

Pediatric Toxicology: Review Questions

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QUESTIONS

Choose the single best answer for each question.

- 1. A 30-month-old boy is brought to an emergency department (ED) 2 hours after ingesting some of his grandfather's clonidine. The child is cyanotic, is unresponsive, and has small pupils; he also has bradycardia and hypotension. Following assessment and management of the patient's airway, breathing, and circulation, which of the following should be the next step in his treatment?**

 - Administer activated charcoal
 - Administer naloxone 0.1 mg/kg body weight intravenously with close cardiovascular monitoring
 - Administer syrup of ipecac to induce emesis
 - Admit him to the intensive care unit
 - Perform whole bowel irrigation (WBI)
- 2. A 3-year-old girl arrives in a pediatric ED after ingesting an unknown number of chewable multivitamins. Her mother reports 2 associated episodes of vomiting. The physician witnesses an episode of vomiting in the ED; there is no blood in the vomitus. The child subsequently has several episodes of bloody diarrhea. Which of the following is the best therapeutic approach for this patient?**

 - Administer activated charcoal
 - Administer deferoxamine
 - Obtain an abdominal radiograph; if no iron tablets are seen, discharge the patient
 - Obtain a serum iron level after 4 hours; if it is greater than 500 µg/dL, perform WBI
 - Perform hemodialysis
- 3. A previously healthy 2-year-old boy is brought to the ED after becoming lethargic at home. His mother reports that he ingested several tablets of carbamazepine that his older brother gave to him. The patient's temperature is 37.6°C (99.7°F), his heart rate is 116 bpm, and his respirations are shallow; no active seizures are noted. Following assessment and management of the patient's airway, breathing, and circulation and performing laboratory evaluation, which of the following should be the next step in his treatment?**

 - Administer multiple doses of activated charcoal
 - Admit him to the hospital for observation
 - Induce emesis with syrup of ipecac
 - Perform hemodialysis
 - Perform WBI
- 4. A previously healthy 8-month-old infant is brought to the ED with abnormal breathing. During evaluation in the triage area, the infant is noted to be tachypneic and cyanotic; oxygen saturation is 87%. His mother reports previously using teething gel on his gums. The infant's cyanosis does not improve following administration of oxygen. Which of the following treatment options will most likely improve the infant's condition?**

 - Administer hyperbaric oxygen
 - Administer methylene blue
 - Obtain arterial blood gas measurements and radiographs of the chest
 - Perform exchange transfusion
 - Provide hydration with intravenous administration of fluids
- 5. A previously healthy 17-year-old girl is brought to the ED after having a seizure at an all-night dance party. She experiences another seizure in the ED that lasts 5 minutes and is followed by vomiting. Her temperature is 39°C (102.2°F), heart rate is 110 bpm, and respiratory rate is 22 breaths/min. Serum chemistry results show that the patient's sodium level is 118 mEq/L. Results of a urine toxicology screen are negative for any toxic substances. Which of the following substances did the patient most likely ingest?**

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- A) Flunitrazepam
- B) Gamma-butyrolactone
- C) Gamma-hydroxybutyrate
- D) 3,4-Methylenedioxyamphetamine (Ecstasy)
- E) Phencyclidine

EXPLANATION OF ANSWERS

- 1. (B) Administer naloxone 0.1 mg/kg body weight intravenously with close cardiovascular monitoring.** This child ingested his grandfather's blood pressure medicine. Clonidine is an antihypertensive agent that exerts its effect through stimulation of α_2 -adrenergic receptors. It is an extremely potent drug, with typical doses of 0.1 to 0.2 mg in adults. Therefore, ingestion of small amounts can potentially lead to significant toxicity in children. Clonidine has excellent central nervous system (CNS) penetration because of high lipid solubility. Clinical features suggestive of clonidine ingestion include lethargy, apnea, bradycardia, profound hypotension, and miosis. The treatment requires immediate assessment and management of the patient's airway, breathing, and circulation. Gastrointestinal (GI) decontamination may be ineffective 2 hours after ingestion, because clonidine is rapidly absorbed from the GI tract. Therapy or maneuvers that cause emesis also should be avoided in this child, because they can cause aspiration. Even placement of a nasogastric tube should not be performed in a comatose child before intubating the child. Naloxone has been suggested as a specific antidote for clonidine overdose and often may improve mental status and cardiorespiratory function.
- 2. (B) Administer deferoxamine.** Iron poisoning is one of the most common potentially fatal intoxications in children. Chelation therapy with parenteral deferoxamine enhances excretion of iron and is indicated in very symptomatic children, regardless of the serum iron level; it is the antidote for significant iron poisoning. Iron does not bind to activated charcoal. Only 50% of radiographs are positive in children who ingest iron tablets; thus, lack of radiographic evidence proves nothing. The mainstay of GI decontamination is early and aggressive use of whole bowel irrigation, which should be used regardless of serum iron level. Hemodialysis is only indicated as an adjuvant to chelation therapy in patients with renal failure; it removes chelated iron but not free iron.
- 3. (A) Administer multiple doses of activated charcoal.** Administration of multiple doses of activated charcoal has a definite therapeutic role in the manage-

ment of patients with carbamazepine overdose and is particularly helpful in reducing serum levels by interfering with the enterohepatic circulation. Inducing emesis can cause aspiration and, therefore, is contraindicated in this lethargic child. The lack of water solubility of carbamazepine renders dialysis ineffective. Whole bowel irrigation is not helpful in this particular case of overdose.

- 4. (B) Administer methylene blue.** This patient has methemoglobinemia, which results from a relative imbalance between hemoglobin and methemoglobin, with iron being present more in its ferric state rather than its normal ferrous state. Methemoglobinemia can be produced because of abnormal hemoglobin M, enzyme deficiency (eg, hemoglobin reductase), or drug or toxin ingestion (eg, benzocaine, dapsone, sulfonamides) but often may be idiopathic (in 70% of patients). Benzocaine is present in teething gel. Abnormal vital signs such as tachycardia and tachypnea are thought to be caused by tissue hypoxia related to the functional anemia of methemoglobinemia. Methemoglobin absorbs light at the same wavelengths as both oxygenated and nonoxygenated hemoglobin, which essentially confuses the oximeter into reporting that both oxygenated and nonoxygenated hemoglobin levels are increased. Such oximeter values are inaccurate; because of the absorption characteristics of methemoglobin, the saturation reported by the pulse oximeter will plateau at 85%, regardless of any further increase in methemoglobin level above 40%. Methylene blue is the treatment of choice for this patient. Exchange transfusion or hyperbaric oxygen may be beneficial when methylene blue is ineffective.
- 5. (D) 3,4-Methylenedioxyamphetamine (Ecstasy).** Recently, Ecstasy has gained popularity in clubs and dance parties. It is a CNS stimulant and may cause a dramatic increase in body temperature up to 40°C (104°F). Hyperthermia possibly occurs from actively exercising (eg, dancing) in a hot environment for prolonged periods of time. Hyponatremia is caused by altered antidiuretic hormone release and rapid oral hydration with hypotonic solutions (eg, alcohol, water). Flunitrazepam, gamma butyrolactone (GBL), and gamma hydroxybutyrate (GHB) are CNS depressants. Flunitrazepam, which is known as "the date rape drug," is a benzodiazepine with a potent amnesic effect. GBL and GHB may cause respiratory depression or arrest. Phencyclidine may cause hyperthermia, tachycardia, and seizure, but it can be detected on a routine toxicology screen. Ecstasy cannot be found on a routine toxicology screen.