

Suspect a battery ingestion in these situations

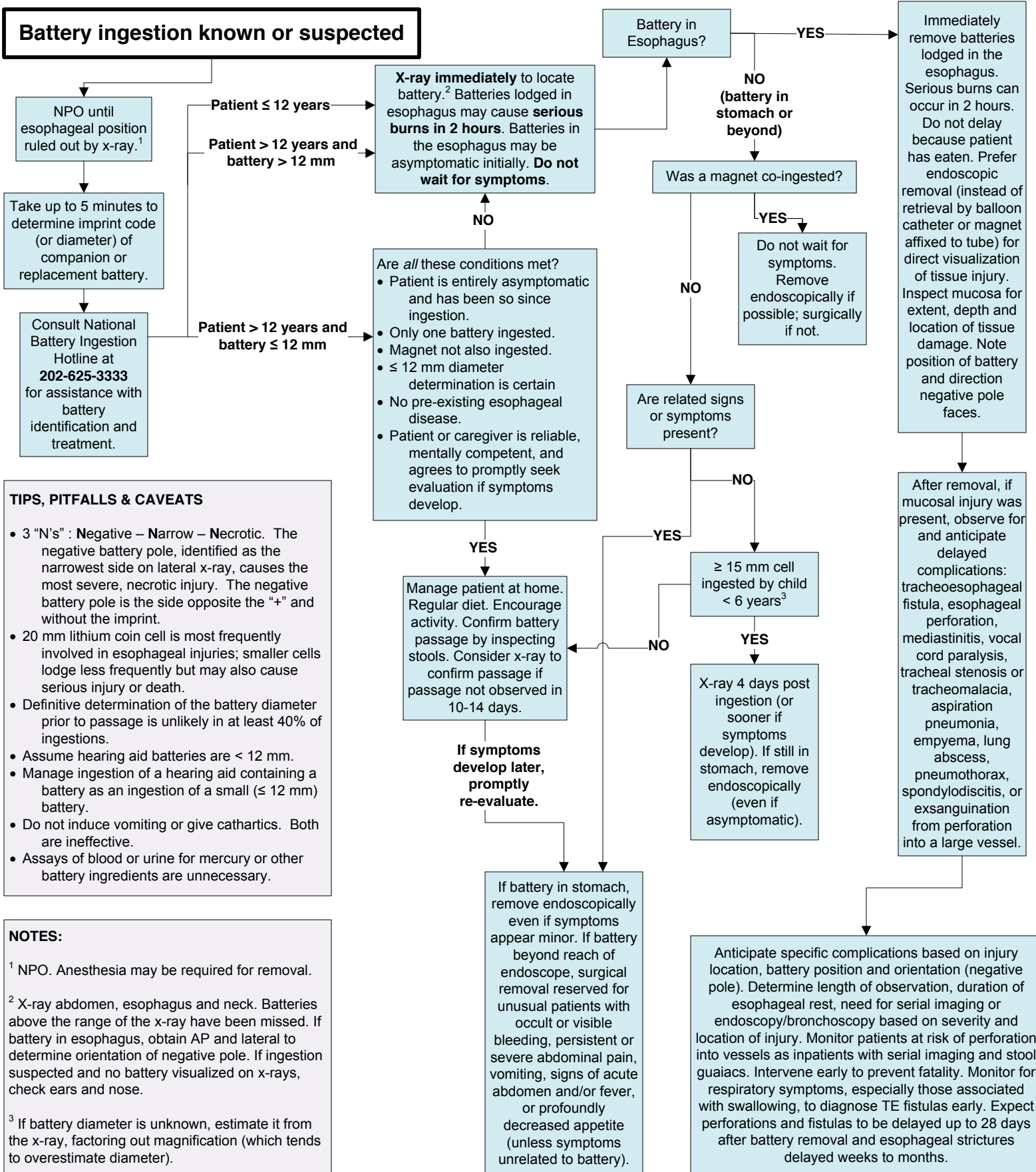
“Coin” ingested.

Check AP x-ray for battery's double-rim or halo-effect and lateral view for step off.

Symptomatic patient, no ingestion history. Consider battery ingestion if:

- Airway obstruction or wheezing
- Drooling
- Vomiting
- Chest discomfort
- Difficulty swallowing, decreased appetite, refusal to eat
- Coughing, choking or gagging with eating or drinking

Battery ingestion known or suspected



TIPS, PITFALLS & CAVEATS

- 3 “N’s” : **N**egative – **N**arrow – **N**ecrotic. The negative battery pole, identified as the narrowest side on lateral x-ray, causes the most severe, necrotic injury. The negative battery pole is the side opposite the “+” and without the imprint.
- 20 mm lithium coin cell is most frequently involved in esophageal injuries; smaller cells lodge less frequently but may also cause serious injury or death.
- Definitive determination of the battery diameter prior to passage is unlikely in at least 40% of ingestions.
- Assume hearing aid batteries are < 12 mm.
- Manage ingestion of a hearing aid containing a battery as an ingestion of a small (≤ 12 mm) battery.
- Do not induce vomiting or give cathartics. Both are ineffective.
- Assays of blood or urine for mercury or other battery ingredients are unnecessary.

NOTES:

¹ NPO. Anesthesia may be required for removal.

² X-ray abdomen, esophagus and neck. Batteries above the range of the x-ray have been missed. If battery in esophagus, obtain AP and lateral to determine orientation of negative pole. If ingestion suspected and no battery visualized on x-rays, check ears and nose.

³ If battery diameter is unknown, estimate it from the x-ray, factoring out magnification (which tends to overestimate diameter).

National Battery Ingestion Hotline

Battery Ingestion Triage and Treatment Guideline

For additional information contact the
National Battery Ingestion Hotline 24/7 at:

202-625-3333

The National Battery Ingestion Hotline is for both health professionals and the public.
It is staffed by toxicologists and poison information specialists, 24/7.

Guideline from the National Battery Ingestion Hotline at the National Capital Poison Center.

Adapted from Litovitz T, Whitaker N, Clark L, White NC, Marsolek M: Emerging battery ingestion hazard: Clinical implications. Pediatrics 2010;125(6): 1168-1177. epub 24 May 2010.

Revised 7 May 2013 to incorporate new information that perforations and fistulas may be delayed up to 28 days after removal of a battery from the esophagus.

Also see www.poison.org/battery.

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Battery Ingestion Triage and Treatment Guideline (text version)

Suspect the diagnosis:

Most serious battery ingestions are not witnessed. Consider the possibility of a battery ingestion in every patient with airway obstruction; wheezing; drooling; vomiting; chest pain or discomfort; abdominal pain; difficulty swallowing; decreased appetite or refusal to eat; or coughing, choking or gagging with eating or drinking. Suspect a battery ingestion in every presumed “coin” or other foreign body ingestion. Carefully observe for the battery’s double-rim or halo-effect on AP radiograph or step off on the lateral view.

If battery ingestion is suspected:

- 1) Keep patient NPO until an esophageal battery position is ruled out by x-ray. Anesthesia may be required for removal. Do not induce vomiting.
 - 2) If the patient is asymptomatic, take up to 5 minutes to determine the imprint code from a companion or replacement battery, battery packaging, or product instructions. If no imprint code is available, measure or estimate the diameter based on the size of the slot the battery fits in or the size of a comparable battery. To estimate the battery diameter, compare the battery with a U.S. penny (19 mm) and nickel (21 mm).
 - 3) Consult the National Battery Ingestion Hotline at 202-625-3333 for assistance in battery identification and patient management.
 - 4) If the patient is ≤ 12 years, *immediately* obtain an x-ray to locate the battery. Batteries lodged in the esophagus may cause serious burns in as little as 2 hours. Do not wait for symptoms to develop. Patients with a battery in the esophagus may be asymptomatic initially. The 20 mm diameter lithium coin cell, with a diameter intermediate between a U.S. penny and nickel, is most frequently involved in esophageal injuries. Smaller cells lodge less frequently, but may also cause serious injury or death.
 - 5) If the patient is > 12 years and the battery diameter is > 12 mm or unknown, *immediately* obtain an x-ray to locate the battery.
 - 6) If the patient is > 12 years and the ingested battery is ≤ 12 mm, no x-ray to locate the battery is required if *all* of the following conditions are met:
 - a. The patient is *entirely* asymptomatic and has been asymptomatic since the battery was ingested.
 - b. Only *one* battery was ingested
 - c. A magnet was *not* also ingested.
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- d. The battery has been *reliably* identified based on imprint code or measurement of an identical cell, and the diameter is ≤ 12 mm. Definitive determination of the battery diameter prior to passage is unlikely in at least 40% of ingestions. Assume hearing aid batteries are less than 12 mm.
 - e. There is no history of pre-existing esophageal disease.
 - f. The patient (or caregiver) is reliable, mentally competent, and agrees to report symptoms that develop prior to battery passage, or over the subsequent month if passage is not documented, and understands the importance of promptly seeking evaluation for symptoms possibly related to the ingested battery.
- 7) X-rays obtained to locate the battery should include the entire esophagus, neck and abdomen. Batteries located above the range of the x-ray have been missed, as have batteries assumed to be coins or cardiac monitor electrodes. Obtain both AP and lateral x-rays for batteries in the esophagus to determine orientation of the positive and negative poles. On the lateral film, the step-off is on the negative side of the battery. (The negative pole has a slightly smaller diameter, fitting within the battery can which forms the positive pole.) Anticipate complications based on battery position and orientation. Damage will be more severe in tissue adjacent to the negative pole.
- 8) *Immediately* remove batteries lodged in the esophagus. Serious burns can occur in 2 hours. Do not delay removal because a patient has eaten recently. Endoscopic removal is preferred as it allows direct visualization of tissue injury. Inspect the mucosa surrounding the battery to determine the extent, depth, and location of tissue damage. Note the orientation of the battery in the esophagus: is the negative pole (side *without* the “+” and *without* the imprint) facing anteriorly or posteriorly? If possible, avoid pushing an esophageal battery into the stomach as the risk of esophageal perforation may increase.
- 9) After removing a battery from the esophagus, if mucosal injury was present, observe for delayed complications such as tracheoesophageal fistula, esophageal perforation, mediastinitis, vocal cord paralysis, tracheal stenosis or tracheomalacia, aspiration pneumonia, empyema, lung abscess, pneumothorax, spondylodiscitis, or exsanguination from perforation into a large vessel.
- a. Determine the length of observation, duration of esophageal rest, and need for serial imaging or endoscopy/bronchoscopy based on the severity and location of the injury, anticipating specific complications based on the injury location, battery position and orientation. Consider the proximity of the lodged battery to major arteries. Monitor patients at risk of fistulization into blood vessels carefully, as inpatients, with serial imaging and stool guaiacs. Intervene early if perforation is imminent. Monitor for respiratory symptoms, especially with swallowing, to diagnose tracheoesophageal fistulas early.
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- b. Expect esophageal perforations and fistulas involving the trachea or major vessels may be delayed for up to 28 days post removal and esophageal strictures may not manifest for weeks to months post ingestion.

10) Retrieve batteries, endoscopically if possible, from the stomach or beyond if:

- a. A magnet was also ingested,
- b. The patient develops signs or symptoms that are likely related to the battery ingestion, or
- c. A large battery (≥ 15 mm diameter), ingested by a child younger than 6 years, remains in the stomach for 4 days or longer. If battery diameter is unknown, estimate if from the x-ray, factoring out magnification (which tends to overestimate battery diameter).

11) Allow batteries to pass spontaneously if they have passed beyond the esophagus and no clinical indication of significant gastrointestinal injury is evident. Manage the patient at home on a regular diet. Encourage activity. Avoid unnecessary endoscopic or surgical removal in asymptomatic patients. Promptly re-evaluate all patients who develop signs or symptoms possibly related to the battery. Endoscopic removal of batteries still in the stomach should be pursued for even minor symptoms. For batteries beyond the reach of the endoscope, surgical battery removal may be required in the unusual patients with evidence of occult or visible bleeding, abdominal pain, profoundly decreased appetite, vomiting, signs of an acute abdomen, and/or fever, unless these clinical manifestations are clearly unrelated to the battery. Confirm battery passage by inspecting stools. Consider repeat radiographs to confirm passage if passage not observed in 10-14 days. Confirming passage may avoid urgent diagnostic intervention for minor symptoms developing later.

12) Manage ingestion of a hearing aid containing a battery as an ingestion of a small battery (≤ 12 mm).

13) Avoid these ineffective, unnecessary or unproven therapeutic interventions:

- a. Ipecac administration (ineffective).
 - b. Blind battery removal with a balloon catheter or a magnet affixed to a nasogastric tube (can't determine extent of injury).
 - c. Blood or urine concentrations of mercury or other battery ingredients (unnecessary).
 - d. Chelation (unnecessary).
 - e. Laxatives (ineffective) or polyethylene glycol electrolyte solution (unproven effectiveness and unknown if solution enhances electrolysis).
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