

# ANESTHESIA

## **( 2 ) General Objectives of ER Management – Diagnosis and Management of Shock**

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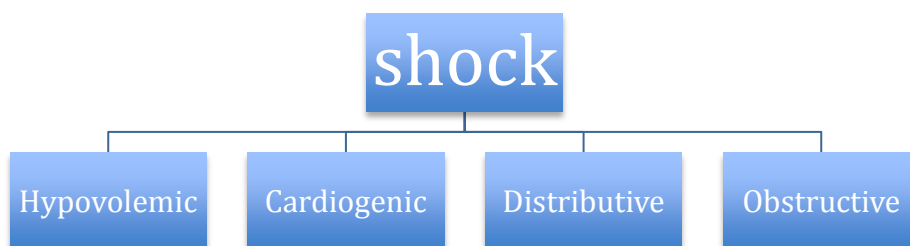
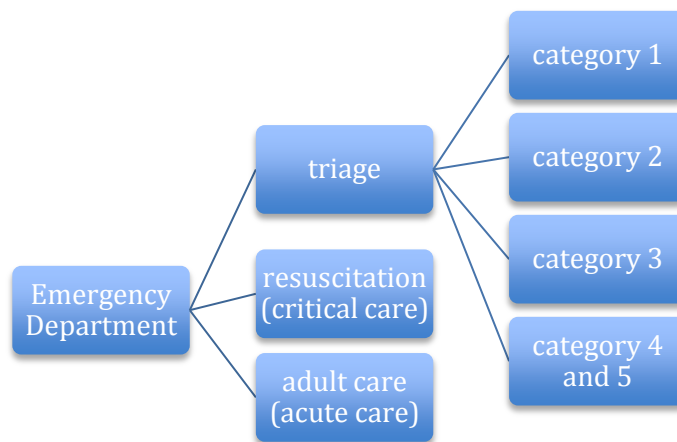
**Revised by: Shatha Al-Shanqeeti**

**Doctor's note**   **Team's note**   Not important   **Important**   **431 teamwork**

(431 teamwork do not highlight it in yellow, but put it in a yellow "box")

## 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 agents.



# INTRODUCTION

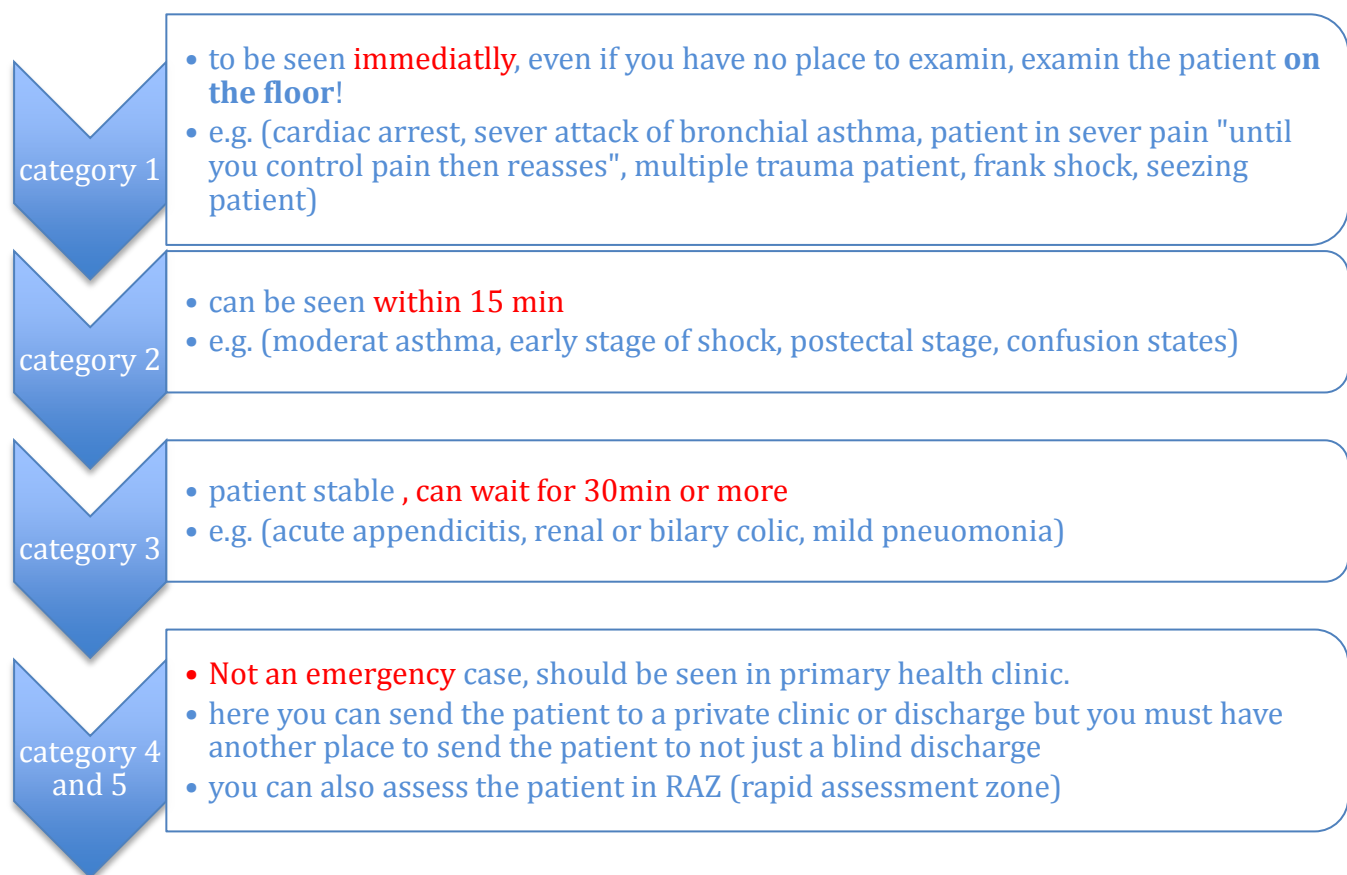
## Triage:

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.

\* 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 KKHU, 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.

## Case study

- A 25 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.  
I can't decide where to put the patient without vital signs in this case

## Vital signs

- 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"

# Classification of shock

- **Shock** is a syndrome of impaired tissue oxygenation and perfusion due to a variety of etiologies
- If left untreated → 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)
- 
- The clinical manifestation 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 **more explanation**

## 1-hypovolemic

**a- Hemorrhagic** → Internal and external bleeding. Upper and lower GI bleeding are the most common. Another example is bleeding in multiple trauma patient

**b- Non-hemorrhagic** → burn “loosing plasma” , GI enteritis, vomiting and diarrhea, Diabetes insipidus, dehydration “ patient can’t reach water, like in old age”

It occur when the intra vascular volume is depleted relative to the vascular capacity as a result of

- 1- Hemorrhage
- 2- G.I.T loss
- 3-urinary loss
- 4-dehydration

### **Management:-**

#### **Repair the loss in fluid**

\* The goal is to **restore the fluid lost.**

**Hemorrhage: typing and crossmatching for transfusion**

**GIT loss: Give normal Saline**

\* **Vasopressors are used only as a temporary method to restore B.P until 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**

## 2- Distributive

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

**A- Septic Shock:** (the most common cause of distributive shock)

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:**

**Temperature** > 38°C or < 36°C;

**Heart rate** > 90 beats/minute;

**Respiratory rate** > 20 breaths/minutes; or PaCO<sub>2</sub> < 32 mmHg

**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.

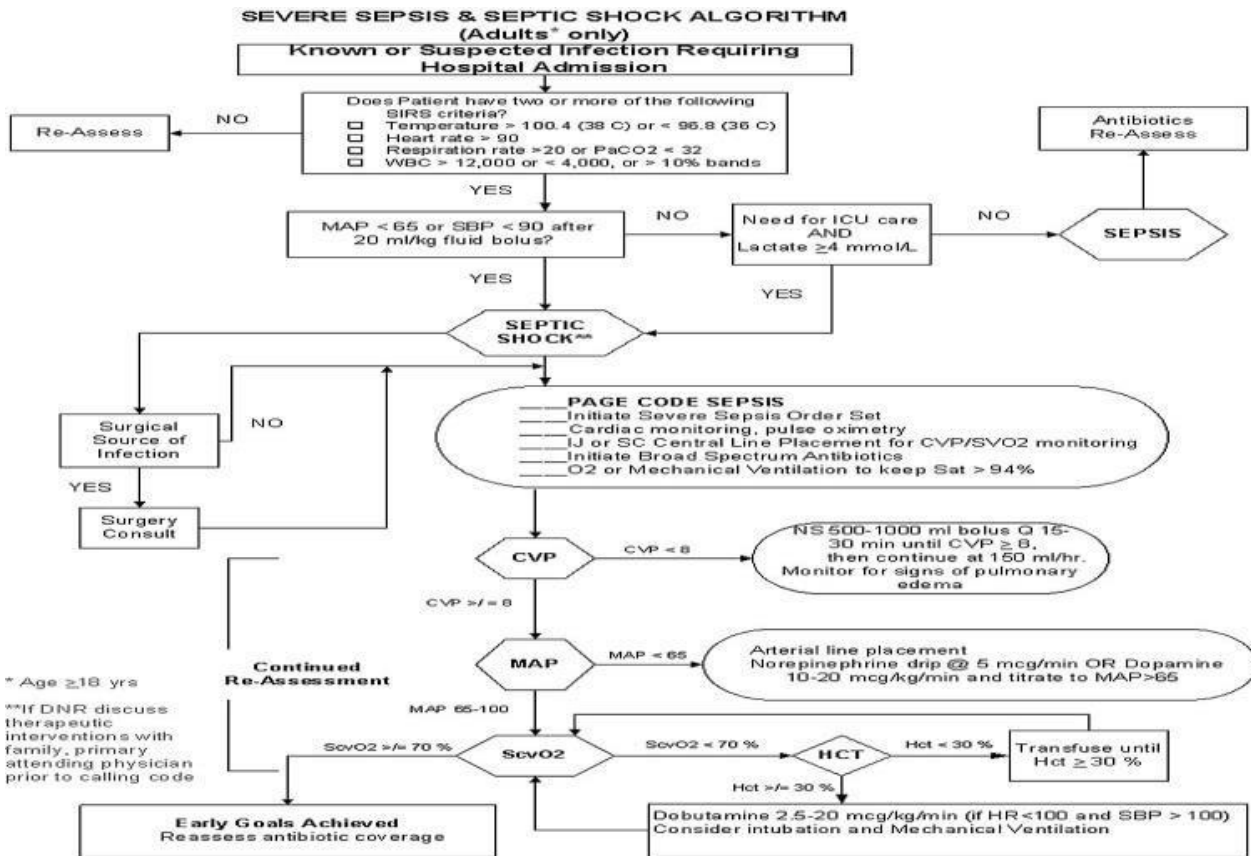
### **The hemodynamic profile of septic shock include:-**

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



**Management:-**

The initial approach to a patient with septic shock is the restoration and maintenance of adequate intravascular volume and prompt institution of appropriate antibiotic. Early GS consultation for treatable cause (abscess → can't treat the patient without drainage).



### 431 teamwork (Explanation of the Algorithm)

Standard pathway of care for patients with septic shock:

If having 2 of the SIRS Criteria → look Mean Arterial Blood pressure

If patient doesn't need ICU and serum lactate is 4 or below → sepsis → give antibiotics and admit to ward. "broad spectrum" in renal pt. give half the dose and if you don't know the renal status give full dose then adjust it.

If patient needs ICU and serum lactate > 4 → treat septic shock → if surgical cause --> treat → if not a surgical cause → start workup for sepsis "page code sepsis" (urine culture, cbc, septic screen, blood cultures, chest x ray, URS, put the patient into cardiac monitor and pulse oximetry to check O<sub>2</sub> saturation, insert central line either Internal jugular IJv or subclavian, femoral line won't be helpful to measure the arterial pressure or central venous pressure. Then initiate broad spectrum antibiotics as early as you can. O<sub>2</sub> through mechanical ventilation → you intubate the patient → it will improve O<sub>2</sub> oxygenation by increasing O<sub>2</sub> saturation in blood and reduce the O<sub>2</sub> demand of tissue by relaxing the patient (not using his muscles)

Then we look at central venous pressure → we need CVP between 8-12 if < 8 it means we need more fluid to give → give until reach 8-12 → then look at the MAP → if still < than 65 → give vasopressors, add norepinephrine > dopamine → dopamine will be converted to norepinephrine to work → takes time + arrhythmogenic induce tachycardia liable to arrhythmia.

1<sup>st</sup> goal to have CVP between 8-12. 2<sup>nd</sup> goal is to have MAP > 65 (65-100) → IF MAP reached 1 → look at mixed venous saturation → take blood from central line → send for ABG → IF O<sub>2</sub> sat venous < 70 → need to increase O<sub>2</sub> carrying capacity of blood → look at hemtcrct → if > 30 → give inotropes (dobutamine). If < 30 hct → give packed RBC to patient. If mixed venous o<sub>2</sub> saturation > 70 → it means we reached 3<sup>rd</sup> goal!!!

Early goal directed therapy ARE 3 to reach (CVP 8-12. MAP > 65. MV O<sub>2</sub> sat > 70) → you are fine and you can now admit him to ICU

### B- 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)

C- Neurogenic Shock (spinal shock) → transection of the spinal cord → loss of sympathetic control → hypotension

### D- Anaphylactic Shock

Some patients have anaphylactic shock to medications that doesn't usually cause anaphylaxis like ceftriaxone

### **3-Cardiogenic**

- \* 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.

**A- Ischemic** → Acute Coronary Syndrome and MI

**B- Myopathy**

**C- Mechanical Valve Disease**

**D- Arrhythmia**

#### **Hemodynamic characteristics:-**

Cardiac output → Low

Ventricular filling pressure → High

SVR → High

Mixed venous O<sub>2</sub> sat → Low

#### **Management:-**

- \* The main goal is to **improve myocardial function**
- \* Arrhythmia should be treated.
- \* **Reperfusion PCI is the treatment of choice in ACS.**
- \* **Inotropes (Dobutamine) and vasopressor.**

### **431 Team**

**If patient is having cardio shock due to acute myocardial infarction STEMI with hypotension** → only treatment here is to take patient to cath lab to open the artery directly and if needed you can insert the intra-aortic balloon pump while inserting cath  
→ contraindication to give fibrinolytics

### **431 Team**

if patient presented to you with pulmonary edema and cardiogenic shock → treat with **inotropes** → don't give dobutamine if patient is hypotensive. it will worsen the problem (hypotensive agent) → so increase blood pressure by vasopressors then give dobutamine. Never give Lasix if he's hypotensive he will collapse → lower BP more. Also can give (nitroglycerine) NTG IV → Will cause hypotension --> never give it if syst. BP < 90. Lasix can be given by infusion 5mg/ hour and need to give him assisted ventilation to help by augmenting his respiratory muscles → fatigued from tachypnea. We can also give IV FLUID (when severely hypotensive and can't give NGT or Lasix) → before intubation you should give IV fluids to increase blood pressure cause all meds for intubation will decrease BP but etomidate (new sedative) can maintain BP → so give etomidate and IV fluids and connect him to ventilator and you'll start phenylephrine (alpha 1 adr agonist) → increase BP → then you can add dobutamine to increase heart contractility and HR (Beta 1 agonist) → of BP goes above > 90 systolic → give NG and Lasix

## **4- Obstructive**

- \* 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.**

### **Hemodynamic profile in obstructive Shock:-**

- Cardiac output → Low
- Afterload → High
- Left Ventricular filling pressure → Variable
- Pulsus Paradoxus in Cardiac Tamponade
- Distended Jugular veins

### **A- Massive Pulmonary Embolism**

Increases the Right ventricular afterload.

### **Management:**

**Medicolegally: 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"**

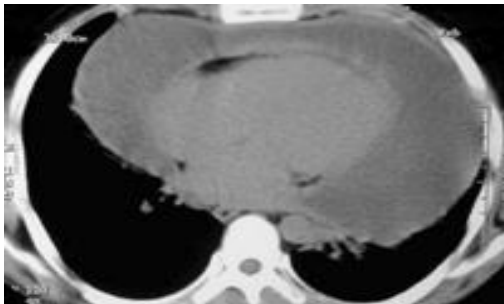
**Treatment depends on hemodynamic stability;**

**Stable → anticoagulation only "heparin and then we start warfarin"**



Massive Pulmonary Embolism  
(Filling Defect)

**B- Cardiac tamponade** diagnosed by bedside echo examination  
Impairs diastolic filling of the Right ventricle (Treated by  
Pericardiocentesis)



Cardiac Tamponade

**C- Constrictive pericarditis**  
Impairs diastolic filling of the Right ventricle  
Usually patient will be chronic not acute



## **D- Tension pneumothorax**

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

### **You can diagnose it clinically based on:-**

- 1- hyperresonance 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

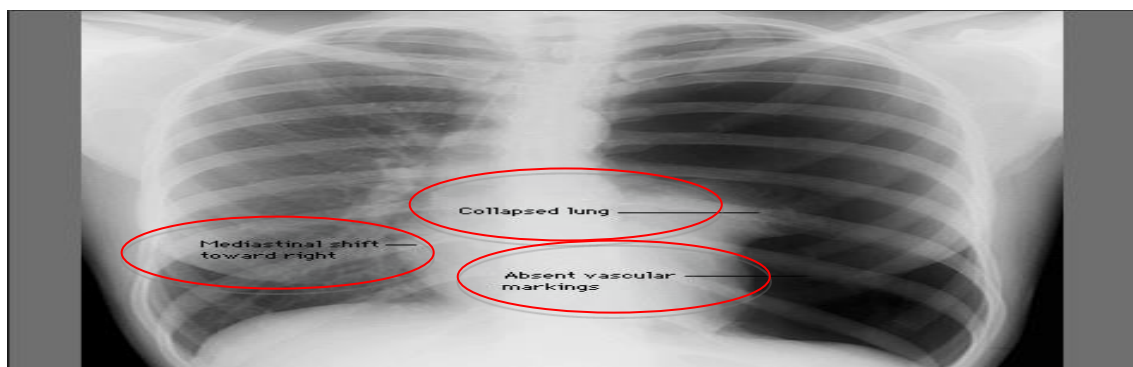
### **Management:**

Don't postpone the patient till you do X-ray "it's a crime"

Insert a needle in 2<sup>nd</sup> 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 5<sup>th</sup> intercostal space mid axillary line gauge 28.

**Immediately insert a needle in 2<sup>nd</sup> 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**

## Tension Pneumothorax



### **431 team**

**Treatment of cause** (pneumothorax → needle in 2<sup>nd</sup> 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 )

### **431 Teams**

The Canadian Triage and Acuity Scale (CTAS) has five levels:

Level 1: Resuscitation – Conditions that are threats to life or limb

Level 2: Emergent – Conditions that are a potential threat to life, limb or function

Level 3: Urgent – Serious conditions that require emergency intervention

Level 4: Less urgent – Conditions that relate to patient distress or potential complications that would benefit from intervention

Level 5: Non-urgent – Conditions that are non-urgent or that may be part of a chronic problem



## 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 **by sedating the patient***

## In Summery

### *Management of shock:-*

- 1- Monitoring*
- 2- Fluid Therapy*
- 3- Vasoactive agents*
- 4- Treat the cause*

## Summary



## MCQ's :

**1-A 30 year old man is admitted to the Emergency Ward with sudden onset of severe shortness of breath, no chest pain, diffuse wheezing, cyanosis, and a BP of 70/30, Pulse = 100. This event occurred soon after a meal. What is the likely diagnosis:**

- A. Acute pulmonary embolism
- B. Tension pneumothorax
- C. Anaphylaxis
- D. Myocardial infarction

**2-Identify the FALSE statement:**

- A. Hypovolemic shock is associated with low cardiac output
- B. Septic shock is associated with cold clammy skin
- C. Cardiogenic shock is associated with arrhythmia, MI, and myocarditis
- D. Extra-cardiac obstructive shock is associated with cardiac tamponade, pneumothorax, and pulmonary emboli

**3-Which of the following is NOT a criterion for SIRS?**

- A. temperature < 36 C
- B. HR > 90
- C. RR<6 OR Paco2 < 23 mmHg
- D. WBC with > 12000

1-C

2-B

3-C

**For mistakes or feedback**

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