



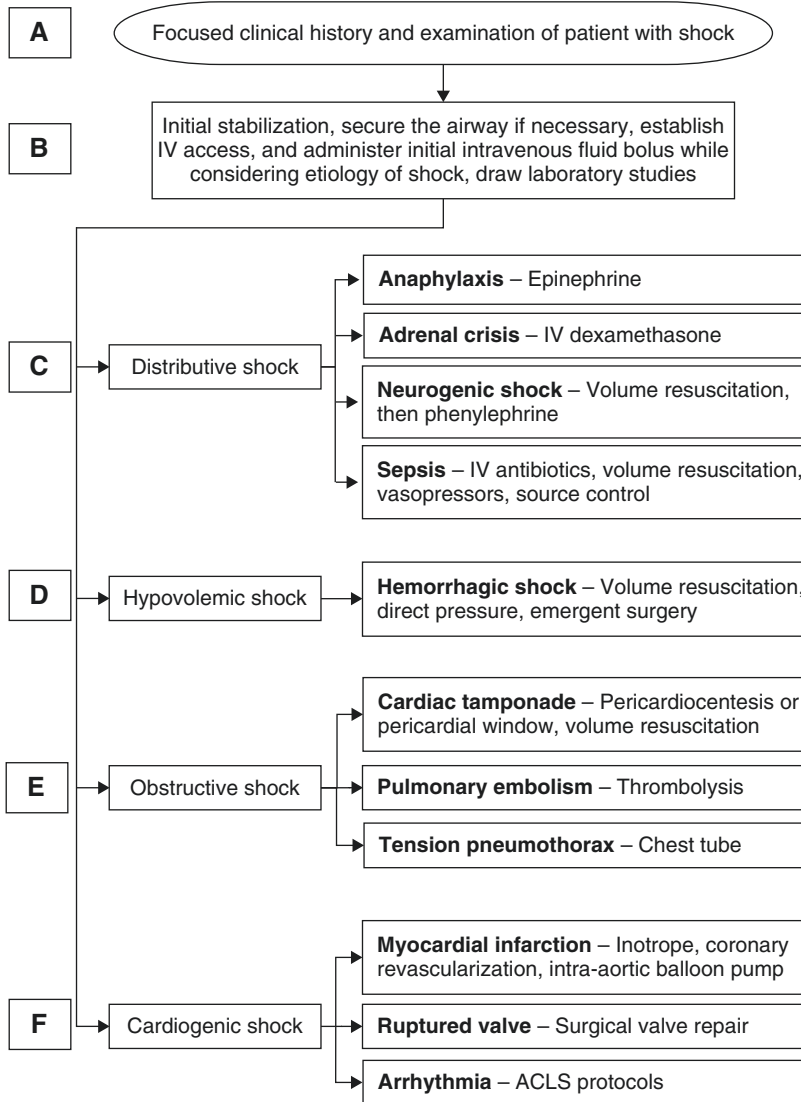
Algorithmic Approach

- A. Shock can be described as a failure of the circulatory system to adequately deliver blood, oxygen, and nutrients to vital organs, preferentially the heart and brain. Patients may present with tachypnea, altered mental status, and hypotension.
- B. Initial stabilization of the patient's airway, breathing, and circulation should be established first. This includes securing an airway through intubation if necessary, establishing IV access, and administering an initial intravenous fluid bolus while considering the etiology of shock. Total volume of fluid resuscitation is determined by the type of shock. Patients with cardiogenic shock due to infarction of the left ventricle or obstructive shock due to pulmonary embolism may require only small volumes for fluid resuscitation, whereas those with hemorrhagic shock, sepsis, or infarction of the right ventricle often require larger volumes for fluid resuscitation. Patients with massive hemorrhage will require blood products. Patient with shock may require vasopressors and inotropes in addition to resuscitation, and hemodynamic monitoring should be established with central venous access, pulmonary artery catheters, and arterial lines. Occasionally echocardiograms are necessary for visualization. Necessary laboratory studies and imaging may include basic metabolic panel (BMP), complete blood count (CBC), coagulation studies, serum lactate, renal function tests, liver function tests, electrocardiogram (ECG), chest X-ray (CXR), arterial blood gas (ABG), or blood cultures with more targeted studies depending on clinical presentation. At this time, any early interventions should be attempted depending on the etiology of shock.
- C. Distributive shock occurs in the setting of anaphylaxis, adrenal crisis, neurogenic shock, and sepsis. Adrenal insufficiency or crisis presents as an acute cardiovascular collapse unresponsive to fluids and vasopressors. Treatment with IV dexamethasone is first line and can be given empirically with suspicion of adrenal crisis as it does not interfere with the corticotrophin stimulation test used for diagnosis. Neurogenic shock occurs as a result of a spinal or head injury leading to loss of the sympathetic tone. This results in decrease in systemic vascular resistance, decrease in blood pressure, decrease in heart rate, and warm extremities. Initial treatment is intravascular fluid resuscitation followed by phenylephrine. Anaphylaxis may occur with severe allergic reactions and patients

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should be administered epinephrine. Sepsis presents with hypotension, confusion, hyperventilation, hyperglycemia, and shock in the setting of a known or suspected infection. Treatment involves a multifaceted approach with volume resuscitation, antibiotics, and source control at its core. Fluid resuscitation can be guided by mean arterial pressure and central venous pressure goals as well as urinary output, lactate clearance, and venous saturations.

- D. Hypovolemic shock occurs as a result of large fluid losses such as with trauma, burns, hemorrhage, vomiting, or diarrhea. In hemodynamically unstable trauma patients, they are considered to be bleeding unless proven otherwise. A focused assessment with sonography for trauma (FAST) exam or other imaging may be necessary to identifying bleeding not
- obvious during the primary or secondary survey. Treatment includes volume resuscitation, direct pressor, and emergent surgical control of bleeding.
- E. Obstructive shock often presents in the setting of cardiac tamponade, pulmonary embolism, or tension pneumothorax. All three of these may require emergent intervention including pericardiocentesis, thrombolysis, or needle decompression and a chest tube, respectively.
- F. Cardiogenic shock may occur as a result of massive myocardial infarction, ruptured valve, unstable arrhythmia, or severe congestive heart failure. Treatment includes coronary revascularization, intra-aortic balloon pump, surgical valve repair, or following advanced cardiac life support (ACLS) protocols in the case of unstable arrhythmias.



Algorithm 175.1

Suggested Reading

Rhodes A, et al. Surviving sepsis campaign: international guidelines for management of severe sepsis and septic shock: 2016. *Crit Care Med.* 2017;45:486–552.

Van Diepen S, Katz JN, Albert NM, et al. Contemporary management of cardiogenic shock: a scientific statement from the American Heart Association. *Circulation.* 2017;136(16):e232–68.

Vincent JL, De Backer D. Circulatory shock. *N Engl J Med.* 2013;369(18):1726–34.