitation or acute VSD
 - Drug overdose (cardiac depressants)
 - Myocarditis

Hypovolaemia

- Haemorrhage, aortic dissection or leaking abdominal aortic aneurysm, post-trauma (splenic rupture), rupture of ectopic pregnancy
- Fluid losses (diarrhea, vomiting, polyuria, or burns)
- 3rd space fluid losses (acute pancreatitis, ascites, dengue shock)
- Adrenal failure

Systemic vasodilatation

- Sepsis
- Liver failure
- Drug overdose (calcium antagonists or other vasodilators)
- Acute adrenal insufficiency

Anaphylaxis

- Recent drug therapy
- Food allergy
- Insect stings

Obstruction

- Cardiac tamponade
- Pulmonary embolus
- Tension pneumothorax
- Others
 - Neurogenic (spinal cord injury, epidural or spinal anaesthesia)
 - Drug (anaesthetics, antihypertensives)

Clinical signs pointing to cause shock

Clinical signs pointing to cause of shock

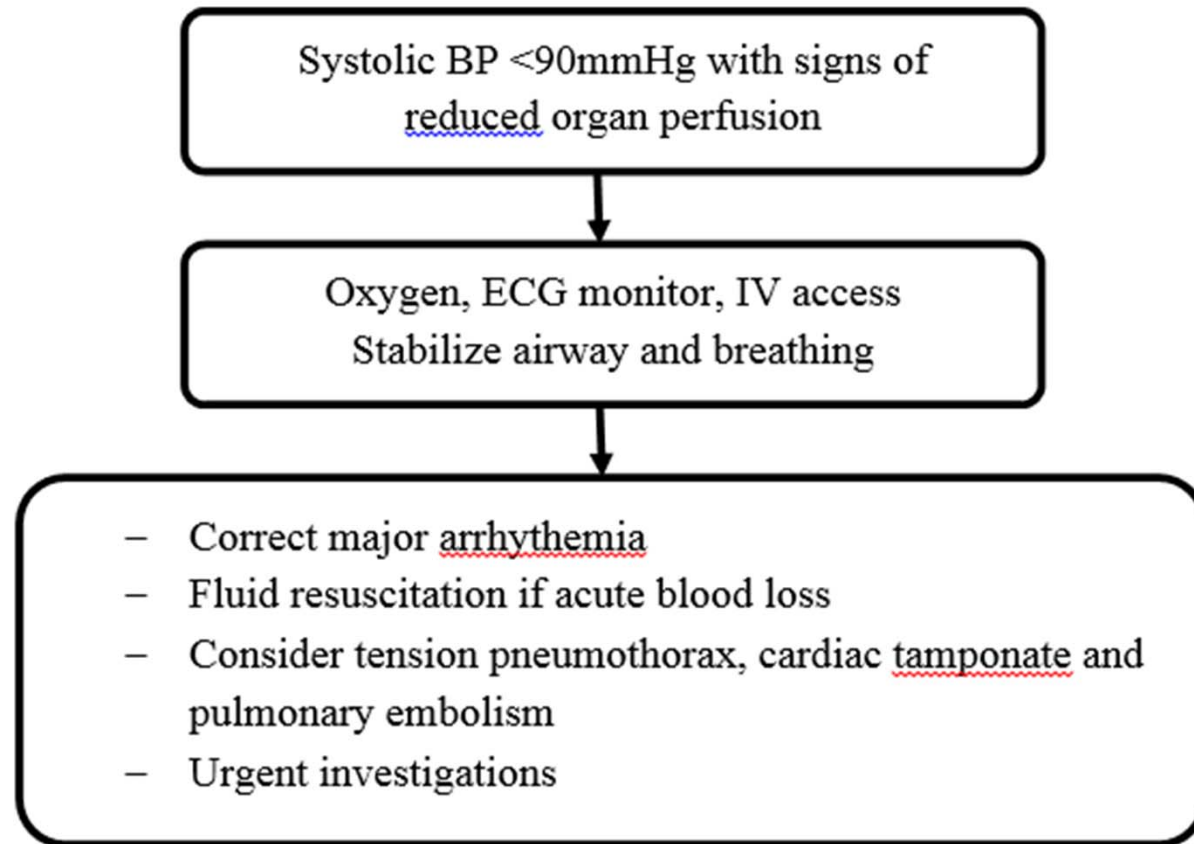
Signs	Causes of shock
Low pulse volume, cold extremities, low JVP	– Hypovolemia
Low pulse volume, cold extremities, normal or raised JVP	– Pulmonary embolism – Cardiac <u>tamponade</u> – RV infarct – Tension pneumothorax
Normal or increased pulse volume, warm extremities, low JVP	– Sepsis – Anaphylaxis – Drugs ○ – Neurogenic cause
Increased respiratory rate	– Acidosis – Pneumothorax – Pulmonary embolism
<u>Arrhythmia</u>	– Cardiogenic shock
Cardiac murmur	– Cardiogenic shock

Clinical signs pointing to cause shock

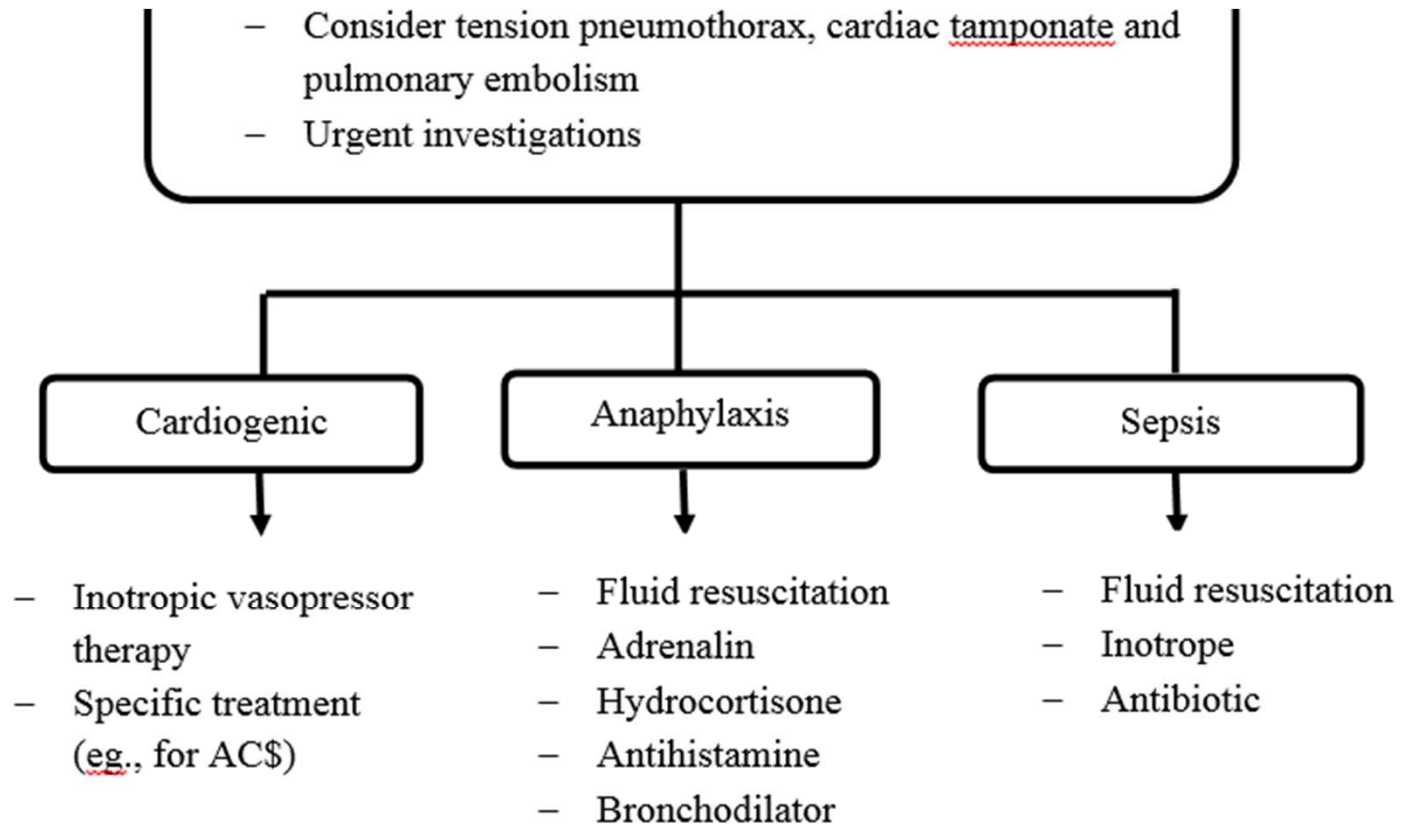
Paragraph	Signs
	<ul style="list-style-type: none"> – Pneumothorax – Pulmonary embolism
<u>Arrhythmia</u>	– Cardiogenic shock
Cardiac murmur	– Cardiogenic shock
Reduced skin turgor, dry mucus membrane	– Hypovolemia
Evidence of <u>haemorrhage</u> and <u>melaena</u>	– Hypovolemia
<u>Urticaria</u> , wheezing, eyelids or lips <u>swelling</u>	– Anaphylaxis
Unequal blood pressure on both arms	– Dissection of aorta
Abdominal mass, signs of perforation	– Hypovolemia or sepsis
Missed period, pallor in reproductive age female	– Rupture of <u>ectopic pregnancy</u>
Rash and <u>purpura</u>	– Sepsis
Hyperpigmentation, <u>vitiligo</u>	– Addison's disease

Management -1

Management



Management -2



Fluid resuscitation

- 1L of normal saline over 30 min
- 1L of sodium lactate (Hartmann solution: Ringer lactate solution) over 30 min
- Start norepinephrine infusion if shock persists despite 2L or more of IV fluid
- Give further maintenance, bolus fluid guided by maintenance 200 ml/hr Ringer lactate

Inotropic vasopressor therapy

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Inotropic vasopressor therapy

- Systolic BP >90mmHg: Dobutamine
- Systolic BP 80-90 mmHg: Dopamine
- Systolic BP <80 mmHg: Norepinephrine

Drug	Dosage (<u>µg/kg/min</u>)	
• <u>Dobutamine</u>	5-40	} Intravenous <u>Admixture</u> Preparation and Administration Guide → see in Annex
• Dopamine	5-10	
• Norepinephrine	0.05-5	
• <u>Adranaline</u>	0.5 – 1` mg of 1 in 1000 (1mg/ml) solution (Intramuscular)	
	Repeat every 5-10 min until BP and pulse are normal.	
• <u>Chlorpheniramine</u>	10-20 mg stat over 1 min (Intravascular)	
• Hydrocortisone	200mg stat and 6hrly or <u>p.r.n</u>	

Target for resuscitation

Target for resuscitation

- Systolic BP >90 mmHg
- Pulse rate $<100/$ min
- CVP >10 mmHg
- Urine output of >0.5 ml/kg/hr
- Capillary refill time <4 seconds

Definition of shock

- **Difficult to define**
 - 1. Acute circulatory failure**
 - 2. with inadequate or inappropriately distributed tissue perfusion**
 - 3. resulting in generalized cellular hypoxia.**

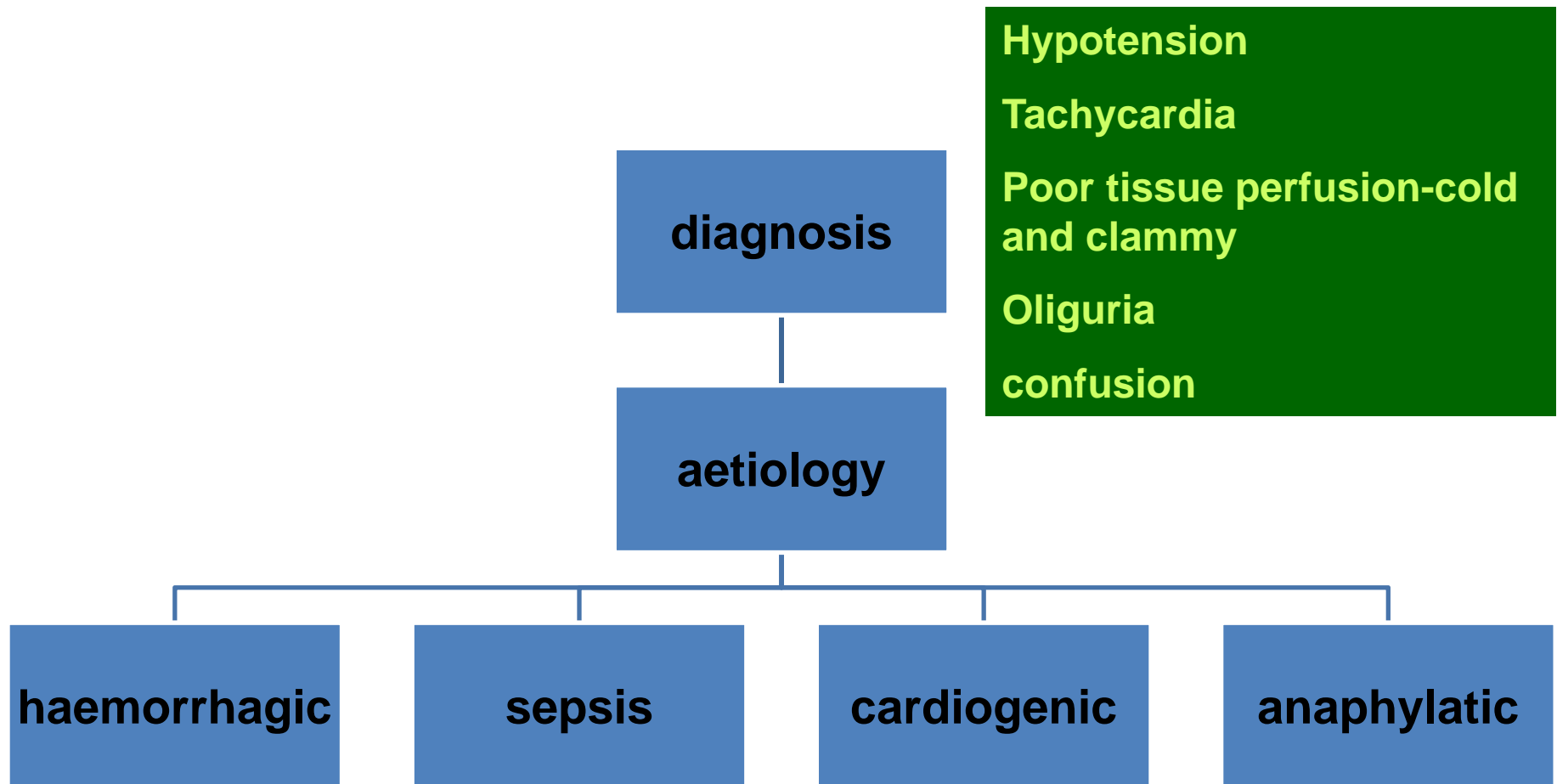
Three stages of shock

- Compensated
- Uncompensated
- Irreversible

Stages of shock

<i>Clinical parameter</i>	<i>compensated</i>	<i>uncompensated</i>	<i>irreversible</i>
Mental status	Agitation/ confusion	drowsiness	unresponse
HR	Tachycardia	Marked tachy	brady
respiration	Normal/mild tachypnoea	tachypnoea/ acidosis	Acidotic/ apnoea
Skin/capillary filling time	Cold peripheral skin and reduced cap filling	Very slow cap filling	Cold and cyanotic
Urine output	adequate	Oliguria/anuria	anuria
BP	normal	Hypotension	unrecordable

Differential diagnosis of shock



Classification and description of different type of shock

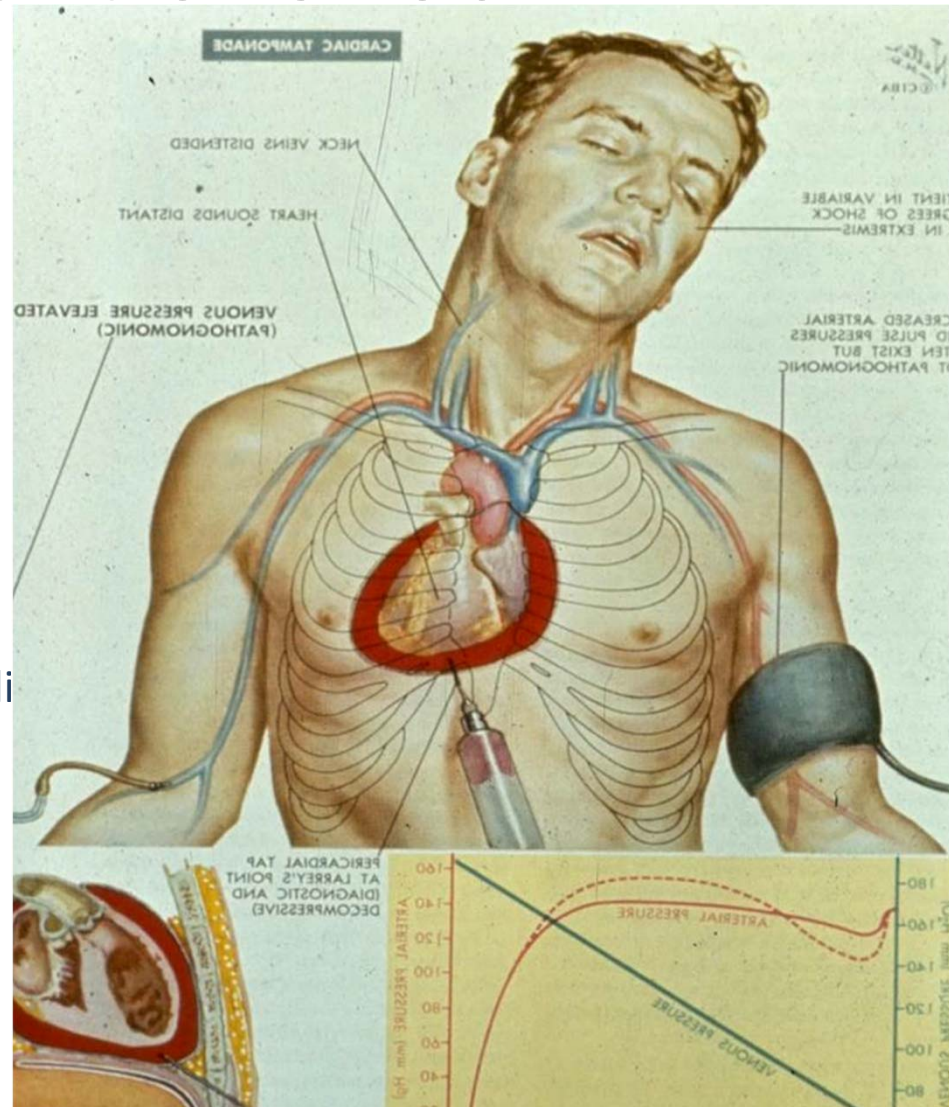
Type of shock	Common causes	Basic derangement	Distinctive features
Hypovolumi c	Dirrhoea, vomiting, h'ge, burn	Reduced circulatory vol:→low CO	HR >>>, BP<<< without sign of CCF or sepsis
Distributive	Sepsis, anaphylaxis, spinal injury, drug	Vasodilation, venous pooling, reduced preload→high CO	None
Cardiogenic	Congenital or acquired Heart d/s	Reduced myo contractility, low CO, normal IV vol	Gallop rhythm, Raised JVP, hepatomegaly
Obstructive	Temponade, massive PE, tension pneumothorax	Mechanical obstruction to ventricular outflow→ low CO	Narrow pulse pressure, profound hypoxia, low voltage ECG
dissociative	Methaemoglobinur ia, carbonmonoxide poison	Inappropriate release of O2 from Hb	Sign of myocardial ischaemia, chololate coloured blood, methHb

Principle of Management

- I. Early recognition of shock state and prompt initiation of resuscitation
- II. Look for treatable cause such as cardiac tamponade, tension pneumothorax etc
- III. Protect and support organ functions and complications
- IV. Correction of any aggravating factors or deficiency
- V. Continuous monitoring

Treatment of Shock

- Goal: Restore perfusion
- Method: Depends on type of Shock
 - Basically 2 kinds:
 - (hemorrhagic, septic, neurogen.)
 - Cardiogenic
(Impedence or primary Cardiac Failure)



Initial Mx of Acute Transfusion Reaction

Signs/symptoms of Acute Transfusion Reaction

General feeling unwell, nausea, fever. Chills, rigors, gushing, urticaria, tachycardia, hyper or hypotension, collapse, bone/muscle/chest/abdominal pain, shortness of breath, respiratory distress

Stop the transfusion and call a doctor

Check Temp, PR, BP, RR, O2sat, Check the identity of the patient, blood pack and Issue form

Mild Allergic Reaction

Chlorpheniramine 10mg IV
Restart transfusion at slower rate & observe more frequently

Mild fever and urticarial rash only

URTICARIA

FEVER

NO

FNHTR

If T rise $<1.5^{\circ}\text{C}$, stable vital signs, otherwise well, paracetamol 0.5 to 1G, Restart infusion slower rate, observe more frequently

Suspect Severe Reaction

Rigors, fever $>1.5^{\circ}\text{C}$, restlessness, chest/loin pain, pain at the infusion site, BP low $>20\%$ in systolic BP, tachycardia ($\wedge 20\%$ in HR), haemoglobinuria, unexplained bleeding (DIC)

LOIN PAIN, Hburia, DIC

High fever, rigor, low BP, no mismatched

Bacteria contamination

Acute dyspnoea, Cyanosis, JVP not raised, CXR- bilateral infiltrate

TRALI
Treat as ARDS, ventilation support

DYSPNOEA, Ri- JVP

Fluid Overload, stop infusion, O2 at 4L, furosemide IV 40-80mg

Bronchospasm, angioedema, abdominal pain, lowBP

SEVERE ANAPHYLAXIS

Recheck blood pack, patient ID/documentation- ABO incompatibility?