

SHOCK

GENERAL CONSIDERATIONS

- A. Hypoperfusion (shock) is the inadequate delivery of vital oxygen and nutrients to body tissues, which left unchecked will result in organ system failure and death.
- B. No matter the initial cause, the final common pathway of shock is inadequate cardiac output. Cardiac output = Stroke Volume x Heart Rate. There are four kinds of shock. A decrease in any of these:
1. Inadequate cardiac pump function
 2. Inadequate overall volume caused by hypovolemia
 3. Overly dilated or leaky vascular system
- ... can contribute to one of the four kinds of shock. Sometimes the cause of shock is multi-factorial.
- C. Occasionally shock may develop even when cardiac output is adequate. This can happen when cell metabolism/metabolic demand is so excessive that the body cannot increase perfusion enough to make supply (oxygen and nutrient delivery) meet demand. This is common in patients with fever, infection, respiratory distress, and extreme pain.
- D. The Shock Syndromes:
1. Hypovolemic – Decreased intravascular fluid volume. Flat neck veins, tachycardia, pallor
 - A) EXTERNAL fluid loss
 - Hemorrhage (Trauma)
 - GI losses (Nausea, Vomiting, Diarrhea)
 - Renal losses
 - Cutaneous losses (big burns)
 - B) INTERNAL fluid loss
 - Fractures (Pelvis, Femur)
 - Intestinal obstruction
 - Hemothorax
 - Hemoperitoneum
 - Third spacing (Fluid shifts from vessels into tissues)
 2. Distributive – Increased vascular “pipe” size; peripheral vasodilation and vascular permeability. Flat neck veins, tachycardia, pallor
 - Sepsis
 - Anaphylaxis
 - Neurogenic shock*
 - Drug or Toxin-induced
 - Hypoxia or Anoxia

3. Obstructive – Vessels are obstructed. Jugular venous distension (JVD), tachycardia, cyanosis
 - PE
 - Tension pneumothorax
 - Cardiac tamponade
 - Severe aortic stenosis
 - Vena cava obstruction

4. Cardiogenic – Primary heart “pump” failure. Jugular venous distension (JVD), tachycardia, cyanosis
 - MI
 - Arrhythmias
 - Cardiomyopathy
 - Acute valve failure
 - Myocardial contusion
 - Cardiotoxic drugs/poisons

*Neurogenic shock (type of Distributive shock) is due to a cervical spinal cord injury, and patient loses sympathetic tone. They’ll have flat neck veins, pink skin (vasodilate by default), and yet a normal or low pulse rate because they cannot mount a compensatory tachycardia. This is different from the poorly named “Spinal shock” which usually refers to a transient “stinger” injury wherein there is blunt spinal cord injury resulting in transient numbness or weakness in the arms or legs that often gradually normalizes without permanent damage.

- E. Generally, the signs and symptoms of hypovolemic shock occur in the following order.
1. Compensated Shock = Patient is still interacting normally and has a normal BP. Intervene early aggressively to prevent worsening shock
 - Weakness & lightheadedness – caused by decreased blood volume
 - Thirst – caused by hypovolemia
 - Pallor – caused by catecholamine-induced vasoconstriction and/or loss of circulating red blood cells
 - Tachycardia – caused by the effects of catecholamines on the heart as the brain increases the activity of the sympathetic nervous system
 - Diaphoresis – caused by the effects of catecholamines on sweat glands
 - Tachypnea – caused by brain elevating the respiratory rate under the influence of stress, catecholamines, acidosis, and hypoxia
 - Decreased urinary output – caused by hypovolemia, hypoxia, and circulating catecholamines
 - Weakened peripheral pulse – the “thready” pulse (meaning “threadlike”, the arteries actually shrink in width as intravascular volume is lost); caused by vasoconstriction, tachycardia, and loss of blood volume
 - NOTE- the symptoms and signs listed above are in the order of progressive “compensation” as the body attempts to deal with the cause of shock. Beginning with the next sign, hypotension, the body is no longer able to maintain perfusion, and the shock condition is now “decompensated.” Hypotension is a late sign. Do not wait for it to occur before intervening!

2. Decompensated Shock = Patient “crashing”. Mortality quadruples! Will arrest if not aggressively resuscitated
 - Hypotension – “Hypotensive” BP varies by age – caused by hypovolemia, either relative (vasodilation) or absolute (hemorrhage, GI losses), and/or by diminished cardiac output seen in obstructive shock.
 - Altered Mental Status (confusion, restlessness, combativeness, decreased responsiveness, obtunded) – caused by decreased cerebral perfusion, acidosis, hypoxia, and catecholamine stimulation
 - Cardiac Arrest – caused by critical organ failure secondary to blood / fluid loss, hypoxia, and occasionally dysrhythmias caused by catecholamines and/or low perfusion

- F. Sepsis is one of the most dangerous and often under-appreciated forms of shock. It can go undiagnosed for a long time until it has progressed far enough to cause significant damage. How to recognize and document sepsis:
 - Use the **qSOFA** (quick Sepsis-related Organ Failure Assessment)
 - Criteria:
 - Resp rate => 22/minute
 - Altered mental status from baseline
 - BPsystolic <= 100 mmHg
 - If a patient has 2 or more of the qSOFA criteria plus a source (or you suspect the source) of infection, they are septic. They must be treated early and aggressively to avoid true septic shock

Basic EMT

- A. Assess and manage airway
 1. Apply pulse oximeter and treat per Pulse Oximeter Procedure. Hypoxia will worsen end-organ damage – maintain an SaO₂ => 94%
 2. Be prepared to ventilate and/or assist ventilations with an oral / nasal airway and BVM

- B. Evaluate patient’s general appearance, relevant history of condition and determine **OPQRSTI** and **SAMPLE**.

- C. Hemorrhagic shock: Control bleeding as indicated – direct pressure, application of tourniquets or hemostatic agents. Apply c-collar if necessary. No backboard is required, regardless of blood pressure. See [Trauma Emergencies Protocol](#)

- D. Anaphylactic shock: If shock syndrome is due to anaphylaxis, See [Allergic Reaction / Anaphylactic Shock Protocol](#).

- E. Septic shock: Apply supplemental oxygen, consider ALS intercept (time permitting) as fluids are the mainstay of prehospital treatment of sepsis

- F. Severe burns: Cover large burns in a dry dressing, avoid using moist dressings as they will cause hypothermia and worsen the burn

- G. Obtain and transmit a 12-lead EKG. Shock can be due primarily to myocardial infarction/arrhythmias, or it may *cause* them

- H. Transport patient in horizontal/supine position. Do NOT use Trendelenburg position, it is counterproductive. IF you suspect a head injury or if patient does not tolerate supine position because of respiratory distress, transport with the head of the bed elevated. There is no reason to transport these patients on a backboard.
- I. Maintain normal body temperature.
- J. Establish communications with Medical Control and advise of patient condition. Transport IMMEDIATELY to the most appropriate facility unless an ALS unit is en route and has an ETA of less than 5 minutes.
- K. During radio communication, emphasize that you suspect patient is in shock and will need to be seen promptly upon arrival, including the vital signs and physical exam findings that support this. If the patient meets qSOFA criteria for sepsis, specifically state that you feel the patient is septic or in septic shock, and which qSOFA criteria they have. Document same in your PCR.

Advanced EMT / Paramedic

- A. Tension Pneumothorax (Obstructive shock): Perform needle decompression. Administer high-flow O2. See [Needle Decompression Procedure](#).
- B. Pelvic/long bone fracture (Hemorrhagic shock): Stabilize “open-book” unstable pelvic fractures with a pelvic binder or sheet to minimize ongoing blood loss. Immobilize long bone-fractures. See [Trauma protocol](#).
- C. Toxin/overdose: IF a direct antidote is available for a given ingestion, administer it per protocol
- D. Specific shock syndromes and Fluids: Obtain IV access with large-bore catheters. Consider IO access if patient is critical and you are unable to establish an IV line.
 - 1. Hypovolemic shock: GI losses, Traumatic hemorrhage
 - 20 ml/kg IV fluid bolus in adults and children
 - Control any external source of blood loss as above
 - 2. Distributive shock: Sepsis, Anaphylaxis, Neurogenic shock:
 - Sepsis: 30 ml/kg IV fluid bolus in adults, 20 ml/kg in children
 - Anaphylaxis: 20 ml/kg IV fluid bolus, plus medications per Anaphylactic Shock Protocol
 - Neurogenic shock/head injury/TBI: Patients with severe head injury (GCS \leq 8) do not tolerate hypotension or hypoxia. Maintain SaO₂ => 94%. The goal of fluid resuscitation in these patients: BPsyst => 110 mmHg in adults, => 90 mmHg in children => 10 years old, => 70 + 2x age (yrs) mmHg in children ages 1-9. Administer a 20 ml/kg IV fluid bolus (patient may not be tachycardic), repeat Neurological exam every 5 minutes and document it; watch for changes
 - 3. Obstructive shock: Decompress tension pneumothorax if possible as above, however in cases of PE or cardiac tamponade, administering 250 mL IV fluid may increase preload and temporarily improve the condition until ED/Trauma can intervene.
 - 4. Cardiogenic shock: Often requires individualized treatment. Treat dysrhythmias per protocol, evaluate 12-lead EKG for arrhythmia or MI. Administer 250 mL fluid challenge to adults without pulmonary edema. If the patient improves, this suggests they are low on preload. If they worsen/develop pulmonary edema, stop fluids immediately
- E. In cases of shock, particularly septic and hypovolemic shock, in which IV fluid bolus has been given and patient is *still* hypotensive, then use of a vasoconstrictor to maintain blood pressure

may be required. Start patient on an [epinephrine](#) drip at 2-10 mcg/minute IV while continuing to give fluids. Always give the IV fluids first – “never squeeze an empty tank!”. Use epinephrine with caution in cases of arrhythmias or MI unless *profoundly* hypotensive or bradycardic

- F. Early and aggressive airway management (i.e. intubation) may be necessary if patient is profoundly hypoxic or their altered mental status precludes adequate airway protection. Altered patients will not tolerate CPAP.
- G. Place patient on cardiac monitor, obtain interpret and transmit a 12-lead EKG. Shock can be due to primarily to infarction/arrhythmias, or it may *cause* them. Refer to [Dysrhythmia](#) and [Acute Syndrome Protocols](#) as indicated.

Paramedic

- A. Consider [HfUbYI Ua JW5 VjX fHL5 L2](#) Grams IV/IO by slow push. Do not rapidly push. Do not piggyback IV solution in adult hemorrhagic shock.

HYPOVOLEMIC SHOCK

KEY

BASIC EMT

ADVANCED EMT

PARAMEDIC

MED CONTROL

- CONTROL LIFE-THREATENING HEMORRHAGE – APPLY TOURNIQUET AND/OR HEMOSTATIC AGENT IF INDICATED
- ASSESS AND MANAGE AIRWAY
- MAINTAIN O2 SATS =>94%
- EVALUATE PATIENT CONDITION
- MONITOR VITAL SIGNS
- MAINTAIN NORMAL BODY TEMPERATURE
- REASSURE PATIENT
- TRANSPORT PATIENT IN HORIZONTAL / SUPINE POSITION IF PATIENT CONDITION ALLOWS

- IV **NORMAL SALINE** – ADMINISTER FLUID BOLUSES OF 20 ML/KG TO MAINTAIN PERFUSION
- MONITOR ECG
- OBTAIN AND TRANSMIT 12 ECG IF TIME PERMITS

- CONSIDER **TRANEXAMIC ACID (TXA)** IF INDICATED. 1 GRAM / 100 ML IVPB OVER 10 MINUTES

CARDIOGENIC SHOCK

KEY

BASIC EMT

ADVANCED EMT

PARAMEDIC

MED CONTROL

- ASSESS AND MANAGE AIRWAY
- MAINTAIN O2 SATS =>94%
- EVALUATE PATIENT CONDITION
- MONITOR VITAL SIGNS
- MAINTAIN NORMAL BODY TEMPERATURE
- REASSURE PATIENT
- OBTAIN AND TRANSMIT 12 ECG
- TRANSPORT PATIENT IN HORIZONTAL / SUPINE POSITION IF PATIENT CONDITION ALLOWS

- IV **NORMAL SALINE** – ADMINISTER FLUID BOLUSES OF 250 ML TO MAINTAIN PERFUSION. DO NOT ADMINISTER FLUIDS IF PULMONARY EDEMA PRESENT
- MONITOR ECG
- OBTAIN AND TRANSMIT 12 ECG IF TIME PERMITS

- REFER TO DYSRHYTHMIA AND ACUTE CORONARY SYNDROME PROTOCOLS AS INDICATED.

DISTRIBUTIVE SHOCK

KEY

BASIC EMT

ADVANCED EMT

PARAMEDIC

MED CONTROL

Qsofa

QUICK SEPSIS-RELATED ORGAN FAILURE ASSESSMENT

RESP RATE => 22 / MINUTE
ALTERED MENTAL STATUS
SYSTOLIC BP <= 100 MMHG

IF PATIENT HAS 2 OR MORE PLUS A SUSPECTED SOURCE OF INFECTION
THEN THEY ARE SEPTIC

- ASSESS AND MANAGE AIRWAY
- MAINTAIN O2 SATS =>94%
- EVALUATE PATIENT CONDITION
- MONITOR VITAL SIGNS
- MAINTAIN NORMAL BODY TEMPERATURE
- REASSURE PATIENT
- CONSIDER ALS INTERCEPT AS FLUIDS IS THE MAINSTAY OF PREHOSPITAL TREATMENT.
- TRANSPORT PATIENT IN HORIZONTAL / SUPINE POSITION IF PATIENT CONDITION ALLOWS

- **IV NORMAL SALINE** – ADMINISTER FLUID BOLUSES OF 30 ML/KG TO MAINTAIN PERFUSION (20 ML/KG IN CHILDREN)
- MONITOR ECG
- OBTAIN AND TRANSMIT 12 ECG IF TIME PERMITS

- START PATIENT ON AN **EPINEPHRINE DRIP** AT 2-10 MCG/MINUTE IV WHILE CONTINUING TO GIVE FLUIDS IF PATIENT REMAINS HYPOTENSIVE.

ANAPHYLAXIS

- IF ANAPHYLAXIS SUSPECTED, SEE ALLERGIC REACTION / ANAPHYLACTIC SHOCK PROTOCOL

NEUROGENIC SHOCK

- NEUROGENIC SHOCK/HEAD INJURY/TBI: PATIENTS WITH SEVERE HEAD INJURY (GCS \leq 8) DO NOT TOLERATE HYPOTENSION OR HYPOXIA. MAINTAIN SAO₂ => 94%. THE GOAL OF FLUID RESUSCITATION IN THESE PATIENTS: BPSYS => 120 MMHG IN ADULTS, => 90 MMHG IN CHILDREN => 10 YEARS OLD, => 70 + 2X AGE (YRS) MMHG IN CHILDREN AGES 1-9. ADMINISTER A 20 ML/KG IV FLUID BOLUS (PATIENT MAY NOT BE TACHYCARDIC), REPEAT NEUROLOGICAL EXAM EVERY 5 MINUTES AND DOCUMENT IT; WATCH FOR CHANGES

OBSTRUCTIVE SHOCK

KEY

BASIC EMT

ADVANCED EMT

PARAMEDIC

MED CONTROL

- CONTROL LIFE-THREATENING HEMORRHAGE – APPLY TOURNIQUET AND/OR HEMOSTATIC AGENT IF INDICATED
- ASSESS AND MANAGE AIRWAY
- MAINTAIN O2 SATS =>94%
- EVALUATE PATIENT CONDITION
- MONITOR VITAL SIGNS
- MAINTAIN NORMAL BODY TEMPERATURE
- REASSURE PATIENT
- TRANSPORT PATIENT IN HORIZONTAL / SUPINE POSITION IF PATIENT CONDITION ALLOWS

- IF SHOCK IS DUE TO A TENSION PNEUMOTHORAX, PERFORM NEEDLE DECOMPRESSION – SEE NEEDLE DECOMPRESSION PROCEDURE.
- IV **NORMAL SALINE** – ADMINISTER FLUID BOLUSES OF 250 ML TO MAINTAIN PERFUSION FOR SUSPECTED TAMPONADE OR PE.
- MONITOR ECG
- OBTAIN AND TRANSMIT 12 ECG IF TIME PERMITS

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