Basics of Fluid Resuscitation In Shock

Fluid resuscitation is a key element in the management of shock. Before we get into the resuscitation part lets have a review of the basics of shock.

Shock is a life-threatening condition characterized by failure of the circulatory system to maintain adequate perfusion of the vital organs and requires immediate and intensive treatment.

Shock can be classified as:

- Hypovolemic
- Cardiogenic
- Vasogenic (Distributive)
- Neurogenic

Recognizing shock

Clinical signs of inadequate perfusion have nothing to do with numbers!

Skin signs of shock include cool extremities, decreased capillary refill of more than 2 seconds. Decreased level of consciousness: confusion, lethargy

Recognizing shock by the numbers

The patient will present with:

1. Tachycardia (>100 beats per minute in an adult, >140 beats per minute in a preschool.
2. Increased respiratory rate.
3. Decreased pulse pressure below the normal which is 40 or 30mmHg.

These are the most sensitive!

Decreased systolic blood pressure is the last to appear.

Causes of shock in trauma

Never wait for a definitive diagnosis before starting treatment. Diagnosis and treatment are carried out simultaneously!

The major causes of shock in trauma are:

Hemorrhage, the most common cause! Therefore you will need to:

1. Stop external bleeding,
2. Suspect internal bleeding,

3. Make a quick search for other causes as you start replacing fluids

Non-hemorrhagic causes
1.Cardiogenic causes

-Cardiac tamponade is the most common cause of trauma.
-Diagnosis of cardiac tamponade is arrived at when there is: Penetrating trauma, muffled heart sounds, increased jugular venous distension (Beck's Triad) and Ultrasound.
-Treatment is by pericardiocentesis if positive followed by surgery.

2.Myocardial contusion
3. *Myocardial infarction* is a rare cause.

Non-hemorrhagic shock

This type of shock occurs as a result of :

1. Tension Pneumothorax characterized by mediastinal shift, decreased breath sounds, acute respiratory distress
2. Neurogenic shock characterized by:

- Spinal cord injury, loss of sympathetic tone
- Lack of tachycardia

You manage with initial fluid bolus then vasopressors.

Note that: ISOLATED HEAD INJURIES DO NOT CAUSE SHOCK!

Hemorrhagic Shock

In hemorrhagic shock, physiologic compensation causes diversion of blood flow from Skin, gastrointestinal tract and Kidney.
Normally blood volume is about 7% of body weight in kg: i.e. 5 liters in the average adult, about 80 ml/kg in pediatrics.

Hemorrhagic Shock is classified as:

Class I: hemorrhage Loss of up to 15% or 750 ml of blood. There may be no signs.
Class II: It occurs when there is a 30% blood loss of 1 to 1.5 liters and is characterized by tachycardia, tachypnea, and decreased pulse pressure.
Class III: This occurs when there is a 40% blood loss of 2 liters and characterized by decreased systolic blood pressure, and decreased level of consciousness.
Class IV: Occurs when there is a loss of more than 40%

Fluid resuscitation in shock

Attain vascular Access by using:

- Minimum 2 large-bore IV lines at least 16 gauge., preferably 14)
- Antecubitals
- Saphenous cut-down
- Central with a short introducer
- Intraosseous in children

Decisions are based on the response to initial therapy
An initial bolus is always with crystalloids such as Lactated Ringer's or normal saline.
Give 1 or 2 liters wide open and reassess (20 ml/kg in children).
Accept a systolic BP of 90 to 100mmHg to avoid hemodilution.

Rapid Response to Initial Bolus

No further boluses needed.
Close and careful monitoring of the patients.
Have blood available in case you may require to transfuse.

Transient Response

This occurs in the majority of patients with significant trauma and patients with ongoing blood loss or inadequate initial bolus.

Give more crystalloid and blood.

Type O negative (O positive in males if necessary) immediately.
Type-specific blood in 15 minutes
Type and cross-matched in 30 to 60 minutes

Minimal or No Response to Initial Bolus

With minimal or no response to an initial fluid, bolus carry out immediate blood transfusion and rapid surgical intervention

Look for non-hemorrhagic causes like tension pneumothorax, cardiac tamponade.
Central venous pressure monitoring.

Fluid Replacement Products

- Crystalloids are the first choice:
- More than 2 liters of normal saline can cause hyperchloremic acidosis.
  Colloids (Hemacell) have shown no benefit over crystalloids
- Whole blood is best for trauma, containing red cells plus clotting factors and platelets
- ~3:1 ratio crystalloid to blood
- Packed red cells more available and efficient
- We need to give fresh frozen plasma with every 4-6 units packed red blood cells.
- May need platelets with massive PRC's

How will you know that you have achieved adequate fluid resuscitation?

End-points of Fluid Resuscitation in shock

1. Clinical parameters such as peripheral perfusion, mental status, pulse, pulse pressure, blood pressure, Urinary output (>50 ml/hr in adults).
2. Biochemical parameters like base deficit on arterial blood gas (shock state causes anaerobic metabolism and metabolic acidosis with lactic acid production), lactate levels, anion gap.