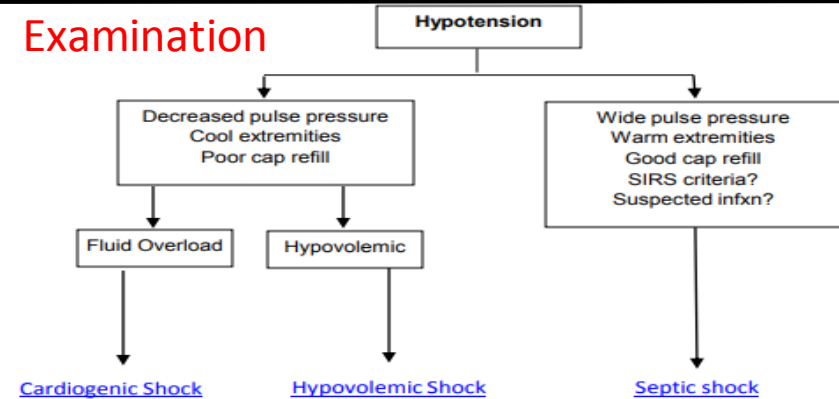


# Shock

- Syndrome of impaired oxygen delivery to tissues
- Mechanisms
- Absolute/relative decrease in oxygen delivery
- Ineffective tissue perfusion
- Ineffective utilization of delivered oxygen

	Cardiac output	Filling pressures	Vascular resistance	Scvo <sub>2</sub> SVO <sub>2</sub>
<b>Cardiogenic</b>	↓	↑	↑	↓
<b>Hypovolemic</b>	↓	↓	↑	↓
<b>Distributive</b>	↑ or N	↓	↓	↑ or N
<b>Obstructive</b>	↓	↑ or N	↑	↓

## Examination



Cardiogenic Shock

Hypovolemic Shock

Septic shock

diagnosis of SIRS requires at least 2 of the following:

1. Temperature >38°C or <36°C
2. Heart rate >90 beats/min
3. Respiratory rate >20 breaths/min, or arterial PCO<sub>2</sub> <32 mm Hg
4. WBC count >12,000/mm<sup>3</sup> or <4000/mm<sup>3</sup>, or >10% Immature neutrophils (band forms)

## Septic shock

Guidelines for the Treatment of Severe Sepsis and Septic Shock from the Surviving Sepsis Campaign.\*

Resuscitation

Begin goal-directed resuscitation during first 6 hr after recognition

Begin initial fluid resuscitation with crystalloid and consider the addition of albumin

Consider the addition of albumin when substantial amounts of crystalloid are required to maintain adequate arterial pressure

Avoid hetastarch formulations

Begin initial fluid challenge in patients with tissue hypoperfusion and suspected hypovolemia, to achieve ≥30 ml of crystalloids per kilogram of body weight†

Continue fluid-challenge technique as long as there is hemodynamic improvement

Use norepinephrine as the first-choice vasopressor to maintain a mean arterial pressure of ≥65 mm Hg

Use epinephrine when an additional agent is needed to maintain adequate blood pressure

Add vasopressin (at a dose of 0.03 units/min) with weaning of norepinephrine, if tolerated

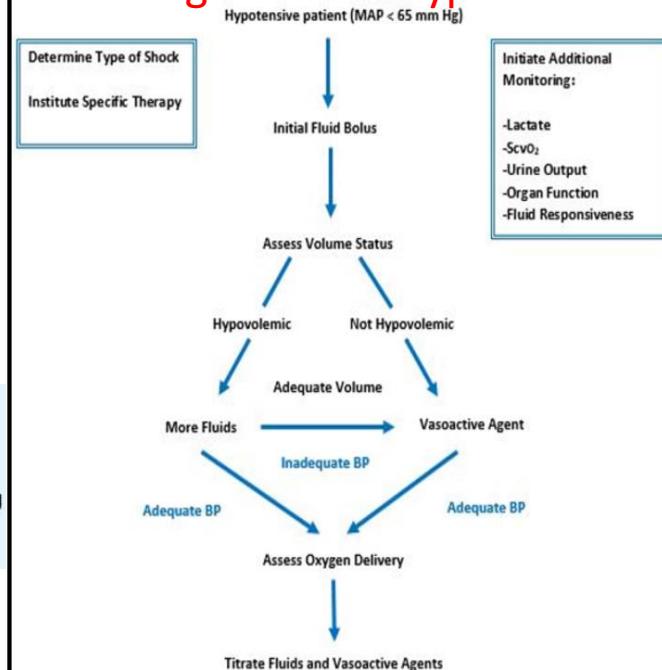
Avoid the use of dopamine except in carefully selected patients (e.g., patients with a low risk of arrhythmias and either known marked left ventricular systolic dysfunction or low heart rate)

Infuse dobutamine or add it to vasopressor therapy in the presence of myocardial dysfunction (e.g., elevated cardiac filling pressures or low cardiac output) or ongoing hypoperfusion despite adequate intravascular volume and mean arterial pressure

Avoid the use of intravenous hydrocortisone if adequate fluid resuscitation and vasopressor therapy restore hemodynamic stability; if hydrocortisone is used, administer at a dose of 200 mg/day

Target a hemoglobin level of 7 to 9 g/dl in patients without hypoperfusion, critical coronary artery disease or myocardial ischemia, or acute hemorrhage

## Management of Hypotension



Determine Type of Shock  
Institute Specific Therapy

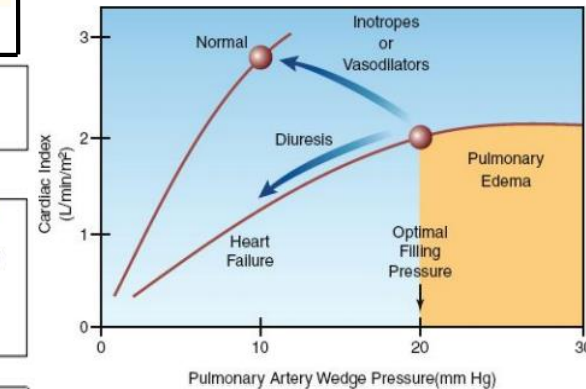
Initiate Additional Monitoring:  
-Lactate  
-Scvo<sub>2</sub>  
-Urine Output  
-Organ Function  
-Fluid Responsiveness

## Interventions for Managing Shock

Component	Intervention
Blood pressure	Fluids, vasopressor, or vasodilator <sup>a</sup>
<b>Cardiac Output</b>	
Preload	Fluids, vasodilator <sup>a</sup>
Contractility	Inotropic agents
Afterload	Vasopressor or vasodilator <sup>a</sup>
<b>Oxygen Content</b>	
Hemoglobin	Blood transfusion
Hemoglobin saturation	Supplemental oxygen, mechanical ventilation
Oxygen demand	Mechanical ventilation, sedation, analgesia, antipyretics

<sup>a</sup>Vasodilator is only indicated when the patient is euvolemic or hypervolemic and the blood pressure is adequate

## Cardiogenic shock



**Suspected Cardiogenic Shock**  
- SBP <90  
- Signs of Low Cardiac Output: oliguria, pulmonary edema, poor mental status

**Initial evaluation and Rapid Stabilization**  
- Immediate ECG  
- Look for evidence of AMI: ST elevations, new LBBB, suspected -posterior MI  
- Supplemental O<sub>2</sub>  
- BP Support: Dopamine, Norepinephrine, Dobutamine

Yes  
**Immediate Reperfusion**

No  
**Immediate TTE**  
- Evaluate LV/RV function  
- r/o mechanical causes: acute valvular issues, papillary muscle rupture, VSD, free wall rupture

Continue medical management and BP support with inotropes/pressors

LV assist device, Heart transplant