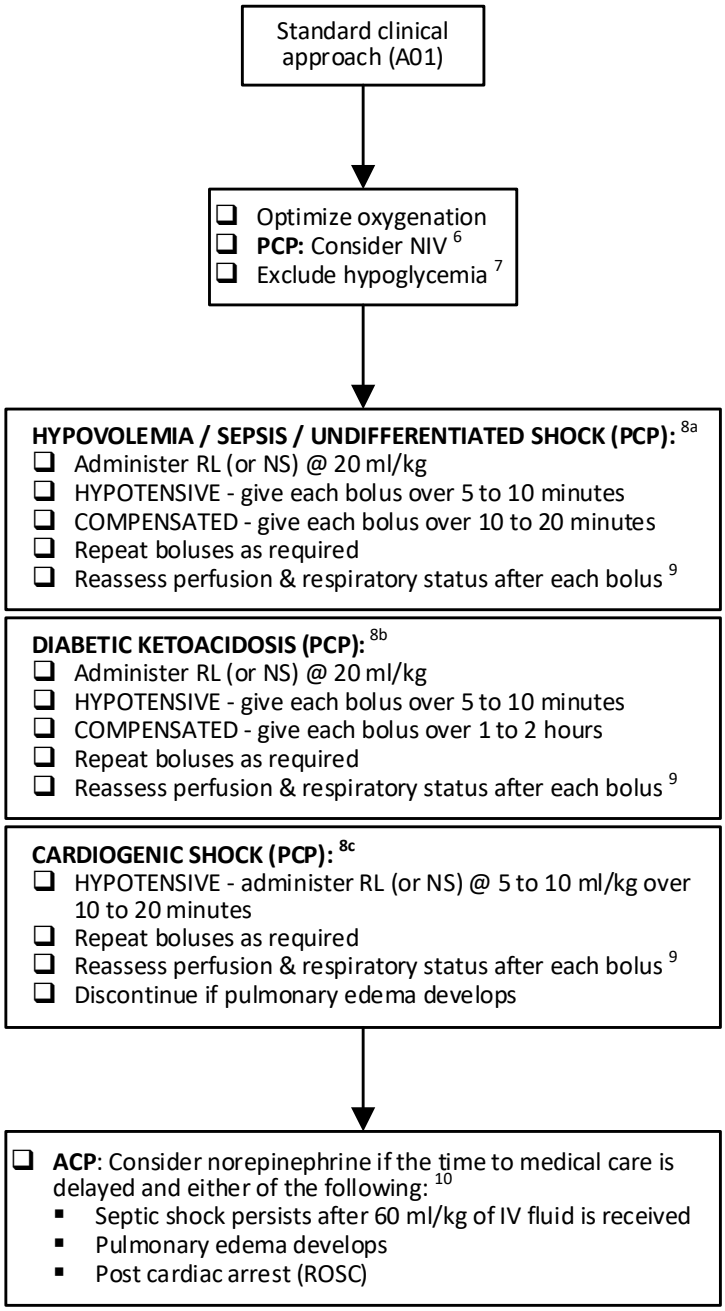
Shared health Soins communs Manitoba	C07.4 – SHOCK (PEDIATRIC)	
	Version date: 2025-03-04	Effective date: 2025-04-30 (07:00)
PCP = PCP - ACP	ICP = ICP & ACP	ACP = ACP only	None = EMR - ACP



VECTRS / OLMS: (204) 949-4000

INDICATIONS
• Hypotension, hypoperfusion, or shock in an infant, child, adolescent (up to 18 years of age)

WARNINGS
• For shock in an adult refer to C07.1 • For shock after cardiac arrest refer to C03 • For nontraumatic hemorrhagic shock refer to C07.2 • For anaphylactic shock refer to E03 • For shock due with adrenal crisis refer to E05 • For hemorrhagic shock due to trauma refer to F01 • For neurogenic shock due to spinal cord injury refer to F06

NOTES

Managing an infant or child in shock can be extremely complicated and anxiety provoking. Contact the Virtual Emergency Care & Transport Resource Service (VECTRS) for on line medical support (OLMS) at any time.

1. Pediatric shock is a life-threatening emergency and options for prehospital management are limited. However, immediate basic interventions such as optimizing oxygenation, restoring perfusion, and reducing oxygen demand may prevent progression to irreversible shock or cardiac arrest.

   Establishing the specific underlying cause is usually difficult without access to the advanced investigations available in hospital. However, identifying the general type of shock can help guide prehospital management.

   For paramedics, the goals are:
   - maintain a high index of suspicion for the presence of shock with symptoms and signs of hypoperfusion.
   - differentiate compensated from hypotensive (uncompensated) shock.
   - improve organ perfusion by the use of fluids, and vasopressor support where necessary.
   - promptly transport the patient to the next level of care.

2. Hypotension and shock are points on a continuum. The key pathophysiological difference between the two is the presence of inadequate organ perfusion in shock. Always remember that poor perfusion can be present with a normal or even elevated blood pressure (BP).

3. The child in shock will progress through 3 stages if not promptly treated.

   During **compensated shock** the body's homeostatic mechanism will attempt to compensate. Signs include elevated heart and respiratory rates, reduced peripheral perfusion (cool skin, slowed capillary refill, weak peripheral pulses), and decreased urinary output (indicated by fewer wet diapers in an infant or younger child). While the patient may maintain a normal or near normal BP, the pulse pressure often first becomes narrowed.

   In **hypotensive shock** the child's compensatory mechanisms begin to fail. The BP will drop, vital organ perfusion will become inadequate, reduced cerebral and coronary perfusion will become evident by a decreased level of consciousness and myocardial dysfunction, and the child will develop severe metabolic derangements including lactic acidosis and hypoglycemia. Prompt action is required to prevent the next phase.

The longer it takes from the onset to the restoring of adequate perfusion and oxygen delivery, the poorer the outlook. In **irreversible shock** end-organ death ensues. Circulatory collapse may lead to cardiac arrest. Then the prognosis is dismal, even if resuscitation is successful.

4. The most common causes of shock in pediatric patients are listed in appendix A, some of which are addressed in other care maps.

   Nonhemorrhagic hypovolemia (often from an acute diarrheal illness) or sepsis are commonly encountered. Diabetic ketoacidosis (DKA) may be the initial presentation of a child with type 1 diabetes, and commonly occurs during periods of illness or stress. Cardiogenic shock from myocardial infarction would be unlikely, but can result from myocarditis, cardiotoxins, or congenital heart disease. Obstructive causes are rare in infants and children, but spontaneous pneumothorax sometimes occur in the teenage years (but rarely cause tension pneumothorax).

   Paramedics may sometimes be confronted with undifferentiated shock, or shock due to more than one cause.

5. The imbalance between oxygen supply and demand can be improved by addressing a child's fever, pain, and anxiety. Analgesics and sedatives and may help, but they may impair the child's compensatory mechanisms, suppress respirations, and worsen hypotension. Treat fever with antipyretics if possible.

6. Non-invasive ventilation (NIV) may lessen the work of breathing but should be used with caution. It has the potential to exacerbate hypotension as the rise in intrathoracic pressure may impede venous return to the heart.

7. Many of the conditions causing shock may result in or be complicated by hypoglycemia, especially in infants & children. Always check the blood glucose (BG) and correct it if low.

8. Prompt administration of intravascular (IV) crystalloid is the first step in correcting the hypoperfusion in almost every type of pediatric shock. Balanced solutions like Ringer's lactate have been shown to lead to improved patient outcomes for some types of shock, compared to unbalanced normal saline.

   The optimal volume to be given will depend on the underlying cause (the numbers in the algorithm are guidelines, not absolutes). Under-resuscitation is far more common.

   a. In non-hemorrhagic hypovolemia, extracellular fluid loss is the causative event, whereas third-spacing is the main culprit in distributive shock, such as with sepsis. Volume deficits can exceed 100 to 200 milliliters per kilogram (ml/kg).

   b. In the hypovolemia of diabetic ketoacidosis (DKA), a more cautious approach is necessary despite fluid deficits that can exceed 100 ml/kg. If the patient is hypotensive IV crystalloid should be administered rapidly. However, once the patient is compensating, fluid should be administered more slowly (over 1 to 2 hours) to prevent the abrupt shifts in serum osmolality that can lead to cerebral edema.

   c. In some types of cardiogenic shock, judicious fluid administration can sometimes improve cardiac output by enhancing right ventricular end-diastolic volume (preload), but there is a risk of putting the patient into pulmonary edema if too much is given too quickly.

9. Carefully reassess after each bolus. Pay attention the clinical indicators of perfusion such as level of consciousness, skin temperature, and capillary refill, in addition to the BP.

   Remember the "three-to-one" rule. After a relatively short time, two-thirds of the volume you give will diffuse into the ECF space. Continuous monitoring with frequent re-evaluation is essential in patients with shock.

10. Vasopressors are rarely required in most cases of pediatric shock. They are generally unnecessary in hypovolemia, as fluid administration is the mainstay of therapy. They should not be initiated in septic shock until adequate fluid resuscitation has been achieved.

    However, in cardiogenic shock or after cardiac arrest a short course of norepinephrine may improve cardiac contractility and vascular tone if the patient does not respond to fluid or fluid is contraindicated and the time to medical care remains long.

LINKS
• A01 - Standard Clinical Approach • C03 - Return of Spontaneous Circulation • C07.1 - Shock (Adult) • C07.2 - Nontraumatic Hemorrhagic Shock • E03 - Anaphylaxis & Anaphylactic Shock • E05 - Adrenal Crisis • F01 - Major Trauma • F06 - Spine & Spinal Cord Trauma • M05 - Epinephrine

APPROVED BY	
	
EMS Medical Director	EMS Associate Medical Director

VERSION CHANGES (refer to X03 for change tracking)
• New • Separation into pediatric & Adult (C07.1) protocols • Addition of advanced work scope • Revised flow chart & notes for greater clarity and ease of use

APPENDIX A: TYPES & CAUSES OF PEDIATRIC HYPOTENSION / HYPOPERFUSION / SHOCK

HYPOVOLEMIA:

- Non-hemorrhagic
  - Diarrhea (gastroenteritis)
  - Vomiting / decreased oral intake
  - Polyuria (diabetic ketoacidosis)
  - Burns
- Nontraumatic hemorrhage (C07.2)
  - Post tonsillectomy
  - Epistaxis (posterior bleeds)
- Traumatic hemorrhage (F01)

DISTRIBUTIVE:

- Sepsis
- Anaphylaxis (E03)
- Adrenal insufficiency (E05)
- Neurogenic shock (F06)

CARDIOGENIC:

- Myocardial depression (e.g. myocarditis, cardiotoxins)
- Dysrhythmia (tachycardia, bradycardia)
- Congenital heart disease

OBSTRUCTIVE:

- Tension pneumothorax (C10)
- Cardiac tamponade
- Pulmonary embolism