جامعة الملك سعود
King Saud University

General Objectives of ER Management

Diagnosis and Management of shock

433
ANAESTHESIA

MED 433
٤٣٣

Objectives:

- Identify the 4 main categories of shock
- Discuss the goals of resuscitation in shock
- Summarize the general principles of shock management
- Describe the physiologic effects of vasopressors and inotropic agent

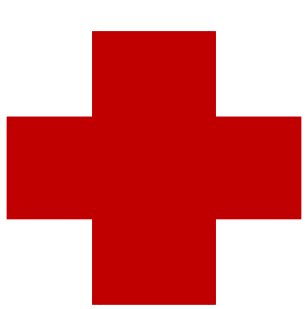
Introduction

➡ **Triage:**

- ✓ The purpose of triage in the emergency department (ED) is to prioritize incoming patients and to identify those who cannot wait to be seen.
- ✓ The triage nurse performs a brief, focused assessment and assigns the patient a triage acuity level, which is a proxy measure of how long an individual patient can safely wait for a medical screening examination and treatment.

➡ **Triage is classified**

Category 1	To be seen immediately, even if you have no place to examine, examine the patient on the floor! • e.g. (cardiac arrest, sever attack of bronchial asthma, patient in sever pain "until you control pain then reassess", multiple trauma patient, frank shock, seizing patient)
Category 2	Can be seen within 15 min • e.g. (moderate asthma, early stage of shock, postictal stage, confusion states)
Category 3	Patient stable , can wait for 30min or more • e.g. (acute appendicitis, renal or biliary colic, mild pneumonia)
Category 4 & 5	✓ Not an emergency case, should be seen in primary health clinic. ✓ Here you can send the patient to a private clinic or discharge but you must have another place to send the patient to not just a blind discharge ✓ You can also assess the patient in RAZ (rapid assessment zone)



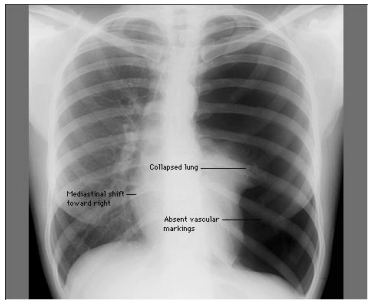
Notes:

- ✓ Ideally time to triage should be zero.
- ✓ Triage is classified into 5 categories by assessing the severity of the patient's condition based on his appearance, history, and vital signs.
- ✓ Before triage there is something called "eyeball" nurse (we created it in KKUH, because our triage takes MORE THAN 12 HOURS), to see the case of the patient and then decide where the patient should go, might send the patient directly to resuscitation even before triage.
- ✓ In crises we try to modify the system, like in corona we have clinics outside the hospital, we also have –ve pressure rooms (bed 5) for airborne infections.
- ✓ In category 2 and 3 the patient has to be reassessed after the initial waiting time has passed.

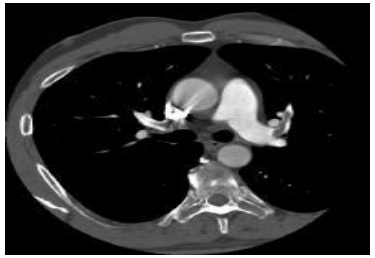
Shock

- **Defined as:** a syndrome of impaired tissue oxygenation and perfusion due to a variety of etiologies. If left untreated will lead to Irreversible injury, Organ dysfunction and finally death.
- **Clinical alterations in shock**
  - ✓ The presentation of patients with shock may be Subtle (mild confusion, tachycardia)
  - ✓ Or easily identifiable (profound hypotension. anuria)
- **Clinical manifestations of shock result from:**
  1. Inadequate tissue perfusion and oxygenation
  2. Compensatory responses "tachycardia, cold extremities, low urine output"
  3. The specific etiology "pulmonary embolism chest pain , Cardiogenic shock shortness of breath and tachycardia, Urinary tract infection dysuria"

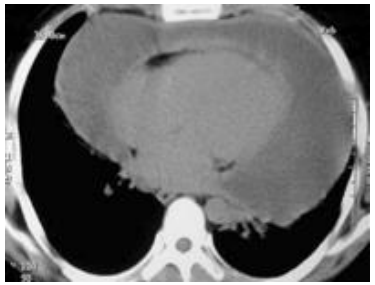
Classification of shock



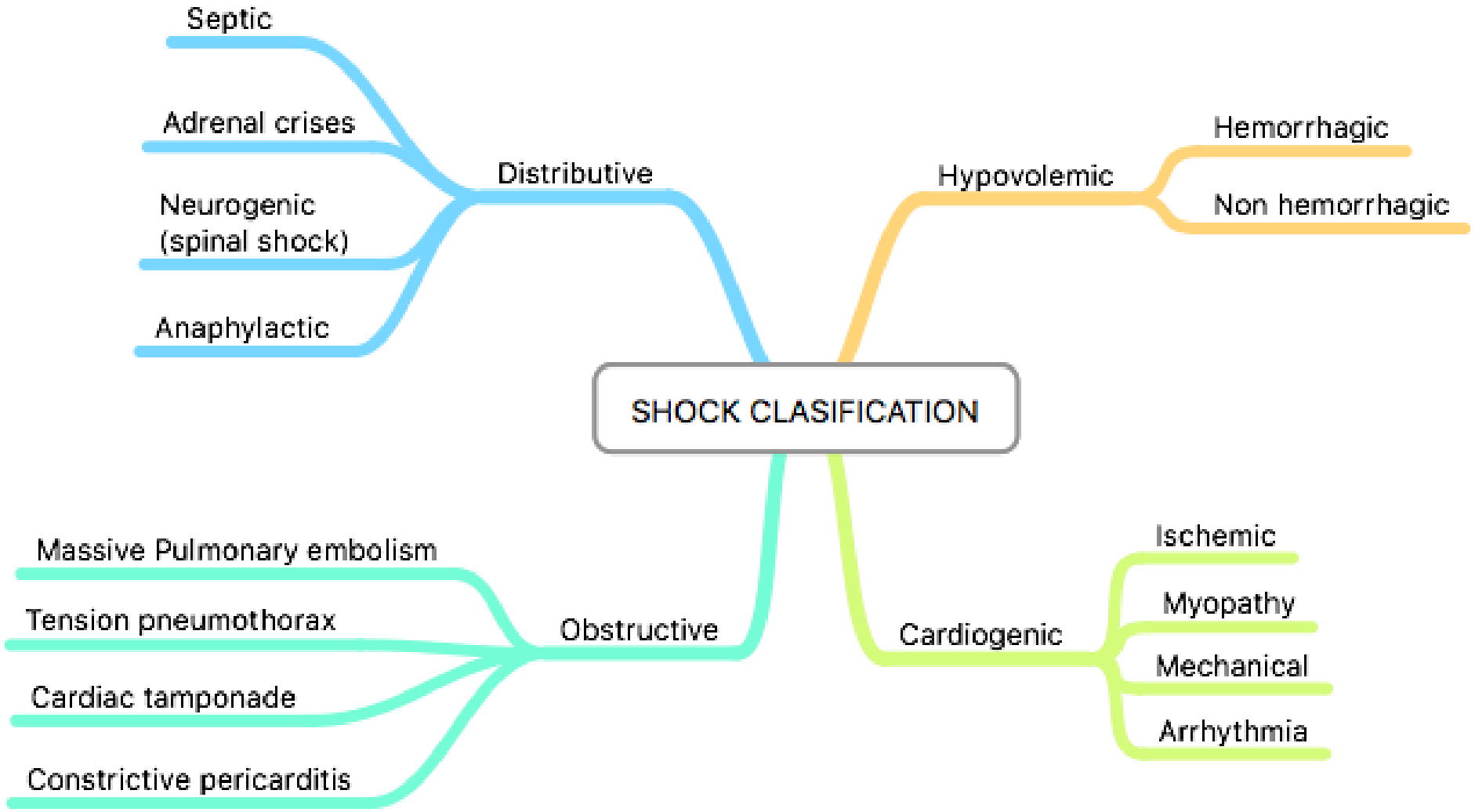
Tension Pneumothorax



Massive Pulmonary Embolism (Filling Defect)



Cardiac Tamponade



I. HYPOVOLEMIC SHOCK

Occurrence	When the intra vascular volume is depleted relative to the vascular capacity	
Result from	1. Hemorrhage. 2. G.I.T loss	3. Urinary loss 4. Dehydration
Types (432 teamwork)	**Hemorrhagic** □ Internal and external bleeding. Upper and lower GI bleeding are the most common. Another example is bleeding in multiple trauma patient	**Non-hemorrhagic** □ burn "loosing plasma" , GI enteritis, vomiting and diarrhea, Diabetes insipidus, dehydration " patient can't reach water, like in old age"
Management	✓ Restore the fluid lost o Hemorrhage: typing and crossmatching for transfusion o GIT loss: Give normal Saline ✓ Vasopressors are used only as a temporary method to restore B.P untill fluid resuscitation take place ✓ Vasopressors only used when 3 liters of fluid are given but patient didn't improve then you can think of giving vasopressors	

Hypovolemic shock management

- ✓ Normal adult blood volume is about 7% of body weight, with a 70kg man having an estimated blood volume (EBV)of around 5000ml.
- ✓ The severity of hemorrhagic shock is frequently classified according to percentage of EBV lost where class I (< 15%) represents a compensated state (as may occur following the donation of a unit of blood) and class IV(> 40%) is immediately life threatening.
- ✓ Arrest of hemorrhage and intravascular fluid resuscitation should occur concurrently; there is little role for inotropes or vasopressors in the treatment of a hypotensive hypovolemic patient.
- ✓ In the emergency situation, before bleeding has been controlled, a systolic blood pressure of 80-90 mmHg is increasingly used as a resuscitation target (permissive hypotension) as it is thought less likely to dislodge clot and lead to delusional coagulopathy.
- ✓ Once active bleeding has been stopped, resuscitation can be shifted to optimize organ perfusion and tissue oxygen delivery.
- ✓ Rapid fluid resuscitation requires secure vascular access and this is best achieved through two wide-bore (14- or 16-gauge) peripheral intravenous cannula; cannulation of a central vein provides an alternative means.
- ✓ The type of fluid used (crystalloid or colloid) is probably less important than the adequate restoration of circulating volume itself.
- ✓ In the case of life -threatening or continued hemorrhage, blood will be required early in the resuscitation.
- ✓ ideally, fully cross-matched packed red blood cells (PRBCs) should be administered, but type specific or O Rhesus-negative blood may be used until it becomes available.

Hypovolemic shock management

- ✓ Massive transfusion can lead to:
  - ✓ Hypothermia,
  - ✓ Hypocalcaemia,
  - ✓ Hyper- or hypokalemia and
  - ✓ Coagulopathy.

- ✓ The acute coagulopathy of trauma (ACOT) is *well* recognized and multifactorial.
- ✓ Dilution of clotting factors and platelets as a result of fluid resuscitation, combined with their consumption at the point of bleeding, results in clotting factor deficiency, thrombocytopaenia and coagulopathy. Hypothermia, metabolic acidosis and hypocalcaemia also significantly impair normal coagulation.

- ✓ Resuscitation strategies aggressively targeting the 'lethal triad' of hypothermia, acidosis and coagulopathy appear to significantly improve outcome following military trauma and observational studies support the immediate use of measures to prevent hypothermia, early correction of severe metabolic acidosis (pH < 7.1), maintenance of ionized calcium> 1.0 mmol and the early empirical use of clotting factors and platelets.
- ✓ Where possible, correction of coagulopathy should be guided by laboratory results (platelet count, prothrombin tme, activated partial thromboplastin time and fibrinogen concentration).
- ✓ Clotting factor deficiency is normally treated by the administration of fresh frozen plasma (FFP) (10-15mljkg),
- ✓ thrombo cytopaenia or platelet dysfunction by the administration of platelets .
- ✓ Fibrinogen deficiency (< I.0 g/L) is best treated with fresh frozen plasma or cryoprecipitate (usually 10 units). The antifibrinolytic, tranexamic acid, can be used to inhibit fibrinolysis and has been shown to reduce mortality from bleeding when used early (< 3 hours) and following major trauma.
- ✓ current military guidelines advocate the administration of warmed PRBC and fresh frozen plasma (FFP) in a 1:1 ratio as soon as possible in the resuscitation of major haemorrhage following trauma in conjunction with platelet transfusions to maintain platelets> 100 .

II. DISTRIBUTIVE SHOCK

Occurrence	Characterized by loss of vascular tone and increased vascular permeability that causes fluids to leak and distribute outside the vessels resulting in 3rd spacing.

1. Septic Shock: (the most common cause of distributive shock) (432 teamwork)

Any major insult to the body, such as infection, major trauma, burns, acute pancreatitis, initiates a hypermetabolic, inflammatory state termed 'Systemic inflammatory response syndrome' (SIRS).

The diagnosis of SIRS is based on finding two or more of the following:

1. Temperature > 38°C or < 36°C;
2. Heart rate > 90 beats/minute;
3. Respiratory rate > 20 breaths/minutes; or $PaCO_2$ < 32 mmHg
4. WBC count > 12000/µL, < 4000/µL , or > 10% immature (band) forms.

✓ Sepsis is a condition in which SIRS is due to documented or suspected infection.

✓ Septic shock is a subset of severe sepsis where there are persistent arterial hypotension and perfusion abnormalities despite adequate fluid resuscitation.

The hemodynamic profile of septic shock include:

Cardiac output	Normal or increased
Ventricular filing pressure	Normal or low
SVR	Low
Diastolic pressure	Low
Pulse pressure	Wide

II. DISTRIBUTIVE SHOCK

1. Septic Shock:
Management of septic shock [1]
✓ The initial approach to the patient with septic shock is the restoration and maintenance of adequate intravascular volume ✓ Prompt institution of appropriate antibiotic ✓ Early GS consultation for treatable cause (abscess can't treat the patient without drainage)
2. Adrenal crises
The criteria for adrenal crisis : hypoglycemia, hyponatremia, hypotension, hyperkalemia especially if the patient is taking steroids. Give IV cortisone (hydrocortisone because it has both glucocorticoid and mineralocorticoid activities)
3. Neurogenic Shock (spinal shock)
transaction of the spinal cord loss of sympathetic control hypotension
4. Anaphylactic Shock
Some patients have anaphylactic shock to medications that doesn't usually cause anaphylaxis like ceftriaxone

III. CARDIOGENIC SHOCK

Forward flow of blood is inadequate because of pump failure due to loss of functional myocardium
It is the most severe form of heart failure and it is distinguished from chronic heart failure by the presence of hypotension, hypoperfusion and the need for different therapeutic interventions.

It is the most severe form of heart failure and it is distinguished from chronic heart failure by:
Presence of hypotension, Hypoperfusion the need for different therapeutic interventions

1. Ischemic: Acute Coronary Syndrome and MI
2. Myopathy
3. Mechanical: Valve Disease
4. Arrhythmia

The hemodynamic profile :

Cardiac output	Low
Ventricular filing pressure	High
SVR	High
Mixed venous O_2 saturation	Low

Management of cardiogenic shock

1. The main goal is to improve myocardial function
2. Arrhythmia should be treated
3. Reperfusion PCI is the treatment of choice in ACS
4. Inotropes (Debutamine) and vasopressor [2]

IV. OBSTRUCTIVE SHOCK

Occurrence	Obstruction to the outflow due to impaired cardiac filling and excessive after load Pulmonary Embolism and Tension Pneumothorax are the most common etiologies. Management is directed mainly at the cause.
	1. Cardiac tamponade and constrictive pericarditis impair diastolic filling of the Rt. ventricle 2. Tension pneumothorax limit Rt. ventricular filing by obstruction of venous return 3. Massive pulmonary embolism increase Rt. ventricular afterload

The hemodynamic profile :	
Cardiac output	Low
Afterload	High
Left ventricular filling pressure	Variable
Pulsus paradoxus In cardiac tamponade	
Distended Jugular veins	

Management Of Obstructive Shock

Directed Mainly to Management of the cause
(pneumothorax→ needle in 2nd intercostal space
tamponade→ needle in the xiphisternal joint,
PE hypotensive hemodynamically unstable→ fibrinolytics and IV FLUIDS.
Stable→ heparin,
pericarditis complication (pericardial effusion)→ needle in xiphisternal joint) med431

Types:

1. Massive Pulmonary Embolism

Increases the Right ventricular afterload.

Management

Medico legally: Stabilize the patient and send for spiral CT or TEE if unstable. Medications are given without an established diagnosis only if the patient is arrested and PE is highly suspected.
Give IV and treat the cause "it's very important to treat" Treatment depends on hemodynamic stability; Stable anticoagulation only "heparin and then we start warfarin"

2. Cardiac tamponade

Diagnosed by bedside echo examination
Impairs diastolic filling of the right ventricle (treated by pericardiocentesis)

3. Constrictive pericarditis

Impairs diastolic filling of the Right ventricle (Usually patient will be chronic not acute)

4. Tension pneumothorax

Tension pneumothorax limits Right ventricular filing by obstruction of venous return.

You can diagnose it clinically based on:-

1. Hyperrosinance on affected side 2. Raised JVP 3. Shifted trachea to the other side	4. Decreased air entry and chest expansion on affected side. 5. Hypotension

Cont.

4. Tension pneumothorax

Management

- ✓ Don't postpone the patient till you do X-ray "it's a crime" Insert a needle in 2nd intercostal space mid clavicular line gauge size 14 or 16 to release the pressure inside and leave it until you insert the chest tube in the 5th intercostal space mid axillary line gauge 28.
- ✓ Immediately insert a needle in 2nd intercostal space to release the tension, leave it in place and prepare chest tube even if its not pneumothorax because we already induced pneumothorax by inserting the needle

General principles of shock management:

- ✓ The overall goal of shock management is to improve oxygen delivery or utilization in order to prevent cellular and organ injury
- ✓ Effective therapy requires treatment of the underlying etiology
- ✓ Restoration of adequate perfusion, monitoring and comprehensive supportive care
- ✓ Interventions to restore perfusion center on achieving an adequate B.P, increasing cardiac output and optimizing oxygen content of the blood
- ✓ Oxygen demand should also be reduced.

In summery management of shock

1. Monitoring
2. Fluid therapy
3. Vasoactive agents
4. Treat the cause

Case study 432 teamwork

<u>The case:</u> A25 Years old lady with no prior history of any chronic disease presented to the emergency department complaining of a productive cough of greenish yellow sputum.

- **<u>Vital signs:</u>**
- Temp. 38.8°C
- Heart rate 129/min → most important one cause in early stage of shock you may only see tachycardia.
- R.R 27/min
- BP 112/68 mmHg

In shock we consider a heart rate of more than 90 tachycardia, in normal person we consider more than 100 tachycardia

- **Where do you triage this Pt.?**

  Category 2 and resuscitate

- **What information do you need to determine if this Pt. is in shock?**

  BP, serum lactate, urine output (normally: 0,5-1 ml/kg/hr), the patient's mental status.

- **What initial interventions are needed to stabilize that Pt.?**

  fluid, fluid, FLUIDS then give early antibiotics in septic shock "if antibiotic is postponed the mortality will increase"

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Color reference:
Black-slids
Green-Notes
Blue-Book
Red-important

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