

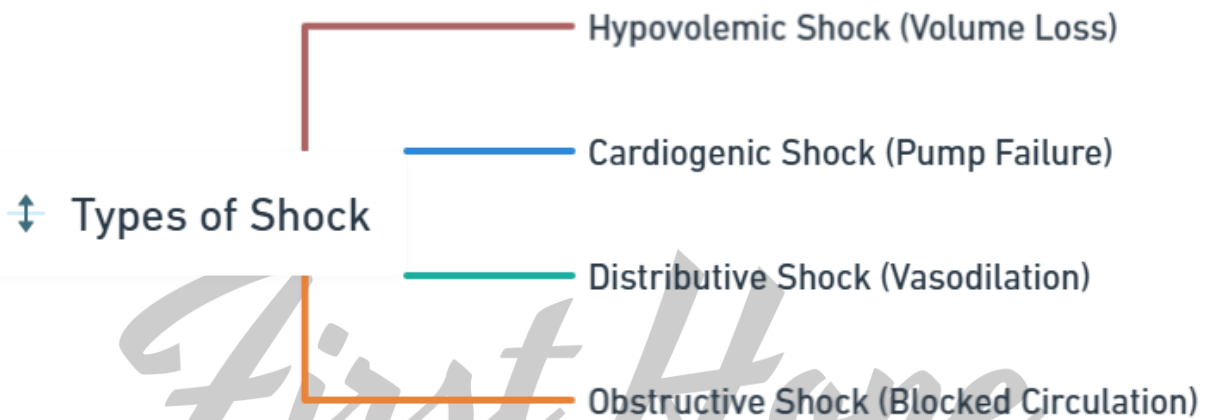
Pharmacology of Drugs Acting on the Cardiovascular System

Shock

Pathophysiology

- **Initial Stage** – Compensatory mechanisms (tachycardia, vasoconstriction) maintain perfusion.
- **Progressive Stage** – Oxygen delivery fails → Anaerobic metabolism → Lactic acidosis → Cell dysfunction.
- **Irreversible Stage** – Multi-organ failure → Death if untreated.

Types of Shock



1. Hypovolemic Shock (Volume Loss):

- **Cause:** Severe blood or fluid loss (e.g., hemorrhage, burns, diarrhea, vomiting).
- **Mechanism:** Reduced preload (venous return) → ↓ Stroke volume → ↓ Cardiac output.

2. Cardiogenic Shock (Pump Failure):

- **Cause:** Heart dysfunction (e.g., myocardial infarction, arrhythmias, myocarditis).
- **Mechanism:** Inability of the heart to pump blood effectively → ↓ Cardiac output.

3. Distributive Shock (Vasodilation):

- **Septic Shock:** Caused by severe infection and systemic inflammation.
- **Anaphylactic Shock:** Allergic reaction causing massive histamine release and vasodilation.
- **Neurogenic Shock:** Spinal cord or brain injury causing loss of vascular tone.
- **Mechanism:** Peripheral vasodilation → ↓ Systemic vascular resistance → Inadequate perfusion.

4. Obstructive Shock (Blocked Circulation):

- **Cause:** Physical obstruction (e.g., pulmonary embolism, cardiac tamponade, tension pneumothorax).

- **Mechanism:** Impaired blood flow → ↓ Cardiac output.

Symptoms

A. General Symptoms:

- Hypotension, tachycardia, cold/clammy skin (warm in distributive shock), altered mental status, oliguria, weak pulse, rapid breathing.

B. Specific Symptoms:

- **Hypovolemic:** Dry mucous membranes, reduced skin turgor, flat neck veins.
- **Cardiogenic:** Chest pain, lung crackles, distended neck veins.
- **Septic:** Early fever/flushed skin, later cool/mottled skin.
- **Anaphylactic:** Hives, angioedema, stridor, wheezing.
- **Neurogenic:** Bradycardia, warm dry skin, paralysis below injury.

Diagnosis

1. **Clinical Assessment:** Vital signs, skin color, capillary refill.
2. **Laboratory Tests:**
 - Elevated lactate, metabolic acidosis (ABG).
 - CBC, electrolytes, renal function.
3. **Imaging:** Chest X-ray, CT, ultrasound for causes.
4. **Hemodynamic Monitoring:** CVP, pulmonary artery catheterization.

Treatment

A. General Management:

- **Airway:** Secure airway, intubation if needed.
- **Breathing:** Oxygen or ventilation.
- **Circulation:** IV fluids, vasopressors.

B. Specific Treatments:

- **Hypovolemic:** IV crystalloids, blood transfusion if hemorrhage.
- **Cardiogenic:** Inotropes, diuretics, revascularization (PCI/CABG).
- **Septic:** Antibiotics, IV fluids, vasopressors, corticosteroids if refractory.
- **Anaphylactic:** IM epinephrine, antihistamines, corticosteroids, airway support.
- **Neurogenic:** IV fluids, vasopressors, spinal stabilization.
- **Obstructive:** Pericardiocentesis, chest tube, thrombolytics/embolectomy.

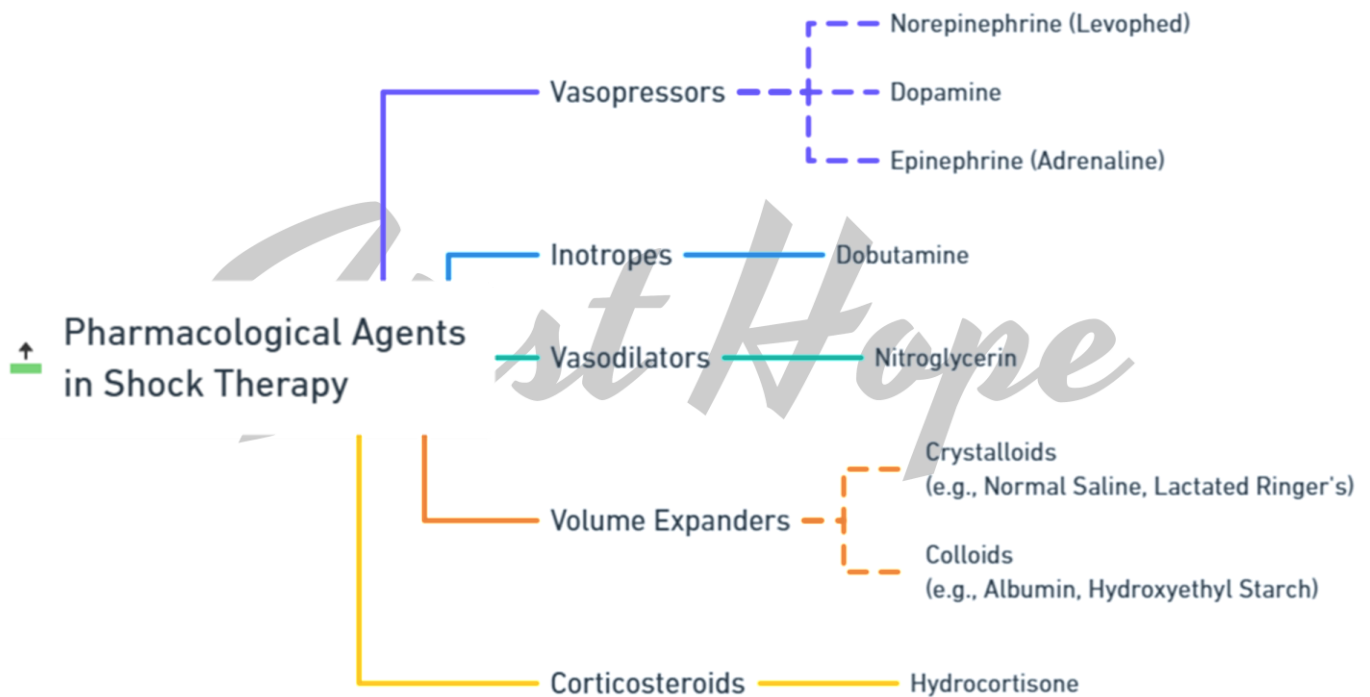
Prognosis and Complications

- **Prognosis:** Depends on type, cause, and timely intervention. Early treatment improves outcomes.
- **Complications:** Multi-organ dysfunction syndrome (MODS), ARDS, renal failure, death if untreated.

Drugs Used in the Therapy of Shock

- **Shock** is a critical condition characterized by inadequate tissue perfusion and oxygenation, leading to cellular dysfunction and potential organ failure.
- Pharmacological management aims to restore adequate circulation and oxygen delivery.
- Shock can be classified into several types, each requiring specific therapeutic agents:

Classification of Drugs & Mechanism of Action



1. Vasopressors:

A. Norepinephrine (Levophed):

- **Mechanism:** Primarily alpha-adrenergic agonist with some beta-1 activity, causing vasoconstriction and increased cardiac contractility.
- **Use:** First-line agent in septic shock; helps increase blood pressure and improve perfusion.
- **Side Effects:** Arrhythmias, excessive vasoconstriction leading to peripheral ischemia.

B. Dopamine:

- **Mechanism:** Dose-dependent effects:
 - Low doses: Dopaminergic receptors, causing renal vasodilation.



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