On-scene Trauma care

“SHOCK”

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What is shock ??

- State of change in cellular function from aerobic metabolism to anaerobic metabolism (Secondary from hypoperfusion)
- A lack of tissue perfusion (oxygenation) at the cellular level

Not defined as low blood pressure, rapid pulse rates, or cool, clammy skin

Classification of Traumatic Shock

Hypovolemic shock

- Vascular volume smaller than normal vascular size
- Result of blood and fluid loss

- Hemorrhagic shock

Classification of Traumatic Shock

Distributive shock

- Vascular space larger than normal

- Neurogenic "shock" (hypotension)

Cardiogenic shock

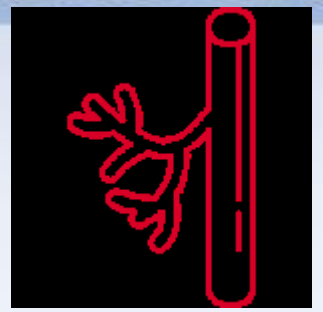
- Heart not pumping adequately
- Result of cardiac injury

Hypovolemic shock

	Class I	Class II	Class III	Class IV
Blood loss (ml)	< 750	750–1500	1500–2000	> 2000
Blood loss (% blood volume)	< 15%	15–30%	30–40%	>40%
Pulse rate	< 100	100–120	120–140	> 140
Blood pressure	Normal	Normal	Decreased	Decreased
Pulse pressure (mm Hg)	Normal or increased	Decreased	Decreased	Decreased
Ventilatory rate	14 to 20	20–30	30–40	>35
CNS/mental status	Slightly anxious	Mildly anxious	Anxious, confused	Confused, lethargic
Fluid replacement	Crystalloid	Crystalloid	Crystalloid and blood	Crystalloid and blood

Hypovolemic shock

- Developing of shock depends on how fast blood is lost from the circulation
- Whole blood replacement is usually not available in the prehospital environment
- The best crystalloid solution for treating hemorrhagic shock is lactated Ringer's solution
- Normal saline can be used
- The first step is administration of packed RBCs and plasma at a ratio of 1:1 or 1:2



Distributive shock

Neurogenic Shock

-Spinal cord injury interrupts the sympathetic nervous system pathway
-Injury to the lower cervical, thoracolumbar, and thoracic levels
-Decrease blood pressure but pulse pressure is normal/widened
-Warm, dry skin, especially below the area of injury

Cardiogenic shock

-Intrinsic Causes

Heart Muscle Damage
Valvular Disruption

-Extrinsic Causes

Cardiac Tamponade
Tension Pneumothorax

Traumatic Shock

Vital Sign	Hypovolemic	Neurogenic	Cardiogenic
Skin temperature/quality	Cool, clammy	Warm, dry	Cool, clammy
Skin color	Pale, cyanotic	Pink	Pale, cyanotic
Blood pressure	Drops	Drops	Drops
Level of consciousness	Altered	Lucid	Altered
Capillary refilling time	Slowed	Normal	Slowed

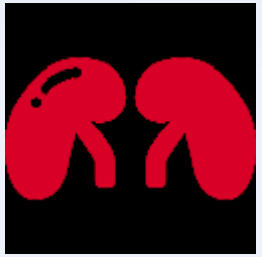
Assessment

Decreased LOC, anxiety, disorientation

Rapid, shallow breathing

Tachycardia, decreased systolic and pulse pressure

Assessment



Decreased urine output

Cold, pale, clammy, diaphoretic or cyanotic skin with decreased capillary refill

Assessment

-All shock in a trauma patient should be considered to be from hemorrhage until proven otherwise

-If there is no evidence of external hemorrhage, internal hemorrhage should be suspected

-If the assessment does not suggest hemorrhage as the cause of the shock, non hemorrhagic causes should be suspected

Primary Assessment

- **Airway**
- Not breathing
- Obvious airway compromise
- Ventilatory rates greater than 20 breaths/minute
- Noisy sounds of ventilation

Primary Assessment

- **Breathing**
- Pulse oximeter reading below 95% is worrisome
  ETC02 has become a routine practice in EMS in patients whose airway has been managed

Primary Assessment

- **Circulation**
- Hemorrhage and the amount of blood loss
- Perfusion with oxygenated blood
- **Disability**
- Hypoxia
- Shock with impaired cerebral perfusion
- TBI
- Intoxication with alcohol or drugs
- Metabolic processes such as diabetes, seizures, and eclampsia

Primary Assessment

- **Expose/Environment**
- Assess for less obvious sites of external blood loss and clues that indicate internal hemorrhage
- The possibility of hypothermia

Compensated / Decompensated Hypovolemic Shock

Vital Sign	Compensated	Decompensated
Pulse	Increased; tachycardia	Greatly increased; marked tachycardia that can progress to bradycardia
Skin	White, cool, moist	White, cold, waxy
Blood pressure range	Normal	Decreased
Level of consciousness	Unaltered	Altered, ranging from disoriented to coma

Approximate Internal Blood Loss Associated Fracture

Type of Fracture	Internal Blood Loss (ml)
Rib	125
Radius or ulna	250 to 500
Humerus	500 to 750
Tibia or fibula	500 to 1000
Femur	1000 to 2000
Pelvis	1000 to massive

Management

Steps in the management of shock are as follows :

1. Ensure oxygenation (adequate airway and ventilation)
2. Identify any hemorrhage(Control external bleeding and recognize the likelihood of internal hemorrhage)
3. Transport the patient to definitive care
4. Administer fluids en route as appropriate

Airway and Breathing

- Supplemental oxygen in a concentration as close to 100% (Fi02 of 1.0) as possible
- Oxygen saturation (Sp02) should be monitored by pulse oximetry
- End-tidal carbon dioxide (ETC0z) monitoring is often used in conjunction with pulse oximetry

Circulation: Hemorrhage Control

- External hemorrhage steps in the field management :

-Hand-held direct pressure

-Compression dressings

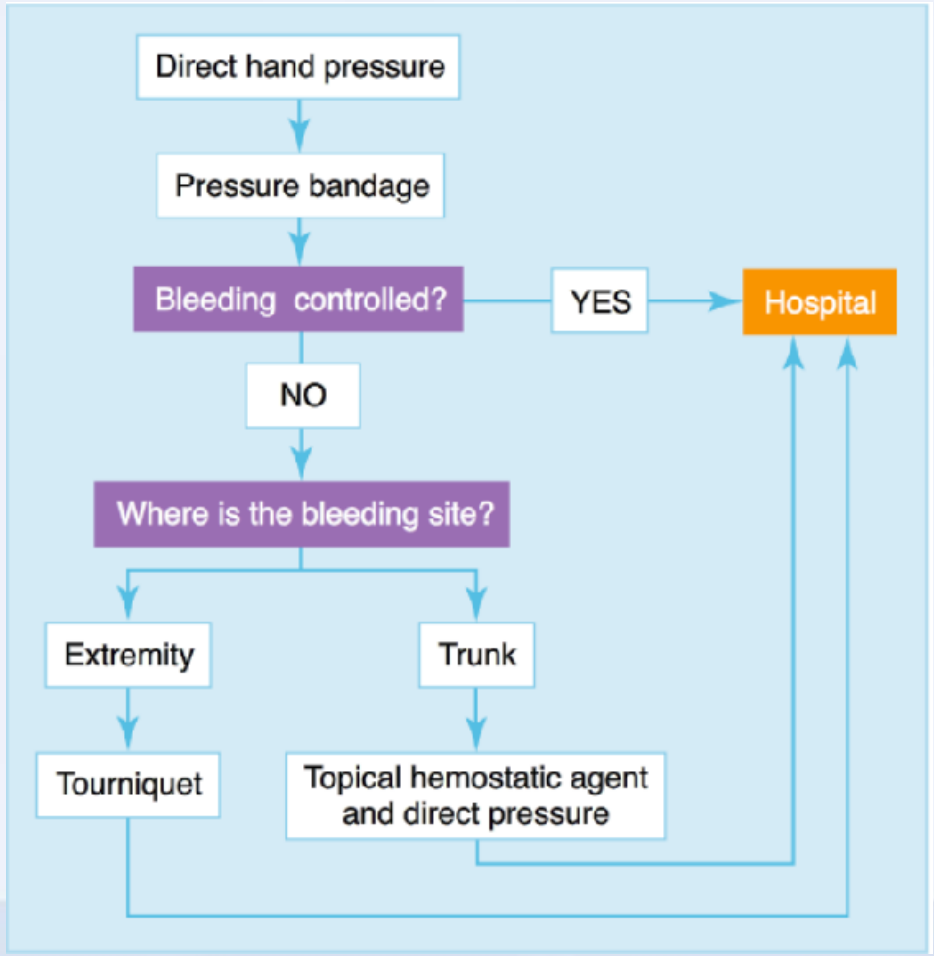
-Woundpacking

-Elastic wrap

-Tourniquet extremities

-Hemostatic agent torso

Circulation: Hemorrhage Control



Tourniquets

Applied just proximal to the hemorrhaging wound
If one tourniquet does not completely stop the hemorrhage, then another one should be applied just proximal to the first
Applied tight enough to block arterial flow and occlude the distal pulse
Remain in place until the patient reaches definitive care at the closest appropriate hospital

Tourniquets

Tourniquets should be used if controlling the hemorrhage with direct pressure or pressure dressing is not possible or fails. The steps in applying a tourniquet are as follows:

1. Apply a commercially manufactured tourniquet, blood pressure cuff, or "Spanish windlass" to the extremity just proximal to the bleeding wound.
2. Tighten the tourniquet until hemorrhage ceases, then secure it in place.
3. Write the time of tourniquet application on a piece of tape and secure it to the tourniquet. For example, "TK 21:45" indicates that the tourniquet was applied at 9:45 pm.
4. Leave the tourniquet uncovered so that the site can be seen and monitored for recurrent hemorrhage. If bleeding continues after application and tightening of the initial tourniquet, a second tourniquet can be applied just above the first.
5. Consider pain management unless the patient is in Class III or IV shock.
6. Transport the patient, ideally to a facility that has surgical capability.

Hemostatic Agents

- Powder that is poured onto the wound
- Gauze impregnated with the hemostatic material that is applied to or packed into the wound
- Minimum of 3 minutes of direct pressure must be applied to the wound site for most of the available agents.

Volume Resuscitation

-Blood

- Packed red blood cells (PRBCs)
- Whole blood
- Reconstituted whole blood as blood products

-IV solutions

- Large volumes of crystalloid
- Hypertonic fluid

o 7% saline

o 3% saline

- Colloid solutions
- Hypotensive or restricted fluid
- Blood substitutes (only investigational use)

Volume Resuscitation

- **Warming Intravenous Fluids**
- The ideal temperature for such fluids is 102°F (39°C)
- A convenient storage area for fluids is in a box in the engine compartment.

Managing Volume Resuscitation

-Uncontrolled Hemorrhage

- Internal hemorrhage IV crystalloid solution should be titrated to maintain a systolic blood pressure in the range of 80 to 90 mm Hg,(MAP of 60 to 65 mm Hg)
- Permissive hypotension, hypotensive resuscitation, and

"balanced" resuscitation

Managing Volume Resuscitation

Central Nervous System Injuries

-Hypotension has been associated with increased mortality in the setting of TBI

-Patients with certain conditions (e.g., TBIs) appear to benefit from a more aggressive fluid resuscitation.

Managing Volume Resuscitation

- **Controlled Hemorrhage**
- Class II, III, or IVshock should receive an initial rapid bolus of 1 to 2 liters of warmed crystalloid solution, preferably lactated Ringer's
- Vital signs should be monitored

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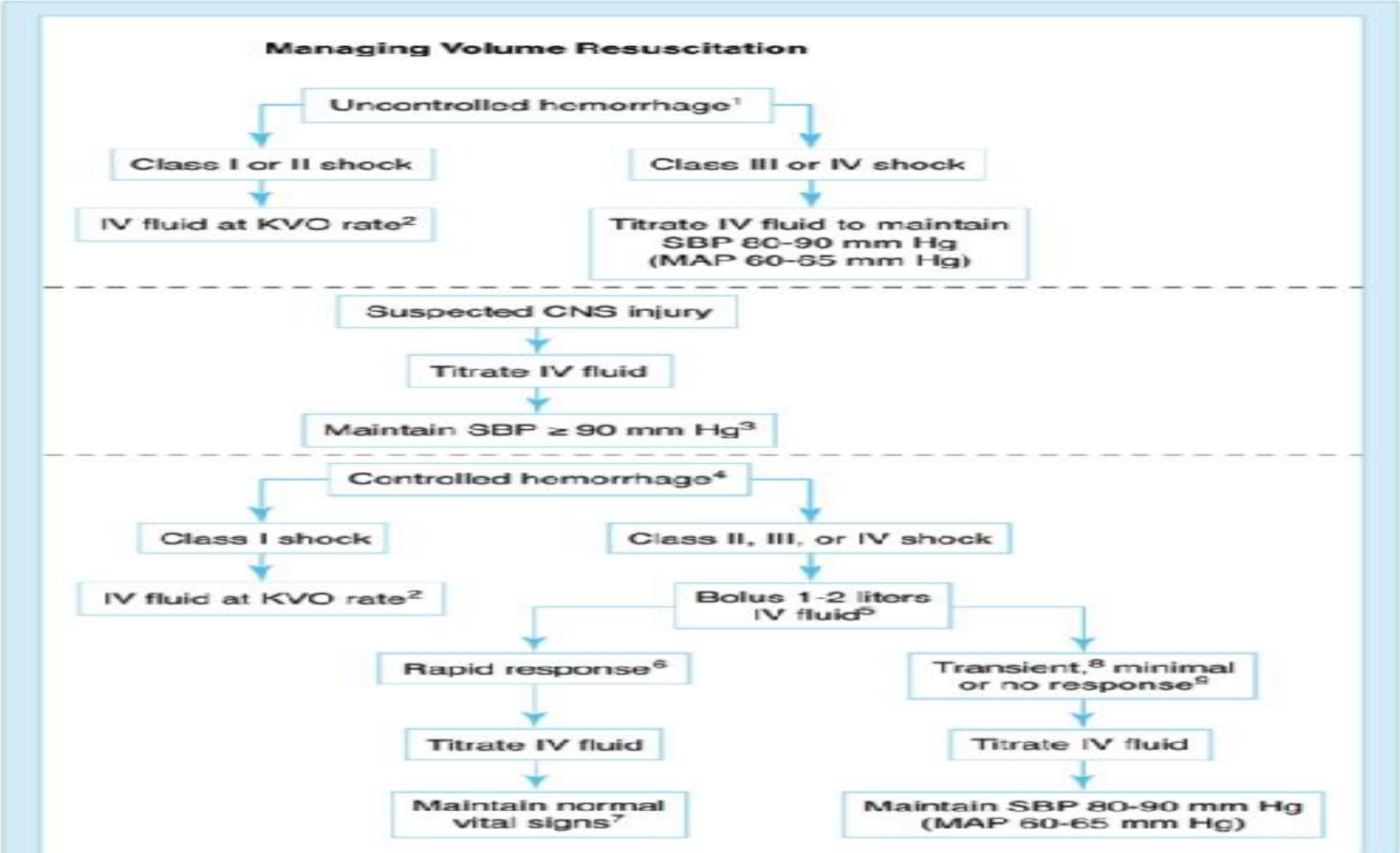

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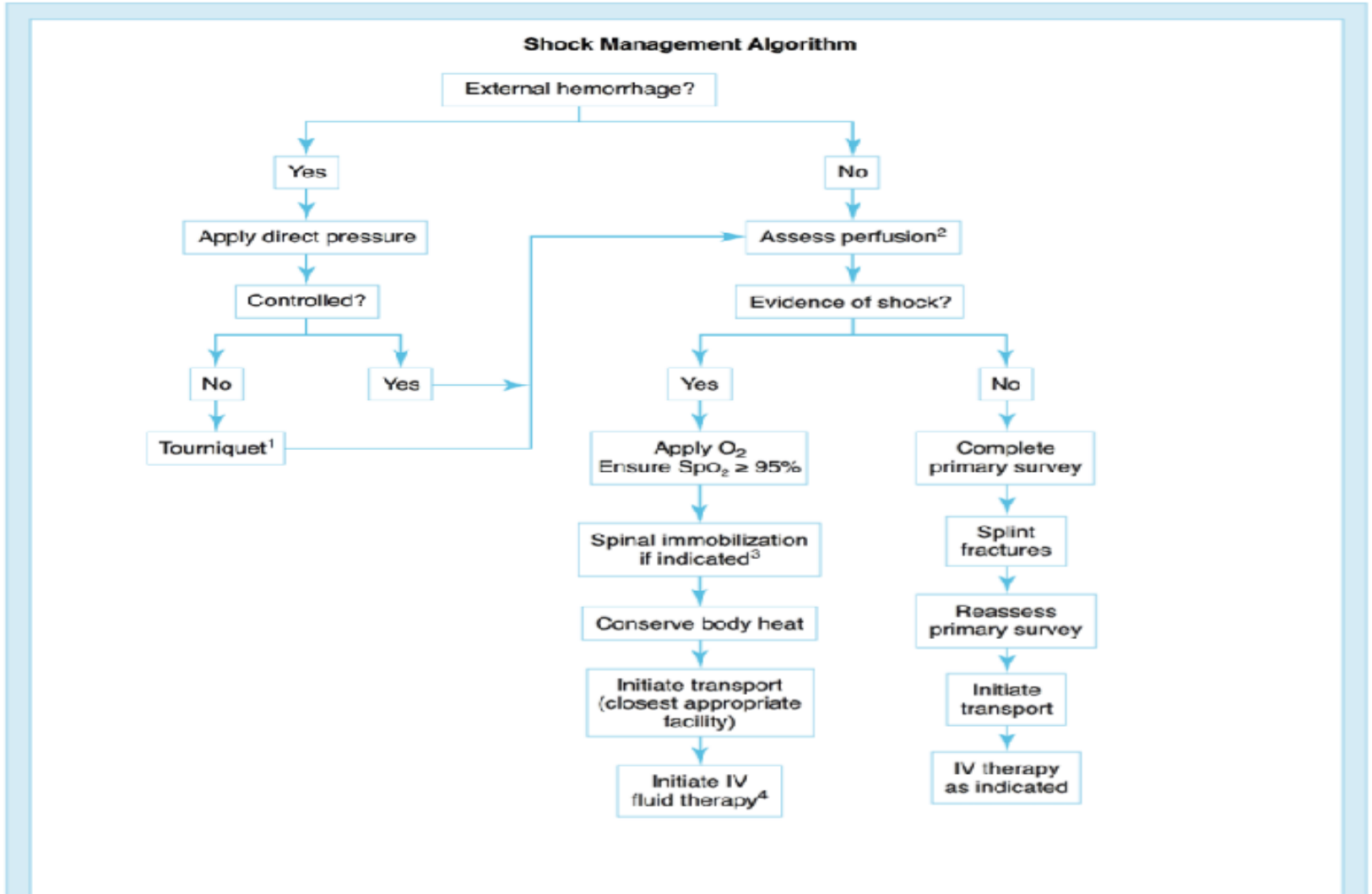

Prolonged Transport

- Airway management should be optimized
- Ventilations : tidal volume and rate
- Direct pressure by hand is impractical during a longtransport,
- A tourniquet has been applied and transport time is expected to exceed 4 hours, attempts should be made to remove the tourniquet after more aggressive attempts at local hemorrhage control
- Vital signs should be reassessed

Any questions?


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