

# D01: Shock

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## Introduction

Shock is a life-threatening condition of circulatory failure that is defined as a state of cellular and tissue hypoxia resulting from reduced oxygen delivery, increased oxygen consumption, or inadequate oxygen use. Four types of shock are recognized:

- Distributive shock, including: septic shock; neurogenic shock; anaphylactic shock; endocrine shock; toxic shock syndrome; systemic inflammatory response syndrome; and end-stage liver disease.
- Cardiogenic shock, resulting from: myocardial infarction; atrial or ventricular dysrhythmias; and valvular or ventricular septal rupture.
- Hypovolemic shock, due largely to hemorrhagic and nonhemorrhagic fluid losses.
- Obstructive shock, due to: pulmonary embolism; pulmonary hypertension; tension pneumothorax; constrictive pericarditis; and restrictive cardiomyopathy.

These should not, however, be considered exclusive. Many patients with circulatory failure have more than one form of shock. 'Undifferentiated shock' refers to a situation where shock is recognized, but the cause is unclear.

Paramedics and EMRs/FRs should suspect shock when confronted with hypotension, altered mental status, tachypnea, cool and clammy skin, oliguria, and metabolic acidosis (usually from hyperlactatemia). Most of these clinical features are not specific or sensitive for the diagnosis of shock and should be used primarily to narrow the differential diagnosis so that empiric therapies can be delivered in a timely fashion.

## Essentials

- Control obvious bleeding in accordance with [CPG D02: Bleeding](#).
- Identify shock states as early as possible.
- Attempt to identify possible causes and types of shock.
- Initiate treatment expeditiously, primarily fluid resuscitation and hemodynamic stabilization.
- [Consider CliniCall consultation](#) to discuss treatment plan and/or early conveyance options.

## Additional Treatment Information

- Prompt identification of shock state is essential to ensure early and aggressive management of the intended shock state.
- When possible, treatment should include specific correction of the cause of shock.
- Clinicians may consider hemodynamic stabilization primarily through fluid resuscitation and administration of vasoactive agents when appropriate.
- Appropriate and expedient treatment should be based on a good understanding of the possible underlying pathophysiology.

## General Information

- The effects of shock are initially reversible but rapidly become irreversible, resulting in multi-organ failure and death.
- Patients who present with undifferentiated shock should have immediate therapy initiated while rapidly identifying the cause and type of shock.
- IV fluids should be used judiciously in cases of suspected cardiogenic shock. Consultation with CliniCall is encouraged in these cases prior to beginning treatment (1-833-829-4099).

## Interventions

**First Responder**

- Control external hemorrhage
  - → [PR03: Tourniquets](#)
  - → [PR04: Wound packing](#)
- Splint pelvis/fractures, if clinically indicated
  - → [PR02: Pelvic Binders](#)
- Position the patient supine to support blood pressure
- Keep the patient warm and protect from further heat loss
- Consider [spinal motion restriction](#) where required
- Provide airway management as indicated:
  - → [B01: Airway Management](#)
- Provide supplemental oxygen as required:
  - → [A07: Oxygen Administration](#)
- Conduct ongoing assessment and gather collateral information, such as medications and identifying documents
- Establish ingress and egress routes from the patient's location
- Communicate patient deterioration to follow-on responders

**Emergency Medical Responder – All FR interventions, plus:**

- Administer supplemental oxygen to maintain SpO<sub>2</sub> ≥ 94%
  - → [A07: Oxygen Administration](#)
- Convey and consider intercept with additional resources
- [CiniCall consultation recommended](#) to discuss treatment plan and/or early conveyance options.

**Primary Care Paramedic – All FR and EMR interventions, plus:**

- Obtain vascular access
  - → [D03: Vascular Access & Fluid Administration](#)
- Consider fluid bolus to correct hypoperfusion or hypotension if clinically indicated
  - [CiniCall consultation recommended](#) prior to treatment to discuss care planning options in cases of suspected cardiogenic shock.
  - Consider [tranexamic acid](#) in cases of shock secondary to blood loss and hypovolemia secondary to occult bleeding

**Advanced Care Paramedic – All FR, EMR, and PCP interventions, plus:**

- Consider needle thoracostomy
  - → [PR21: Needle Thoracentesis](#)
- Consider an appropriate airway adjunct
  - → [B01: Airway Management](#)
- Consider [EPINEPHrine](#) if refractory to fluid resuscitation
- Consider cardiac arrhythmia
  - → [C02: Bradycardia](#)
  - → [C03: Narrow Complex Tachycardia](#)
  - → [C04: Wide Complex Tachycardia](#)

**Critical Care Paramedic – All FR, EMR, PCP, and ACP interventions, plus:**

- Shock differentiation is a hallmark of CCP care. The first thing when dealing with a patient in shock is to differentiate the shock state. Each shock state is specific to the presenting disease or injury pattern. As such each has a specific treatment. The overarching goal is to maintain tissue homeostasis. One of the tools used for differentiation is the use of ultrasound and the RUSH protocol. However this gives a singular data point and needs to be corroborated with history, clinical presentation, and lab data.
- Hypovolemic
  - Is loss of fluid

- Replace fluid and electrolytes
  - Stop further fluid loss
- Loss of blood
  - Replace blood with a balanced blood product administration.
  - Stop further blood loss.
- Cardiogenic
  - Arrhythmia
    - Bradyarrhythmias are treated as per ACLS protocols
    - Tachyarrhythmias are treated as per ACLS protocols
  - Cardiomyopathic
    - This is a failure of the muscle to contract properly and eject blood effectively. The most common cause is a STEMI. Regardless of type treat as per ACLS protocols. Determination of Killip class may be helpful.
    - Important to identify right versus left and HFREF and HFrEF (Heart failure with reduced ejection fraction, Heart failure with preserved ejection fraction)
  - Mechanical
    - This is a failure of the mechanics of the heart. The most common is valvular issues such as regurgitation. Other examples are VSD, PFO, or septal rupture.
- Obstructive
  - Failure to fill
    - Abdominal compartment syndrome, pericardial tamponade, tension pneumothorax, and excessive PEEP are examples that lead to a reduction in blood returning to the ventricle.
    - Treatment consists of removal of the offending pressure.
  - Failure to eject
    - Pulmonary embolism, aortic stenosis, or iatrogenic levels of vasopressor support are examples that restrict the ability of forward blood flow.
    - Remove the offending pressure and support preload, afterload, or contractility.
- Distributive
  - Characterized by the loss of vascular resistance
    - Differentiation can start immediately with a pulse pressure and skin temperature.
    - Further delineation can be identified with heart rate (bradycardia) as in the case of neurogenic.
- Treatments
- Fluid replacement
  - Saline
  - Ringers lactate
  - Plasmalyte
  - [Blood products](#)
  - Electrolyte replacement
- Fluid reduction
  - [Lasix](#)
- Preload reduction
  - [Nitroglycerine](#)
  - Nitroprusside
- Vasopressor
  - Consider [Norepinephrine](#) infusion
  - Consider [epinephrine](#) infusion
  - Consider [vasopressin](#)
  - Consider [phenylephrine](#)
  - Consider [Dopamine](#)
- Inotrope support
  - Consider [Dobutamine](#)
  - Consider [Milrinone](#)
- Chronotropic support

- Consider [Isopril](#)
- Consider [Atropine](#)
- [TVP](#)
- Procedural
  - Consider [needle/finger/tube thoracostomy](#)
  - Consider [pericardiocentesis](#)
  - Consider rapid sequence induction ([RSI](#))
  - Consider thrombolytics such as [TNK](#)
  - Consider specialty resource center
- If MAP is unachievable, attempt to maintain signs of end organ perfusion

## Evidence Based Practice

### Cardiogenic Shock

#### Supportive

- [Bypass/Direct to PCI](#)
- [Dopamine](#)
- [Norepinephrine](#)
- [Epinephrine](#)

#### Neutral

- [Crystalloid Infusion](#)

#### Against

### Hemorrhagic Shock

#### Supportive

- [Plasma infusion](#)
- [Restricted Crystalloids](#)
- [Tranexamic Acid](#)
- [Mechanical Intraosseous Insertion](#)
- [Shock Prediction Tool](#)

#### Neutral

- [Colloid Infusion](#)
- [Hypertonic Saline](#)
- [Trendelenburg](#)
- [Blood transfusion](#)
- [Manual Intraosseous Insertion](#)

#### Against

- [Aggressive Crystalloids](#)
- [MAST](#)
- [Pressors](#)

### Neurogenic Shock

### Supportive

- [Aggressive Crystalloids](#)
- [Pressors](#)

### Neutral

- [Colloid Infusion](#)

### Against

## References

1. Alberta Health Services. AHS Medical Control Protocols. 2020. [\[Link\]](#)
2. Ambulance Victoria. Clinical Practice Guidelines: Ambulance and MICA Paramedics. 2018. [\[Link\]](#)
3. Gaieski M, et al. Definition, classification, etiology, and pathophysiology of shock in adults. In UpToDate. 2020. [\[Link\]](#)

