

Shock Diagnosis & Management

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Shock Diagnosis & Management

What is the NO. 1 cause of death in anaphylaxis?

a) **RESPIRATORY**

b) **LOC**

c) **CVS**

**year old male presented with cough and yellow 62
sputum and**

Heavy smoker, alcoholic

Saudi

SBP 160/95 mmgh, afebrile

HR 190

Warm skin

agitated

Shock Diagnosis & Management

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?? What is the best indicator of shock

1. **Low BP**
2. **High HR**
3. **High lactate**
4. **Decrease loc**
5. **Decrease UOP**
6. **Capillary refilling time**

Shock Diagnosis & Management

Shock

Definition

Shock results from the widespread failure of the circulatory system to oxygenate and nourish the body adequately

Mortality

Always greater than 20% in large studies regardless the cause

Obstructive

Pulmonary embolism
Cardiac tamponade
Pneumothorax
Valvular dysfunction
Acute thrombosis of prosthetic valve
Critical aortic stenosis

Hypovolemia

GE
Bleeding

Cardiogenic

Arrhythmia
Ischemia
rupture

Cellular Poisons

Carbon monoxide
Methemoglobinemia
Hydrogen sulfide
Cyanide

Hyperdynamic sepsis syndrome
(early sepsis)
Anaphylactic shock
Central neurogenic shock
Drug overdose (dihydropyridines, $\alpha 1$ -antagonists)

disturbutive

Adrenal crisis

Shock

Elevated concentrations of blood lactate is a sentinel marker of widespread inadequate tissue perfusion and disappear when adequate resuscitation has been achieved.

Shock

Heart in Shock State

Cardiac function may also be indirectly depressed in shock conditions by coronary hypotension

Gregg phenomenon

In an isolated working heart the strength of cardiac contraction will vary in proportion to the coronary perfusion pressure

Cardiac contractility

Amount of work done by the heart that is independent of preload and afterload.

Hemorrhagic Shock

Rapid reduction in blood volume



Baroreceptor activation



Increased heart rate

+

Increased strength of cardiac contraction

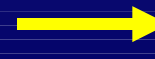


Vasoconstriction



increase in the diastolic BP narrow pulse pressure

↓ Ventricular filling



↓ Cardiac output



Hemorrhagic Shock

Hemorrhagic Shock

base deficit

- defined as the amount of strong base that would have to be added to a liter of blood to normalize the pH.
- indirectly calculated from the pH and PaCO₂ and is normally more positive than -2 mEq/L.

Hemorrhagic Shock

Treat.

- Ensure adequate ventilation/oxygenation.
- Provide immediate control of hemorrhage, when possible (e.g., traction for long bone fractures, direct pressure).
- Initiate judicious infusion of crystalloid solution (10–20 ml/kg)
- With evidence of poor organ perfusion and 30-minute anticipated delay to hemorrhage control, begin packed red blood cell (PRBC) infusion (5–10 ml/kg).
- With suspected central nervous system trauma or Glasgow Coma Scale score <9, immediate PRBC transfusion may be preferable as initial resuscitation fluid.

O-negative blood is used in women of childbearing age and O-positive blood in all others

Cardiogenic Shock

- **Decreased cardiac output and evidence of tissue hypoxia in the presence of adequate intravascular volume**
- **Cardiogenic shock results when more than 40% of the myocardium becomes necrosed**



Cardiogenic Shock

- What is the most common cause of cardiogenic shock ?
- Extensive MI

Cardiogenic Shock

Causes

- **Systolic dysfunction**
- **Diastolic dysfunction**
- **Valvular dysfunction**
- **Cardiac arrhythmias**
- **Coronary artery disease**
- **Mechanical complications**

Cardiogenic Shock

- Provide oxygen and positive end-expiratory pressure (PEEP) for pulmonary edema.
- Begin inotropic support; dobutamine (5 $\mu\text{g}/\text{kg}/\text{min}$) is common empiric agent.
- Seek to reverse the insult (e.g., initiate thrombolysis, arrange percutaneous transluminal angioplasty, or administer charcoal for drug overdose).
- Consider intraaortic balloon pump counterpulsation for refractory shock.

The fastest and most successful method of restoring coronary artery flow would provide the best outcome.

Anaphylaxis

Definition

Anaphylaxis is derived from the Greek word *ana* meaning backward or **against** and *phylaxis* meaning **protection**

Moreover, there is no universally accepted clinical definition of anaphylaxis

ED Anaphylaxis

A review of 142 patients in a single year

■ Dyspnoea	61 (43)	• Laryngeal edema	15 (10.6)
■ Wheeze	50 (35.2)	• Hoarseness	14 (9.9)
■ Vomiting	27 (19.0)	• SBP <90 mmHg	13 (9.2)
■ B.spasm	26 (18.3)	• GCS <15	4(2.8)
■ Syncope & dizziness	21 (14.8)	• Loc	3 (2.1)
■ R. rate ≥25	19 (13.4)	• Stridor	2 (1.4)
		• Cyanosis	2 (1.4)

Anaphylaxis

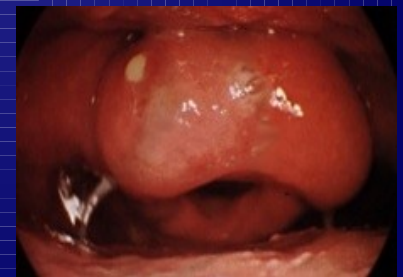
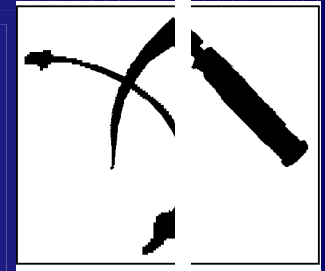
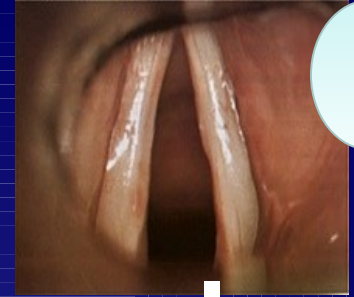
TREATMENT

- ***Stop Administration of Antigen (blood)***
- **Establish and maintain a/w**
- **100% oxygen administration,**
- **intravascular volume expansion.**
- **Epinephrine**
- **Systemic glucocorticosteroid**

TREATMENT

AIR WAY

- ✓ Low Threshold
- ✓ Tube Size?
- ✓ Induction Agent?
- ✓ paralytic agent?



Anaphylaxis

Bronchospasm

For bronchospasm resistant to epinephrine

- Nebulized (albuterol, salbutamol)
repeated doses

Anaphylaxis



Volume Expansion

- Volume expansion is important as part of the resuscitation with epinephrine to treat acute hypotension.
- Initially, 2 to 4 L of RL ,NS or colloid

Anaphylaxis

EPINEPHRINE

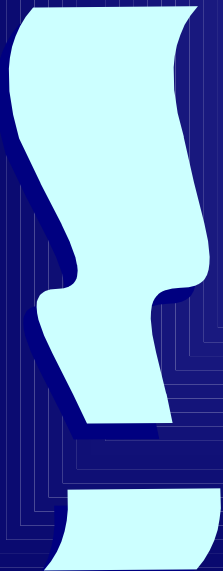
Epinephrine is the main therapeutic agent when resuscitating patients during anaphylaxis

It's low plasma and tissue conc's are associated with enhanced release of chemical mediators of inflammation as well as vasodilation and hypotension

Anaphylaxis

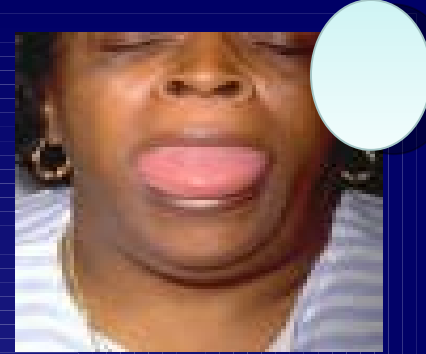
Corticosteroids

Corticosteroids form an important component of the treatment of acute anaphylactic reactions

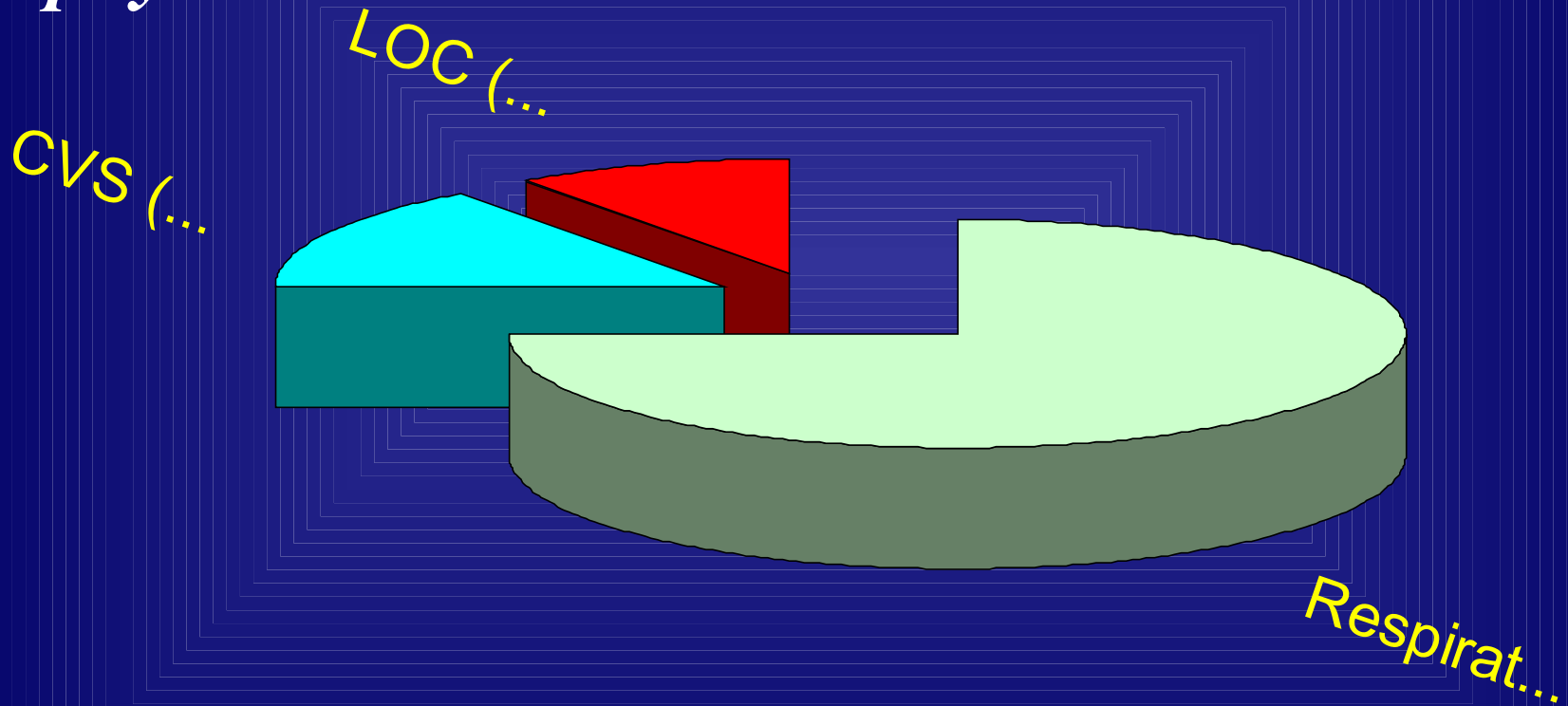


Reported cases of fatal 6 < ■
anaphylactic reaction after
.iv steroid

Anaphylaxis



Causes of Death In Anaphylaxis





Anaphylaxis Algorithm

(due to Antigen Hypotension)

Check ABCs in Monitored bed

Stop Administration of Antigen (i.e. blood)

oxygen administration 100%, establish and maintain a/w

mL Epinephrine 0.3 1:1,000
IM* in lateral aspect of the thigh
Repeated dose if still
hypotensive in 3-4 minutes

IV N/S 500—1000cc Bolus

Diphenhydramine 50 mg of IV/IM

Methylprednisolone (Solu-Medrol) 125 mg IV

Ranitidine 50 mg in adults (1 mg/kg) in children, diluted in 5% dextrose to a total volume of 20 mL and injected IV over 5 minutes

Start **Glucagon** , 1-5 mg (20-30 µg/kg
,(maximum, 1 mg in children)
iv bolus over 5 minutes
followed by infusion of 5—15 µg/min

**Low threshold for Intubaion if any
*one of the following present**

Persistent airway and/or sever tongue swelling
Respiratory Failure
Respiratory Distress
Hypoxia

For bronchospasm resistant to epinephrine give nebulized ((salbutamol

D/C Home with prednisone 50 mg once per day for 5 days
diphenhydramine 25 – 50 mg , po Q 6—8 h for 2 days and consider 0.3 mg epi pen prescription in food allergy induced anaphylaxis

Stable

Observe for 6 hours

Unstable

NO

****High Risk Patient**

Yes

Reassess ABCs

Hypotension

Yes

NO

*****IV Epinephrine**

ICU Admission

Is the patient on B. Blockers?

Yes

Still Hypotension

Yes

Reassess ABCs

NO

NO

High Risk Patient**

*****IV Epinephrine**

.mg (0.1 ml) of 1:1,000 with 10 ml of n 0.1/s
.this is equivalent to a 100 mcg bolus given at 10 mcg/min
.a continuous infusion of 0.5 to 5 mcg/min titrated to clinical response
Epinephrine should not be administered IV to patients with normal BP

- Airway compromise
- Requirement of high doses of epinephrine
- History of Cornary Artery Disease
- History of B.Asthma
- Patient on B.Blockers or ACEI

Prepare for difficult air way and call* anaesthesia for back up

Definition

Infectious agents +/- infection-induced mediators

Other causes of shock potentially associated with fever include pulmonary embolism, acute myocardial infarction, and adrenal crisis

Hemodynamic
Decompensation

Septic Shock

Primarily a
form of
distributive
shock

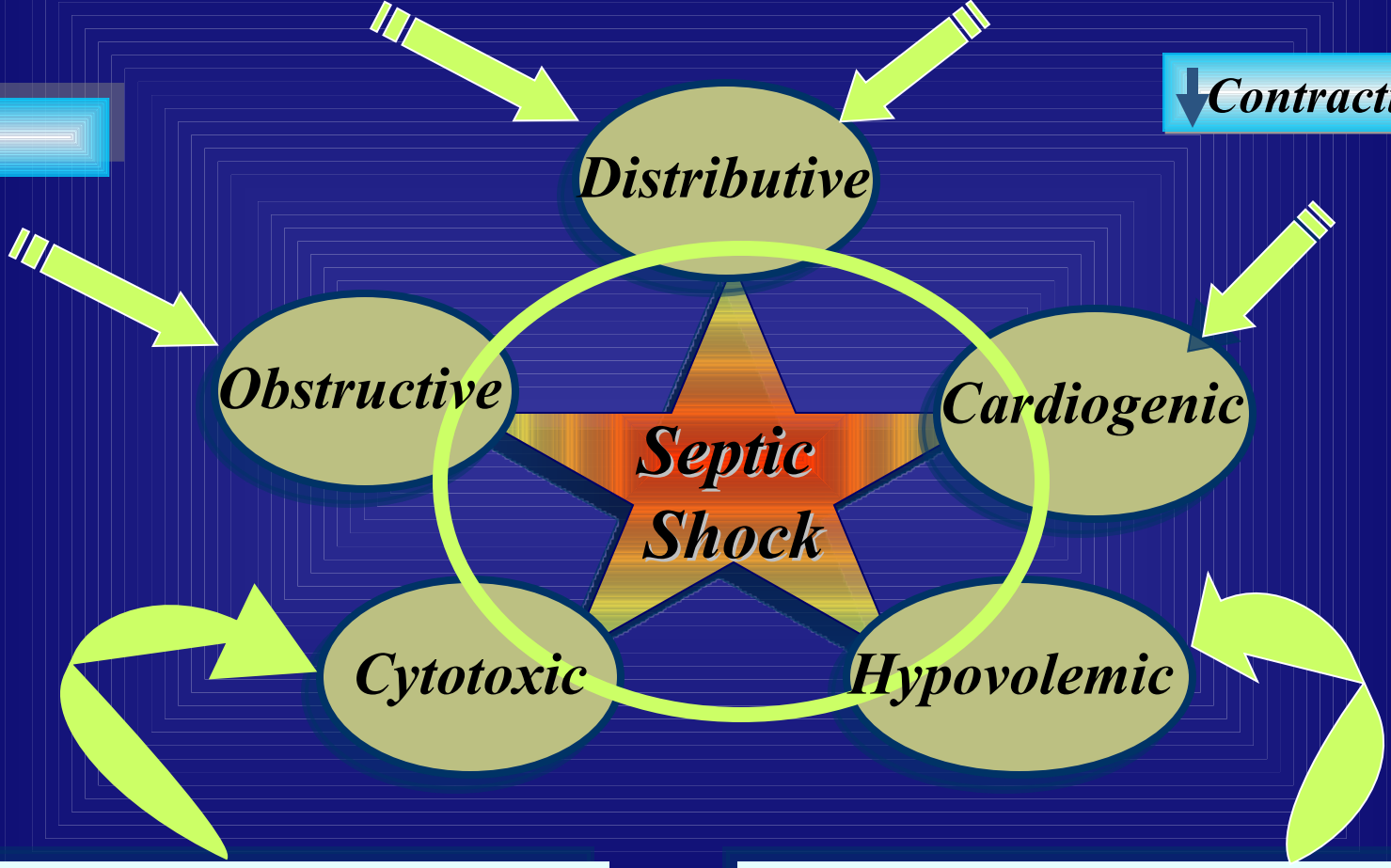
Ineffective tissue O₂
delivery and extraction

Inappropriate peripheral
vasodilation

(hypoperfusion despite normal or high COP)
Macrovascular ↓ splanchnic blood flow
Microvascular Shunting

↑ PVR

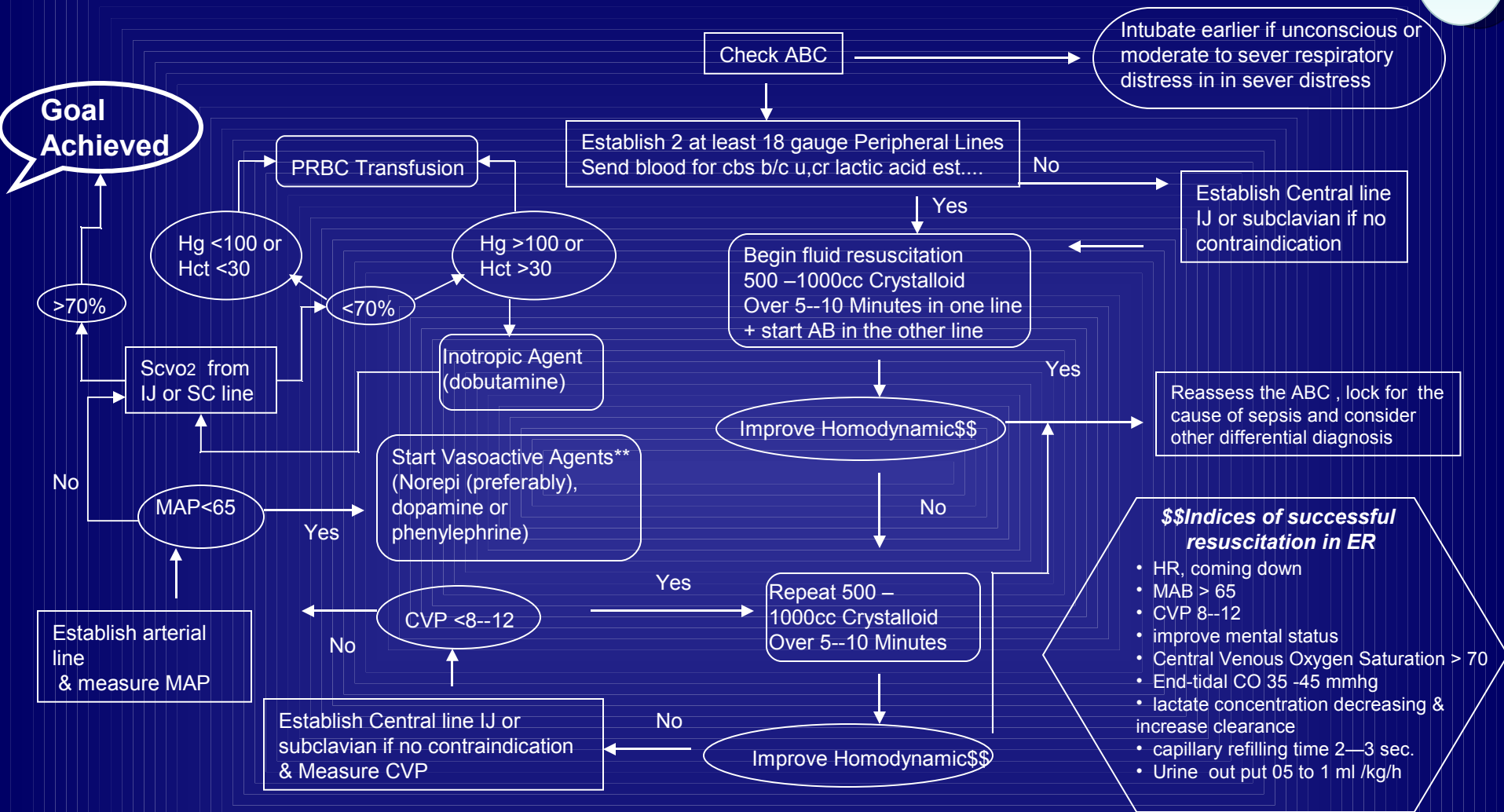
↓ Contractility



Cellular inability to utilize oxygen despite adequate supply

Capillary leak (absolute hypovolemia)
Venodilation (relative hypovolemia)

Protocol for Septic Shock* Management in ED



Septic shock defined as *
 ^^SIRS Criteria
 &
 Hypotension or Organ Dysfunction
 &
 Possible Infectious Aetiology

^^ Systemic inflammatory response syndrome (SIRS)
 Two or more of the following:
 • Temperature > 38° C or < 36° C
 • Heart rate > 90 beats/min
 • Respiratory rate > 20 breaths/min or PaCO2 < 32 mm Hg
 • White blood cell count > 12,000/mm3, < 4000/mm3, or > 10% band neutrophilia

**Vasopressor agent for use in septic shock

Agent	IV Dose Range
Norepinephrine	1-30 mcg/min
Epinephrine	1-10 mcg/min
Phenylephrine	40-180 mcg/min
Dopamine	5-25 mcg/min
Vasopressin	0.01-0.04 units/min

Pulmonary Embolism

PE complicated by shock is best treated by

- Ventilatory support
- Volume infusion
- Norepinephrine
- Thrombolytic therapy.

Tension Pneumothorax

CT

Cardiac Tamponade

Pericardiosentesis, Surgery



Obstructive Shock

Acute massive pulmonary embolism (PE) produces by obstruction of the pulmonary vasculature



right ventricular overload



impairs left ventricular



Circulatory Shock

Central Neurogenic Hypotension

In spinal cord lesions cardiac vagal influences dominate, and bradycardia is prominent.

Hypotension (< 90 mm Hg systolic, or mean arterial pressure < 70 mm Hg) should first be treated with atropine to increase HR and prevent sudden death.

Central Neurogenic Hypotension

With CNH, atropine should be readily available in case it is needed during rapid sequence induction to block the vagal discharge triggered by tracheal intubation.

With spinal cord injury, BP must be normalized, even if urine output indicates adequate renal perfusion.

Central Neurogenic Hypotension

Because inadequate perfusion pressure can worsen ischemia in the region of a spinal cord contusion where vascular dysregulation exists, **pharmacologic vasoconstriction** should be instituted promptly to increase spinal cord perfusion.

Central Neurogenic Hypotension

- The agents of choice are α_1 -adrenergic specific including phenylephrine and ephedrine.
- In the setting of trauma resuscitation, ephedrine is especially useful; one 10-mg bolus will increase vascular resistance for 3 to 4 hours.

Indices of Successful Resuscitation

Perfusion

V/S

**End-tidal
CO₂**

**Indirect Fick
equation**

Central Venous Oxygen Saturation

UOP

Lactate Clearance

Lactate concentration

Clinical Exam

BD

- The overall goal of all resuscitation procedures is to improve oxygenation and perfusion of body tissues.