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Emergency and Critical Care Drugs

Pharmacology

Adrenaline, atropine, emergency bronchodilators, vasopressors, anticonvulsants, emergency cardiac drugs, antidotes and drugs used in resuscitation.

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CHAPTER 22 / PHARMACOLOGY 22. Emergency and Critical Care Drugs

1. Introduction

Emergency medicines treat immediately threatening disturbances of breathing, circulation, consciousness or metabolism. They complement, rather than replace, high-quality assessment, CPR, defibrillation, airway support and treatment of the cause. The following examples are for supervised nursing education; actual administration follows the current locally adopted emergency algorithm and authorized clinical team.

2. Adrenaline (epinephrine): indications must not be confused

Adrenaline stimulates alpha and beta adrenergic receptors. Vasoconstriction improves vascular tone; beta effects support cardiac stimulation and bronchodilation. The route, concentration and dose depend on the emergency.

Adult teaching example	Route and dose	Important distinction
Anaphylaxis (RCUK protocol)	0.5 mg IM into anterolateral thigh, using 1 mg/mL; repeat after 5 minutes if needed	Patient with circulation; urgent ABC assessment and support [4].
Cardiac arrest (AHA 2025)	1 mg IV/IO every 3-5 minutes under adult ALS protocol	Pulseless patient; continue CPR and rhythm-specific defibrillation [3].

Never substitute the IM anaphylaxis regimen for the IV/IO arrest regimen or vice versa. Use concentration in mg/mL rather than relying on ratio notation. In arrest, give adrenaline as soon as feasible for nonshockable rhythm and after initial unsuccessful defibrillation attempts for shockable rhythm, following the adopted algorithm. Paediatric algorithms are different.

3. Emergency cardiac drugs

Drug	Main role	Nursing considerations
Atropine	Selected symptomatic bradycardia with haemodynamic compromise	Monitor ECG and perfusion; pacing or alternative drugs may be necessary. AHA 2025 adult starting dose is 1 mg IV; follow complete algorithm and local protocol.
Amiodarone / lidocaine	Selected shock-refractory ventricular fibrillation or pulseless VT	Rhythm-specific use; verify concentration, route, timing and adverse effects.
Adenosine	Selected regular tachycardias involving AV nodal conduction	Continuous monitoring, emergency readiness; avoid inappropriate use in irregular or unstable rhythms.
Magnesium sulfate	Selected torsades de pointes or magnesium deficiency	Monitor ECG, respiratory and renal status; not routine for every arrest.

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Calcium salts	Selected hyperkalaemia-related ECG changes, calcium-channel blocker toxicity or hypocalcaemia	Formulation and IV access precautions; not routine arrest treatment.
Sodium bicarbonate	Selected toxicological or metabolic indications	Sodium load, alkalosis, compatibility; not routine during cardiac arrest.

Atropine is not a routine medication for asystole or pulseless electrical activity. Unstable tachyarrhythmias may require immediate electrical cardioversion. Do not delay defibrillation to prepare a medicine.

4. Vasopressors and inotropes

Drug	Major action / use	Monitoring
Noradrenaline	Vasoconstrictor, common first-choice pressor in septic shock	Continuous haemodynamics and perfusion; monitor extravasation and ischaemia.
Adrenaline infusion	Alpha/beta stimulation in selected shock	Arrhythmia, ischaemia, hyperglycaemia; prescribed titration.
Vasopressin	V1-mediated vasoconstriction; selected adjunct in shock	Perfusion and sodium/water effects; not routine replacement for arrest adrenaline.
Dobutamine	Inotrope for selected low cardiac output	HR, ECG, BP, perfusion and response.
Dopamine	Dose-related adrenergic effects; selected circumstances	Arrhythmias and extravasation; not a routine renal-protective infusion.

Use approved standardized concentrations and pump settings. Verify line access, compatible infusions and titration targets. Reassess lactate trends, urine output, capillary refill and mental status alongside BP. Persistent shock requires review of underlying cause, volume status and source control.

5. Emergency bronchodilators, anticonvulsants and metabolic medicines

Salbutamol and ipratropium are used in selected acute bronchospasm; systemic corticosteroids may support treatment but are not immediate bronchodilators. Monitor work of breathing, oxygenation, HR and response. Benzodiazepines (lorazepam, diazepam or midazolam depending on protocol/access) are used for prolonged convulsive seizures; support ventilation and monitor sedation. Second-line antiseizure drugs are chosen under protocol. IV glucose treats severe hypoglycaemia when appropriate; glucagon may be useful when IV access is unavailable depending on setting. In hyperkalaemia, IV calcium can stabilize cardiac membranes, insulin with glucose shifts potassium intracellularly, and other therapies remove potassium. Glucose and potassium require serial monitoring; calcium itself does not lower potassium.

6. Common antidotes

Toxic exposure	Antidote / treatment concept	Safety point

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Opioids	Naloxone	Support ventilation; repeat/observe as effect may wear off.
Paracetamol overdose	N-acetylcysteine	Time-sensitive risk assessment and liver monitoring.
Organophosphates	Atropine, selected oxime such as pralidoxime	Protect staff from contamination; titrate to clinical protocol.
Unfractionated heparin	Protamine	Reversal based on heparin exposure; hypotension/anaphylactoid risk.
Warfarin	Vitamin K and PCC when indicated	Assess severity of bleeding and INR.
Digoxin	Digoxin immune Fab	Selected severe toxicity; monitor rhythm and potassium.
Local anaesthetic systemic toxicity	Lipid emulsion under specialist protocol	Activate anaesthetic emergency response.
Magnesium toxicity	Calcium gluconate under protocol	Stop magnesium as directed, support ventilation and monitor ECG.

Flumazenil is not a universal overdose antidote; it may precipitate seizures. Poisoning requires agent identification, supportive care and toxicology consultation. Do not induce vomiting routinely. Antidote dose depends on exposure and protocol.

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7. Nursing responsibilities and crash-cart management

Check emergency trolleys for expiry, appropriate concentrations, seals and functioning equipment according to policy. During resuscitation, assign roles, announce medication name/dose, use closed-loop confirmation and document exact times. Check dose, route and concentration without delaying life-saving compressions. Monitor response, report errors promptly and replenish supplies after use. Participate in simulation and debriefing.

8. Examination questions

Long answer questions

1. 1. Classify emergency drugs and explain the different roles of adrenaline.
2. 2. Describe vasopressors, inotropes and relevant critical care monitoring.
3. 3. List common antidotes and their nursing considerations.

Short answer questions

- Adrenaline in anaphylaxis versus arrest; atropine; noradrenaline; naloxone; magnesium sulfate; crash cart.

Very short answer questions

- First-line route of adrenaline in anaphylaxis? - IM.
- Adult arrest adrenaline interval under AHA 2025? - Every 3-5 minutes.
- Is sodium bicarbonate routinely recommended in all cardiac arrests? - No.

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9. Quick revision

Treat airway, breathing and circulation first. Different adrenaline regimens are not interchangeable. Rhythm and haemodynamic status guide cardiac drugs. Verify concentrations and document resuscitation medication timing. Antidotes supplement essential supportive care.

Conclusion

Emergency pharmacology requires rapid but accurate verification, protocol-based decision-making, continuous assessment and effective teamwork. Training and current local algorithms are essential.

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Practice questions

Choose one best answer. The answer key and explanations follow the questions.

1. Which rhythm-related situation is a selected indication for atropine?

A. All pulseless electrical activity
B. Symptomatic bradycardia with haemodynamic compromise
C. Routine asystole treatment
D. Every regular tachycardia

2. Which arrhythmia is a selected indication for magnesium sulfate?

A. Every first-degree AV block
B. All episodes of asystole
C. Torsades de pointes
D. Every sinus tachycardia

3. A shockable cardiac arrest rhythm requires defibrillation while a medicine is being prepared. Which principle applies?

A. Wait until every medicine is ready
B. Give medicines before any indicated shock
C. Replace defibrillation with routine calcium
D. Do not delay defibrillation to prepare the medicine

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Answer key and explanations

1. B - Symptomatic bradycardia with haemodynamic compromise

Atropine is used in selected symptomatic bradycardia, following the adopted algorithm.

2. C - Torsades de pointes

Magnesium sulfate has selected use in torsades de pointes or magnesium deficiency.

3. D - Do not delay defibrillation to prepare the medicine

Emergency medicines complement CPR and rhythm-specific defibrillation.

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