Make sure you know how to act quickly if a child ingests a toxic substance and what to teach parents to prevent accidental poisonings. By Maureen A. Madden, RN, MSN

OF THE NEAR 1,200 people who died of poisoning in 2004, 11% were children. Although most children who ingest poison suffer no lasting harm, prompt intervention is always indicated. In this article, I’ll review common causes of pediatric poisoning and discuss how to assess a patient and intervene appropriately. (Recreational drug toxicity is beyond the scope of this article.)

Who’s at risk?
Children under age 6 accounted for nearly 52% of the more than 2.2 million poison exposures in 2004. The American Association of Poison Control Centers defines a poison exposure as ingestion or contact with a toxic substance; a poisoning is an exposure that results in adverse reactions. For simplicity in this article, however, I’ll use the term “poisoning” to cover both definitions.

A child’s reaction to a toxic substance depends on the specific substance, amount ingested, size of the child, and time lapse between ingestion and treatment. The pharmacodynamics of drugs in children—how they may or may not metabolize an ingested agent—predispose them to an increased risk of adverse reactions.

Poisonings fall into two broad types: accidental and intentional. Accidental poisonings usually involve young children who ingest a small amount of a toxic substance; typically they’re taken by a family member for medical care soon after ingestion.

Toddlers are especially vulnerable to poisoning because they’re newly mobile, curious, eager to imitate adult behavior, and interested in exploring their environment through putting things in their mouths to taste. They may mistake a brightly colored toxic substance for candy or a beverage. If an item tastes bad, they’re likely to ingest less of it.

Three top factors put young children at risk for toxic exposure: improper storage of toxic substances in the home, spending time in other people’s homes, and caregiver distraction. Other risk factors include a chaotic or stressful home, unemployed or single-parent household, and lack of proper supervision. An increasing number of poisonings in children under age 6 involve ingestion of a grandparent’s or other older adult’s medication, which often is a sustained-release form that’s more toxic to children.

Adolescents who experience poisonings are typically intentionally ingesting agents through experimentation or are making a suicide attempt. Because of this and the fact that adolescents may delay seeking medical care, poisonings in adolescents are more likely to have more adverse reactions and a greater risk of death than poisonings in younger children. See Risky business for details on substances typically involved in pediatric poisoning and Safety tips for parents for preventive steps.

Initial treatment
In the ED, the medical team will work to stabilize the patient, diagnose the problem, and treat it. If you know or suspect that a child has ingested a toxic substance, start with a history: Document the type and amount of substance ingested (if known); the possibility of multiple agents; time of ingestion; time the child arrived at...
the ED; any history of vomiting, choking, coughing, or altered mental status; and any interventions performed before the child arrived at the ED. Follow the ABCs to assess and support your patient’s airway breathing and circulation.

For most patients, treatment is guided by clinical condition rather than the specific substances the patient ingested. This approach doesn’t preclude treating specific toxins or toxicities (more on those shortly), but reinforces the concept of basic clinical management and resuscitation techniques.

Consult with the nationwide poison control center hotline (1-800-222-1222) or a medical toxicologist promptly; standard interventions for emergency cardiovascular and critical care may not be sufficient to stabilize the patient, and specific antidotes may be needed.

Supportive care, when indicated, is the mainstay of managing a poisoned patient. Monitor his airway and respirations and intervene as appropriate to support oxygenation and ventilation. Attempt to maintain normothermia. Correct hypotension or hypertension, acid-base imbalances, and electrolyte disturbances if they occur. Place the patient on a cardiac monitor to continuously assess for dysrhythmias. Inspect his skin for blistering, which can be caused by contact with caustic agents.

After the ABCs, address D (disability, drugs, decontamination) and E (ECG and exposure). If your patient is lethargic or he’s been exposed to sulfonyleureas or other agents that can cause hypoglycemia, obtain a fingerstick glucose level. Hypoglycemia is one of the most easily detected and treatable effects of a toxic ingestion. The ECG can reveal cardiac effects from poisonings involving calcium channel blockers, tricyclic antidepressants, and antiarrhythmic drugs.

Perform a focused neurologic assessment; the central nervous system (CNS) is most likely to be affected by toxic syndromes. Look for changes in pupillary size (such as miosis or mydriasis). Also assess the patient’s skin, oral mucosa, and odors.

You might be able to use your assessment findings to identify or categorize ingestion with a specific toxidrome. The patient’s signs and symptoms may suggest a specific toxidrome or class of poisoning: sympathomimetic, sedative/hypnotic, opioid, anticholinergic, or cholinergic. See Figuring out the problem for details.

Although many tests can identify poisonous substances, they usually aren’t helpful in an emergency or when the ingested substance isn’t known. Instead, toxicologic analysis in children is used to identify serum drug levels and guide management, as the clinical effects and toxicity of many poisons correlate with their serum levels.

Some substances can be identified by a radiologic exam: enteric-coated pills, iron pills, lead paint chips, button batteries, drug-filled packets, and heavy metals such as lead, mercury, and arsenic.

Serum and urine toxicology screens may be needed to identify the presence of drugs and rule out additional unknown agents. Urine toxicology screening tests reflect the presence or absence of a drug or metabolite at or above a threshold concentration. These tests don’t exclude the presence of a drug or metabolite below the threshold, so routinely screening for substance-abuse drugs isn’t helpful in managing poisoned patients.

Other lab tests include basic serum chemistry studies in symptomatic patients and tests to confirm suspected toxins and determine the need for specific antidotal therapy. Determining the anion gap (a test to narrow down the causes of metabolic acidosis) and obtaining an arterial blood gas analysis may help if the toxic agent is unknown. Use the mnemonic MUDPILES to help you remember the frequent causes of elevated anion gap metabolic acidosis: Methanol, Uremia, Diabetic ketoacidosis, Parasalicylate, Iron/isoniazid, Lactic acidosis, Ethanol or ethylene glycol, and Salicylates.

An adolescent who’s attempted suicide may not report all the substances she’s ingested, so a thorough investigation should include salicylate and acetaminophen levels. If the name or amount of poison ingested isn’t known (for example, if the incident wasn’t witnessed), treat the child as though he’d ingested a harmful substance.

Physical assessment focuses on...
detecting traumatic injuries and signs and symptoms related to ingestion and clinical presentation that suggest a toxidrome.

The ECG also can lend some clues about the toxic agent: Tachycardia typically occurs with anticholinergic and antihistamines; bradycardia, with beta-blockers and cholinergic agents.

### Your interventions

After the patient is stabilized, management focuses on gastrointestinal (GI) decontamination to reduce absorption of the toxin, alter metabolism to limit the production of toxic metabolites, and increase toxin elimination. A specific antidote may be administered, if indicated, and the patient continues to receive supportive care as long as clinically indicated.

The preferred methods of gastric decontamination are:

- activated charcoal administration, the most effective treatment for reducing the bioavailability of a toxin. Charcoal binds with the toxin in the GI tract, rendering it inactive. Because of its taste and gritty texture, activated charcoal is best administered by nasogastric (NG) or oro gastric tube to small children. (A flavored slurry also is available for oral administration.)

An extended dosing regimen may be most effective for preventing absorption of sustained-release drugs. Before administering the weight-based dose of activated charcoal, verify the presence of bowel sounds. Absent bowel sounds may indicate ileus or obstruction, which are contraindications to activated charcoal administration. Activated charcoal binds to all organic substances, but it doesn’t work for alcohols, glycols, hydrocarbons, caustics, agents with rapid onset of action, and heavy metals such as lead, mercury, lithium, and arsenic.

Activated charcoal should be administered within 1 hour of the toxic ingestion. In children, the first dose of activated charcoal is most effective when combined with a cathartic such as sorbitol, which propels the toxin rapidly through the GI tract. Administer subsequent doses of activated charcoal without sorbitol to avoid severe diarrhea, fluid shifts, and electrolyte abnormalities, which can lead to hypernatremia and seizures. Place her in the left lateral decubitus position with the head of the bed elevated and have suction available in case she vomits.

Because activated charcoal may cause vomiting, a patient with diminished ability to protect her airway will need endotracheal intubation before receiving activated charcoal.

Besides preventing absorption, multiple-dose activated charcoal enhances elimination of certain agents (including theophylline, phenobarbi-
whole bowel irrigation, which is used primarily to help eliminate sustained-release or enteric-coated preparations, drug-filled packets, and ingestions that won’t bind with activated charcoal (such as heavy metals). In this technique, a polyethylene glycol balanced electrolyte solution is administered orally or via NG tube. The solution hastens evacuation of the GI tract without creating fluid and electrolyte shifts. Continue to infuse the solution until rectal effluent is clear. Common adverse reactions include GI bloating and vomiting, which can limit the dose given. Minimize these reactions by using a slow infusion rate and administering an antiemetic, as prescribed.

Whole bowel irrigation is contraindicated with bowel obstruction, perforation, or ileus.

Besides standard resuscitation measures, the American Heart Association recommends special interventions for children who’ve overdosed on cocaine, opioids, tricyclic antidepressants, calcium channel blockers, and beta-blockers. In some cases (for example, opioid toxicity), an antidote is available.

Gastric emptying is indicated if the toxic substance doesn’t bind to activated charcoal or if the child has significant CNS signs and symptoms and he swallowed the toxin within the last hour. After an hour, most toxins will already have been absorbed or passed through the pylorus, making gastric emptying ineffective.

The technique for gastric emptying in a pediatric poisoning victim depends on the child’s clinical status, time of ingestion, type of substance, and amount of substance ingested. Two techniques are no longer routinely recommended:

- Induced emesis with syrup of ipecac hasn’t been shown to improve outcomes in pediatric poisonings. The American Academy of Pediatrics no longer recommends that parents keep p ipecac at home, and it’s no longer favored in the clinical setting because it causes prolonged vomiting, delaying clinicians’ ability to administer activated charcoal.7,8

- Gastric lavage is no longer the standard of care for pediatric poisoning, but it may be indicated in some situations. In this technique, a large-bore NG or oro gastric tube is inserted and flushed with room-temperature fluids until the yield is clear. Because pill fragments rarely can be removed with pediatric-sized gastric tubes, lavage may not be effective in children, although it may be helpful for treating adolescents. In patients with diminished gag reflex, endotracheal intubation should be performed before gastric lavage to reduce the risk of vomiting and aspiration.

Gastric lavage may be useful if the amount ingested is very large, if the child has ingested agents that delay gastric emptying (such as barbiturates and anticholinergics) within the last 2 hours, if sustained-release or insoluble compounds have been ingested, or if the agent is particularly toxic.9

Gastric lavage is absolutely contraindicated if the child ingested caustic or hydrocarbon agents.

**Ready for anything**

Children who’ve ingested toxic substances are a nursing challenge. By understanding toxicidromes and GI decontamination techniques, you can help your patient get the best possible care.

**REFERENCES**


