Chapter 95
Approach to General Poisoning in the ICU

95.1 Introduction

Poisoning remains a critical and potentially life-threatening presentation in the ICU, requiring prompt and systematic evaluation and intervention. Globally, poisoning accounts for a significant number of ICU admissions, with trends varying by region. Data from the American Association of Poison Control Centers (AAPCC) indicate thousands of poisoning incidents annually, highlighting both accidental and intentional exposures. Studies from India reveal a high prevalence of pesticide poisoning, often leading to severe outcomes due to the toxicity of agents involved and delays in treatment. Mortality rates are notably higher in intentional poisonings compared to accidental exposures, underscoring the urgency of effective management strategies [1–3].

General poisoning cases involve diverse toxins, each with specific clinical features and management protocols. This chapter outlines a structured approach to stabilize patients, assess risks, identify toxins, and initiate appropriate treatments, incorporating the latest recommendations and therapeutic innovations [Ref: Algorithm 95.1].

95.2 Initial Stabilization (ABCs)

- Airway: Assess and secure the airway to prevent aspiration and ensure adequate oxygenation. If compromised, consider endotracheal intubation. Common indications for intubation include altered mental status or airway obstruction. Advanced airway management strategies like Rapid Sequence Intubation (RSI) may be necessary for critically ill poisoned patients.

S. B. Mishra et al., *Mastering ICU Care*,
https://doi.org/10.1007/978-981-95-0179-3_95

- Breathing: Provide oxygen to address hypoxemia. Monitor for respiratory depression, which may suggest opioid or sedative-hypnotic toxicity. Mechanical ventilation may be required for severe cases.
- Circulation: Measure blood pressure, heart rate, and perfusion status. Administer IV fluids for hypotension. Vasopressors may be necessary if refractory shock occurs, especially in cardiotoxic overdoses (e.g., cyclic antidepressants). Continuous ECG monitoring is essential for early detection of arrhythmias.

95.3 Risk Assessment and Prioritization

Post-stabilization, a structured risk assessment is crucial to predict the toxicity course and tailor interventions:

- History and Exposure Details: Obtain information about the substance(s) involved, quantity, time of ingestion, and intent (accidental vs. intentional). Consider potential for mixed or unknown exposures.
- System-Based Diagnostic Approach:
- Cardiovascular: Assess for arrhythmias, conduction abnormalities, and signs of cardiotoxicity.
- Pulmonary: Evaluate for respiratory compromise or bronchospasm.
- Neurological: Monitor for altered mental status, seizures, or focal deficits.
- Gastrointestinal: Check for nausea, vomiting, abdominal pain, or bleeding.
- Renal and Hepatic: Assess for signs of organ dysfunction, such as decreased urine output or jaundice.
- Laboratory Tests: Order electrolytes, renal and liver function tests, blood glucose, arterial blood gases, and coagulation profiles. Obtain toxin-specific levels when indicated (e.g., acetaminophen, salicylates).
- Imaging and ECG: Perform ECG to detect cardiac abnormalities. Imaging studies may be required based on clinical suspicion (e.g., chest X-ray for aspiration).

95.4 Administer Coma Cocktail for Altered Mental Status

The “coma cocktail” targets reversible causes of unconsciousness in suspected poisoning:

- Dextrose: Administer if hypoglycemia is detected or suspected, as it can mimic severe poisoning.
- Thiamine: Give 100 mg IV to malnourished or alcoholic patients to prevent Wernicke’s encephalopathy.
- Naloxone: Administer 0.04–2 mg IV for suspected opioid overdose to rapidly reverse respiratory depression. Titrate to improve respiratory function without precipitating withdrawal.

Note: The routine use of the coma cocktail is controversial and should be guided by clinical judgment.

95.5 Systematic Toxidrome Evaluation

A thorough assessment helps identify toxidromes, although overlapping presentations are common in mixed ingestions.

- Sedative-Hypnotics: CNS and respiratory depression, hypotension, bradycardia. Withdrawal may present with agitation and seizures.
- Opioids: Pinpoint pupils, respiratory depression, bradycardia, hypotension.
- Cholinergic: SLUDGE-M symptoms (Salivation, Lacrimation, Urination, Defecation, Gastrointestinal upset, Emesis, Miosis), bronchorrhea, bradycardia. Common in organophosphate poisoning.
- Anticholinergic: Hyperthermia, dry flushed skin, mydriasis, tachycardia, urinary retention, altered mental status ("hot as a hare, dry as a bone, red as a beet, mad as a hatter").
- Sympathomimetic: Agitation, tachycardia, hypertension, hyperthermia, mydriasis, diaphoresis. Seen with cocaine or amphetamine use.
- Serotonin Syndrome: Hyperreflexia, clonus, mydriasis, hyperthermia, autonomic instability.
- Withdrawal Syndromes: Alcohol or benzodiazepine withdrawal presents with tremors, hallucinations, tachycardia, hypertension, seizures.

Recognizing these patterns aids in narrowing down potential toxins and initiating appropriate treatments.

95.6 Supportive Measures

Adopt the Scandinavian method, emphasizing supportive care as the primary intervention:

- Symptom Management: Treat seizures with benzodiazepines, correct hypotension with fluids and vasopressors, manage arrhythmias per ACLS guidelines.
- Monitoring: Continuous observation of vital signs, neurological status, and organ function.
- Minimize Invasive Procedures: Avoid unnecessary interventions that may complicate the patient's condition.

95.7 Diagnostics

Understand the limitations and applications of toxicology screening:

- Limitations: Broad toxicology screens may not detect all substances and often do not impact acute management due to delayed results.
- Targeted Testing: Focus on specific toxins when identification will alter treatment (e.g., acetaminophen levels for N-acetylcysteine administration).
- ECG Monitoring: Essential for detecting cardiotoxic effects like QRS widening in tricyclic antidepressant overdose.

95.8 Decontamination and Operational Safety

- Activated Charcoal: Administer 1 g/kg (up to 50 g) for recent ingestions (within 1–2 h) if the airway is protected.
- Gastric Lavage: Rarely used; consider only for life-threatening ingestions within 1 h.
- Whole Bowel Irrigation: Use polyethylene glycol solutions for sustained-release preparations or substances not bound by charcoal (e.g., iron, lithium).

Healthcare Worker Safety:

- Use personal protective equipment (PPE) during decontamination, especially with agents like organophosphates, to prevent secondary contamination.

95.9 Therapeutic Innovations

Lipid Emulsion Therapy:

- Indication: Overdose of lipophilic drugs (e.g., local anesthetics, certain antidepressants).
- Mechanism: Acts as a “lipid sink” to sequester fat-soluble toxins.
- Dose: Initial bolus of 1.5 mL/kg 20% lipid emulsion IV over 1 minute, followed by infusion.

Extracorporeal Removal:

- Hemodialysis: Effective for methanol, ethylene glycol, lithium, salicylates.
- Hemoperfusion: Consider for high-molecular-weight or protein-bound toxins.
- Enhanced Elimination Techniques:
- Urinary Alkalinization: Useful for salicylate poisoning to enhance renal excretion.

95.10 Organ-Specific Management

Hepatic Failure:

- Acetaminophen Toxicity: Leads to coagulopathy and encephalopathy.
- Management: Early N-acetylcysteine administration, monitor liver function tests, consider liver transplantation in fulminant cases.

Cardiotoxicity:

- Tricyclic Antidepressants: Cause arrhythmias, hypotension.
- Management: Sodium bicarbonate therapy to narrow QRS complex, manage arrhythmias.

Renal Failure:

- Rhabdomyolysis: From prolonged immobilization or certain toxins.
- Management: Aggressive hydration, monitor electrolytes, consider dialysis.

95.11 Emerging Therapies and Guidelines

Stay updated with recent recommendations from key toxicology societies:

- American Academy of Clinical Toxicology (AACT).
- European Association of Poisons Centres and Clinical Toxicologists (EAPCCT).

These organizations provide evidence-based guidelines on managing specific toxins, dosing regimens, and new therapeutic interventions.

95.12 Tables and Quick-Reference Guides (Ref: Table 95.1).

Table 95.1 Common antidotes

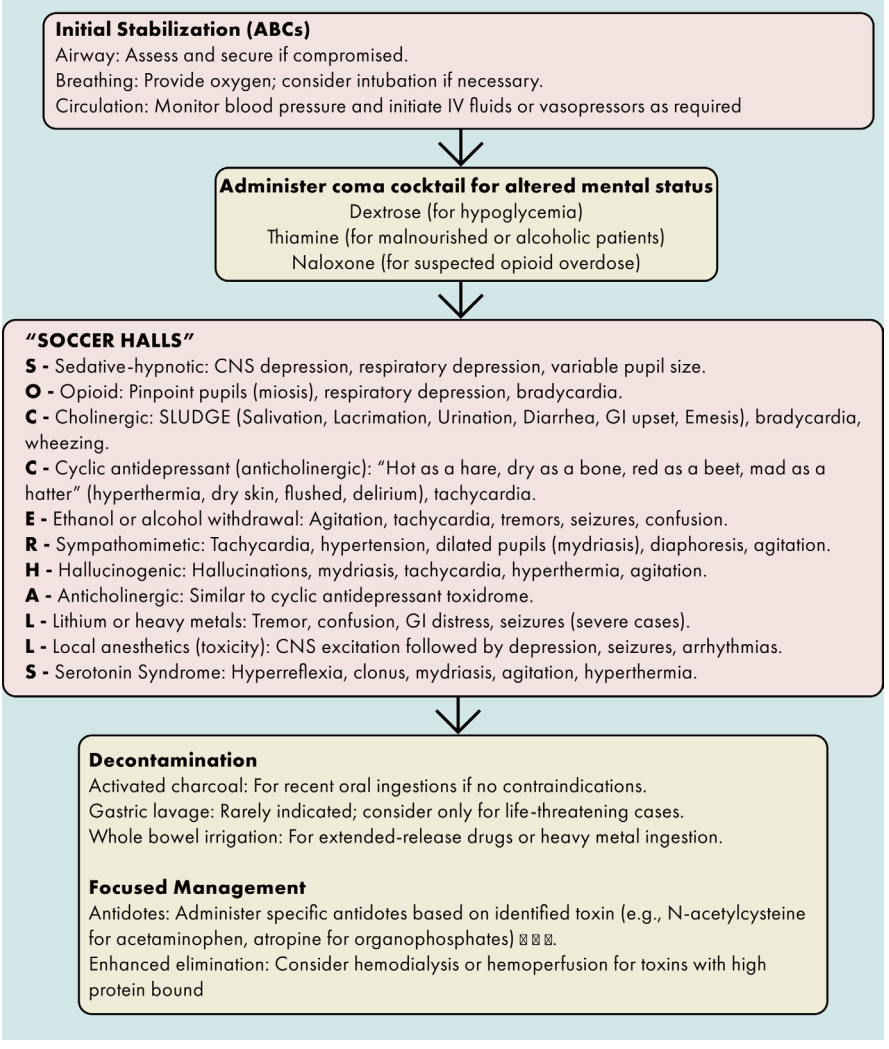
Toxin	Antidote	Dose	Indications	Limitations
Acetaminophen	N-acetylcysteine	Oral: 140 mg/kg loading, then 70 mg/kg every 4 h (17 doses) IV: 150 mg/kg over 60 min, then 50 mg/kg over 4 h, then 100 mg/kg over 16 h	Elevated levels or ingestion >150 mg/kg	Best if started within 8 h of ingestion
Opioids	Naloxone	0.04–2 mg IV, repeat every 2–3 min as needed	Respiratory depression from opioids	May precipitate withdrawal
Benzodiazepines	Flumazenil	0.2 mg IV over 15 s, repeat up to 1 mg total	Known ingestion in non-tolerant patients	Risk of seizures in chronic users
Organophosphates	Atropine and Pralidoxime	Atropine: 1–2 mg IV every 5 min, Pralidoxine: 1–2 g IV over 30 min	Cholinergic symptoms	Monitor for atropine toxicity
Methanol/ethylene glycol	Fomepizole	15 mg/kg IV loading, then 10 mg/kg every 12 h	Toxic alcohol ingestion	Requires dialysis in severe cases
Digoxin	Digoxin-specific antibodies	Dose based on amount ingested or serum level	Life-threatening arrhythmias, hyperkalemia	Limited availability, costly
Beta-blockers/Ca channel blockers	Glucagon	3–10 mg IV bolus, followed by infusion	Refractory hypotension or bradycardia	May cause vomiting, hyperglycemia

95.13 Conclusion

A systematic approach to poisoning in the ICU enhances patient outcomes by ensuring prompt stabilization and targeted therapy. Prioritizing the airway, breathing, and circulation is crucial in the initial management of poisoned patients. A structured risk assessment helps predict the toxicity course and tailor interventions accordingly. Recognizing toxidromes enables clinicians to identify patterns and guide effective management strategies. Emphasizing supportive care through symptom management and continuous monitoring is fundamental. Judicious use of targeted diagnostics and laboratory tests assists in confirming suspected toxins and guiding treatment decisions. Incorporating therapeutic innovations, such as lipid emulsion therapy when appropriate, can improve patient outcomes. Promptly addressing

organ-specific dysfunctions is essential to prevent further complications. Operational safety measures protect healthcare workers during decontamination procedures. Staying informed and adhering to current guidelines from toxicology societies ensures that management strategies are evidence-based and up-to-date. Early decontamination and elimination techniques, combined with supportive measures, are vital in preventing severe complications. Familiarity with this comprehensive approach is crucial for ICU providers managing toxicological emergencies.

Algorithm 95.1: Approach to general poisoning in the ICU



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