CHAPTER 12

EMERGENCY CARE

Author

Dr. Aditi Naidu Patti, Assistant Professor, Department of Pharmacy Practice, Vignan Institute of Pharmaceutical Technology, Duvvada, Visakhapatnam, Andhra Pradesh, India

Abstract

Emergency care in pharmacy settings involves medication management, first response capabilities, toxicology knowledge, and organizational protocols for crisis situations. Emergency medications maintained in pharmacy inventories include life-saving agents addressing anaphylaxis (epinephrine), opioid overdose (naloxone), hypoglycemia (dextrose, glucagon), cardiac arrest (atropine, amiodarone), and status epilepticus (benzodiazepines, levetiracetam), with pharmacist responsibilities including proper storage, expiration monitoring, dosing reference maintenance, and team education regarding appropriate administration. First aid in pharmacy settings requires preparation for common medical emergencies including cardiac events, allergic reactions, hypoglycemia, seizures, bleeding, and respiratory distress, with pharmacist training in basic life support, automated external defibrillator operation, and emergency response protocols coordinated with local emergency medical services. Toxicology basics essential for pharmacist practice include recognition of common poisoning presentations, initial management approaches for substance overdoses, familiarity with antidote mechanisms and indications, poison control center collaboration protocols, and triage decision-making for determining appropriate level of care. Crisis management extends beyond medical emergencies to address disaster response, medication supply chain disruptions, security incidents, and public health emergencies, requiring established communication hierarchies, essential medication stockpiles, alternative dispensing procedures, and coordination with government agencies and healthcare systems. This emergency preparedness helps pharmacists during both individual medical crises and larger-scale emergencies affecting medication access and public health.

Keywords: *Emergency Response; Overdose Management; Antidote; Disaster Preparedness; Life-Threatening Conditions*

Learning Objectives

After completion of the chapter, the learners should be able to:

- Prepare emergency medication kits with appropriate drugs, concentrations, and administration supplies for various practice settings.
- Demonstrate proper response techniques for common pharmacy emergencies including anaphylaxis, cardiac events, hypoglycemia, and seizures.
- Apply toxicology principles to identify and manage common poisoning and overdose scenarios including opioids, acetaminophen, and salicylates.
- Implement triage protocols to determine appropriate levels of care for patients presenting with various emergency conditions.
- Develop pharmacy disaster preparedness plans addressing medication supply maintenance, communication protocols, and coordination with emergency services.
- Recommend appropriate antidotes and supportive treatments for specific toxic exposures based on mechanism of action and patient presentation.

EMERGENCY MEDICATIONS

Emergency medications address acute, potentially life-threatening conditions requiring immediate intervention. These critical agents serve multiple roles in different settings, from community pharmacy response to medical emergencies, to institutional crash cart contents, to emergency medical services deployment. Proper emergency medication management requires thorough understanding of indications, contraindications, dosing, administration techniques, and storage requirements to ensure readiness when seconds matter in patient outcomes.

Cardiac Emergency Medications

Cardiac emergencies represent among the most time-critical situations requiring immediate pharmacological intervention. Epinephrine stands as the cornerstone of cardiac arrest management through its alpha- and beta-adrenergic effects, increasing coronary and cerebral perfusion pressure during cardiopulmonary resuscitation while enhancing myocardial contractility and stimulating spontaneous contractions. Administration in cardiac arrest employs 1 mg (1:10,000 concentration) intravenously or intraosseously every 3-5 minutes, with continuous infusion considerations for post-resuscitation support. Vasopressors including norepinephrine, dopamine, and vasopressin

support blood pressure in cardiogenic, distributive, and other shock states through vasoconstriction and variable inotropic effects, with dosing typically weight-based and titrated to target blood pressure or perfusion parameters. Antiarrhythmic agents address various rhythm disturbances with amiodarone used in ventricular fibrillation/pulseless ventricular tachycardia refractory to defibrillation; lidocaine sometimes employed as an alternative; and adenosine serving as both diagnostic and therapeutic agent for supraventricular tachycardias through transient AV node blockade. Antiplatelet and antithrombotic therapy in acute coronary syndromes includes aspirin administration immediately upon suspicion, with additional agents including P2Y12 inhibitors (clopidogrel, ticagrelor) and anticoagulants (unfractionated heparin, enoxaparin) initiated based on specific presentation and planned intervention approach. Rapid administration of these agents significantly influences morbidity and mortality outcomes, making both appropriate stocking and proper administration knowledge essential in emergency settings.

Respiratory Emergency Medications

Respiratory emergencies require prompt pharmacological intervention to maintain oxygenation and ventilation. Bronchodilators represent first-line therapy for bronchospasm, with short-acting beta-2 agonists (albuterol) providing rapid airway smooth muscle relaxation through multiple administration routes including metered-dose inhalers with spacers, nebulization, or in extreme cases, intravenous formulations. Anticholinergic agents (ipratropium) offer complementary bronchodilation through different mechanisms, particularly valuable in COPD exacerbations and when combined with beta-agonists for enhanced effect. Systemic corticosteroids (methylprednisolone, prednisone, dexamethasone) address the inflammatory component of many respiratory emergencies, with early administration reducing symptom duration, hospitalization rates, and relapse frequency despite their delayed onset of action. Magnesium sulfate provides additional bronchodilation in severe asthma exacerbations through smooth muscle relaxation via calcium channel antagonism, typically administered intravenously over 20-30 minutes with careful monitoring for hypotension. Epinephrine serves critical roles in both anaphylaxis and severe asthma unresponsive to conventional therapy, with intramuscular administration (1:1,000 concentration) preferred in anaphylaxis for reliable absorption and rapid effect. Oxygen therapy supports all respiratory emergencies, with delivery systems ranging from simple nasal cannulas to non-rebreather masks and high-flow nasal cannula systems based on patient needs. Naloxone reverses respiratory depression from opioid overdose through

competitive mu-receptor antagonism, administered via multiple routes including intranasal, intramuscular, intravenous, and subcutaneous, with dose titration ideally balancing respiratory stimulation against precipitation of withdrawal in opioid-dependent individuals.

Table 12.1: Emergency Medications and Their Uses

Medication Class	Primary Indications	Critical Monitoring Parameters
Vasopressors	Cardiac arrest Hypotension Anaphylaxis Septic shock	Blood pressure Heart rate Peripheral perfusion ECG changes Tissue necrosis (extravasation)
Antiarrhythmics	Ventricular fibrillation Ventricular tachycardia Supraventricular tachycardia Atrial fibrillation	ECG changes Blood pressure QT interval Heart rate Signs of toxicity
Anticonvulsants	Status epilepticus Acute seizures Seizure prophylaxis Alcohol withdrawal	Respiratory status Level of consciousness Seizure control Vital signs Paradoxical reactions
Reversal Agents	Opioid overdose Benzodiazepine overdose Heparin reversal DOAC reversal	Respiratory rate Level of consciousness Withdrawal symptoms
Inotropes	Cardiogenic shock Heart failure Cardiac output augmentation Bradycardia	Blood pressure Heart rate Cardiac output Arrhythmias Signs of toxicity
Analgesics	Acute pain Procedural sedation Trauma Myocardial infarction	Respiratory rate Sedation level Pain score Blood pressure
Sedatives	Procedural sedation	Respiratory status

Medication Class	Primary Indications	Critical Monitoring Parameters
	Mechanical ventilation Agitation Status epilepticus	Hemodynamic parameters Sedation depth Recovery time Paradoxical reactions
Neuromuscular Blockers	Rapid sequence intubation Mechanical ventilation Procedure facilitation Status asthmaticus	Ventilation adequacy Train-of-four monitoring Sedation adequacy Anaphylaxis Malignant hyperthermia
Antidotes	Overdose/poisoning Acetaminophen toxicity Digoxin toxicity Cyanide poisoning	Vital signs Mental status Specific toxicity markers Allergic reactions Electrolyte abnormalities
Emergency Cardiovascular	Bradycardia Hyperkalemia Metabolic acidosis Torsades de pointes	Heart rate ECG changes Acid-base status Electrolytes Signs of toxicity
Respiratory Medications	Asthma/COPD exacerbation Croup Airway edema Bronchospasm	Respiratory rate Oxygen saturation Work of breathing Peak flow/spirometry Side effects
Glucose Regulators	Hypoglycemia Hyperkalemia Calcium channel blocker overdose Sulfonylurea overdose	Blood glucose Mental status Potassium levels Fluid status Rebound effects

Neurological Emergency Medications

Neurological emergencies require specific pharmacological interventions addressing seizures, stroke, and other acute neurological conditions. Benzodiazepines represent first-line therapy for status epilepticus, with midazolam increasingly preferred for non-intravenous administration routes (intramuscular, intranasal, buccal) when vascular access is unavailable; lorazepam demonstrating longer seizure control duration when given intravenously; and diazepam offering rectal administration options particularly valuable in home management plans. Second-line anticonvulsants including fosphenytoin, valproate, and levetiracetam address benzodiazepine-refractory seizures, with specific agent selection considering onset time, administration considerations, and side effect profiles. Hyperosmolar therapy with mannitol or hypertonic saline reduces intracranial pressure in traumatic brain injury and other conditions with cerebral edema, requiring careful administration rate control and monitoring for fluid and electrolyte disturbances. Thrombolytic therapy with tissue plasminogen activator (tPA) remains the primary pharmacological intervention for ischemic stroke within appropriate time windows, requiring rapid recognition, careful patient selection through established criteria, and precise weight-based dosing to balance potential benefit against hemorrhagic conversion risk. Glucose management in neurological emergencies addresses both hypoglycemia with concentrated dextrose solutions (D50W, D10W) and hyperglycemia with insulin therapy, recognizing that both extremes adversely affect neurological outcomes. Antidotes for specific toxicological emergencies affecting the nervous system include flumazenil for benzodiazepine overdose and physostigmine for anticholinergic toxicity, though both carry significant cautions regarding seizure precipitation in certain contexts.

Anaphylaxis and Other Emergency Medications

Anaphylaxis represents a systemic, life-threatening hypersensitivity reaction requiring immediate pharmacological intervention. Epinephrine constitutes the definitive first-line treatment through multiple beneficial effects including alpha-1-mediated vasoconstriction reducing mucosal edema and hypotension; beta-1 cardiac stimulation increasing contractility and heart rate; and beta-2-mediated bronchodilation addressing respiratory symptoms. Intramuscular administration into the anterolateral thigh (vastus lateralis) provides optimal absorption, with 0.3-0.5 mg (0.3-0.5 mL of 1:1,000 concentration) for adults and weight-based dosing for pediatric patients, repeated every 5-15 minutes as needed based on response. Delayed epinephrine administration correlates with increased mortality, making immediate

access through emergency kits, autoinjectors, or rapid preparation from ampules critically important. Adjunctive therapies include H1-antihistamines (diphenhydramine) primarily addressing urticaria and pruritus without significant impact on core anaphylactic pathophysiology; H2-antagonists (famotidine, ranitidine) sometimes added for potential additive benefit; and corticosteroids (methylprednisolone, prednisone) potentially reducing risk of biphasic or protracted reactions despite delayed onset. Additional emergency medications include activated charcoal for specific ingestions, administered within appropriate timeframes and when airway protection remains assured; dextrose for hypoglycemia confirmation or empiric administration in altered mental status when glucose measurement is unavailable; and calcium channel blocker or beta-blocker antidotes including calcium chloride, glucagon, and high-dose insulin therapy for significant cardiovascular toxicity. Pharmacy-based emergency kits require regular inspection, temperature monitoring, organization supporting rapid medication identification, and clear protocol guidance including proper dosing, administration techniques, and post-administration monitoring parameters.

Table 12.2: Emergency Response Algorithms and Medications

Emergency Condition	Initial Assessment	First-Line Medications	Secondary Interventions
Cardiac Arrest (VF/VT)	CPR Defibrillation Airway management IV/IO access	Epinephrine 1 mg IV/IO q3-5min Amiodarone 300 mg IV/IO Lidocaine 1-1.5 mg/kg IV/IO	Magnesium 1-2 g IV (Torsades) Sodium bicarbonate (specific indications) Calcium (hyperkalemia) Reversal agents (overdose)
Cardiac Arrest (PEA/Asystole)	CPR Airway management IV/IO access Identify causes	Epinephrine 1 mg IV/IO q3-5min Fluids for hypovolemia Atropine no longer routine	Address reversible causes: - Calcium (hyperkalemia) - Sodium bicarbonate (acidosis, TCA overdose) -Dextrose/Glucagon (hypoglycemia) - Naloxone (opioid overdose)

Emergency Condition	Initial Assessment	First-Line Medications	Secondary Interventions
Anaphylaxis	Airway assessment Vital signs Rash evaluation Auscultation	Epinephrine 0.3-0.5 mg IM (adult) Epinephrine 0.01 mg/kg IM (pediatric) IV fluids	Diphenhydramine 25-50 mg IV/PO Methylprednisolone 125 mg IV Ranitidine 50 mg IV Albuterol for bronchospasm
Status Epilepticus	Airway protection Oxygen IV access Glucose check	Lorazepam 0.1 mg/kg IV/IO Diazepam 0.15-0.2 mg/kg IV/IO Midazolam 0.2 mg/kg IM	Fosphenytoin 20 mg PE/kg IV Valproic acid 40 mg/kg IV Levetiracetam 60 mg/kg IV Phenobarbital 20 mg/kg IV
Acute Coronary Syndrome	Vital signs 12-lead ECG Cardiac markers STEMI vs. NSTEMI	Aspirin 162-325 mg chewed Nitroglycerin 0.4 mg SL Morphine 2-4 mg IV (if needed) P2Y12 inhibitor (per protocol)	Anticoagulant (heparin/enoxaparin) Beta-blocker if appropriate Statin ACE inhibitor Reperfusion strategy meds
Stroke (Ischemic)	NIHSS assessment CT scan Blood glucose Vital signs	Alteplase 0.9 mg/kg IV (if eligible) Aspirin 325 mg (if no tPA) BP management medications	Antiplatelet therapy Statin therapy DVT prophylaxis Swallowing assessment before PO
Acute Heart Failure	Vital signs Oxygen saturation JVD/edema Lung auscultation	Nitroglycerin 0.4 mg SL/spray Furosemide Oxygen therapy	Morphine (selected cases) ACE inhibitor/ARB Nitroprusside (severe HTN) Inotropes