
Ingestions & Toxic Exposures

Background:

- An estimated 3 million children experience toxic exposures each year in the United States, with 50% occurring in patients younger than 6 years of age and nearly 25% occurring in children less than 2 years of age.
- The most frequent calls to Poison Control Centers include cosmetics, cleaning agents, analgesics, foreign bodies, topical agents, cough and cold preparations, vitamins, pesticides, plants, antihistamines, GI preparations, antimicrobials, office supplies, alcohols.
- The most common fatal drug ingestions in children younger than 6 years of age include prenatal iron supplements, antidepressants, cardiotoxic agents, salicylates, carbon monoxide, hydrocarbons, stimulants and illicit drugs.
- Children with developmental delays and autistic spectrum disorders, as well as adolescents with anorexia nervosa or psychiatric conditions, have an increased risk for self-poisoning.
- Caustic ingestions (bleach, laundry detergents, drain cleaners) most often occur in children between 1 and 3 years of age and may cause severe esophageal injury resulting in esophageal perforation.
- Methanol and ethylene glycol are frequently found in antifreeze and solvents.

Signs and Symptoms:

- Acute onset of multiorgan dysfunction, altered mental status, seizures, respiratory or cardiac compromise, unexplained metabolic acidosis.
- Acute acetaminophen ingestion:
 - Stage 1 (0-24hrs): Nausea, emesis; may be asymptomatic.
 - Stage 2 (24-72hrs): RUQ pain, elevated LFTs.
 - Stage 3 (72-96hrs): Jaundice, hepatic encephalopathy, hyperammonemia, coagulopathy.
 - Stage 4 (4-14 days): Recovery phase.
- Sympathomimetics (amphetamines, cocaine, ephedrine, phenylephrine): Dilated pupils, tachycardia, tachypnea, sweating, agitation.
- Organophosphates: Hypersalivation, diarrhea, bronchorrhea, lacrimation, small pupils, seizures, respiratory failure, bradycardia.
- Salicylates: Fever, tachypnea, hyperpnea, tinnitus, nausea, lethargy, metabolic acidosis.
- Anticholinergics (diphenhydramine, cold preparations, doxylamine): Dry mouth and skin, flushed appearance, dilated pupils, fever, ileus, urinary retention, disorientation.
- Methanol: Severe metabolic acidosis, sluggish pupils, hyperemic retina, blurred vision.
- Ethanol: Hypoglycemia, lethargy, ataxia, seizures, breath odor.
- Ethylene glycol: Metabolic acidosis, lethargy, crystalluria.
- Opioids: Depressed mental status, bradypnea, pinpoint pupils.
- Carbon monoxide: Headache, flulike symptoms, lethargy, dizziness, coma.
- Methemoglobinemia (sulfa drugs, local anesthetics, nitrates): Respiratory distress, cyanosis, mental status changes, headache, dysrhythmias, seizures, coma.
- Inhalants and hydrocarbons may cause rapidly progressing respiratory distress and ARDS.
- Serotonin syndrome: Hyperthermia, neuromuscular rigidity, autonomic dysfunction, agitation, delirium.
- Tricyclic antidepressants: Metabolic acidosis, prolonged QRS interval, dysrhythmias, seizures, coma, dilated pupils.
- Cyanide: Metabolic acidosis, feeling of impending doom, sudden coma.
- Caustic agents may cause dysphagia, stridor, and respiratory distress.
- Ingestions associated with elevated anion gap: Metformin, methanol, ethanol, iron, ethylene glycol, cyanide, salicylates.

- Ingestions associated with hypoglycemia: Oral hypoglycemics, beta blockers, insulin, ethanol, salicylates.

Evaluation:

- Obtain detailed history including location of patient just prior to ingestion, medications in the proximity, name and number of ingested medications, time of ingestion.
- Physical exam: Vital signs, general appearance, pupil size, skin findings, serial neurologic exams, respiratory and cardiovascular status.
- Pulse oximetry may be normal in patients with carbon monoxide toxicity (device measures hemoglobin saturation and does not differentiate oxyhemoglobin from carboxyhemoglobin).
- Identify and address life-threatening conditions.
 - A: Airway maintenance.
 - B: Breathing and ventilation.
 - C: Circulation.
 - D: Disability (evaluation of neurologic status). See Trauma for Glasgow coma scale.
 - E: Exposure (complete visualization)/environmental control.
- Labs (directed by history and physical exam):
 - CBC, rapid glucose, electrolytes, LFTs, carboxyhemoglobin level by cooximetry, quantitative serum acetaminophen and salicylate levels, serum osmolality, lactate, ammonia, iron level, urinalysis, urine pregnancy test (postmenarchal females), urine toxicology screen, serum methanol and ethylene glycol level.
- Imaging:
 - ECG; CXR (if inhalation exposure or respiratory symptoms).
 - Consider CT head for patients with altered mental status of unclear etiology.
 - Consider neck XR, CXR and KUB for foreign body ingestion.

Management:

- Consult Poison Control (800-222-1222) and Toxicology.
- Utilize Pediatric Advanced Life Support (PALS) guidelines.
- Administer 100% oxygen if suspected carbon monoxide poisoning or respiratory distress.
- Gastric lavage and induced emesis are NOT recommended.
- Consider GI decontamination with activated charcoal (discuss with Toxicology).
- For endotracheal intubation: See Supplemental Oxygen & Airway Management section in Preparing to Transport.
- For metabolic acidosis: Sodium bicarbonate (1 mEq/kg/dose) slow IV push once.
- For shock: See Sepsis and Septic Shock section in Infectious Emergencies.
- For wide QRS interval: Consider sodium bicarbonate infusion (discuss with Toxicology).
- For seizure activity: See Seizure and Status Epilepticus section in Neurologic Emergencies.
- For opioid ingestion: Naloxone (0.1 mg/kg/dose; max 2 mg/dose) IV once; may need to repeat dose every 30 minutes.
- For benzodiazepine ingestion: Flumazenil (0.01 mg/kg/dose; max 0.2 mg/dose) IV once over 30 seconds; may repeat dose every minute to maximum cumulative dose of 1 mg.
- For hypoglycemia: See Hypoglycemia section in Endocrine Emergencies.
- For hypertension: See Hypertensive Urgency & Emergency section in Renal/Electrolyte Emergencies.
- For acetaminophen toxicity: N-Acetylcysteine (150 mg/kg; max 15 gm) IV once over 60 minutes, then 50 mg/kg (max 5 gm) IV over 4 hours, then 100 mg/kg (max 10 gm) IV over 16 hours.
- For methanol or ethylene glycol ingestion: Fomepizole (15 mg/kg/dose diluted in 100 mL 0.9% NS) IV once over 30 minutes.
- For acute iron intoxication: Deferoxamine (20 mg/kg/dose; max 1000 mg) administered IV no faster than 15 mg/kg/hr, followed by 10 mg/kg (max 500 mg) over 4-hour intervals for 2 doses.

- For anticholinergic ingestion with moderate to severe symptoms: Physostigmine (0.02 mg/kg/dose; max 2 mg/dose) IV once no faster than 0.5 mg/min; may repeat every 5-10 minutes until response occurs.
- For salicylate intoxication: Volume resuscitation and 1.5x maintenance IVF, sodium bicarbonate (1 mEq/kg/dose) slow IV push once.
- For organophosphate ingestion: Atropine (0.05 mg/kg/dose; max 2 mg/dose) IV once; repeat every 5-10 minutes as needed, doubling previous dose if no improvement of pulmonary symptoms, **AND** Pralidoxime (20-50 mg/kg/dose; max 2 gm/dose) IV once; may repeat dose once in 60 minutes if muscle strength has not normalized.