Poisoning, Ingestions and Other Environmental Exposures

Brett McAninch, MD, FAAP
Assistant Professor of Pediatrics, Division of Pediatric Emergency Medicine
University of Pittsburgh School of Medicine
Children’s Hospital of Pittsburgh of UPMC
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Learning Objectives

Upon completion of this session the learner will be able to...

• Plan the initial management of the poisoned child
• Identify signs and symptoms of selected pediatric toxic exposures or ingestions
• Plan the management of selected pediatric toxic exposures or ingestions
• Plan the management of selected common and high risk pediatric foreign body ingestions
Exposure to Toxins Higher Risk in Kids**

- Greater exposure relative to weight
- Relatively greater surface area
- Rapid growth and development
- High metabolic rates
- Immature metabolic/enzymatic/immune systems
- Longer lifetimes
- Exploratory behaviors, unaware of risks
Screening for Common Environmental Poisons and Toxins
Consider Toxic Exposures

• Think about them or you’ll never take the history
• Most environmental toxins present with non-specific signs and symptoms
• Anticipatory guidance for prevention
Sample Screening Questions**

• Age and condition of the home? Renovation?**
  – Lead paint, lead pipes (use cold water), asbestos
• Working carbon monoxide detector?
• Water source?
  – Microbials (Hepatitis A, *Giardia intestinalis*, *Campylobacter*, *E. coli*, *Shigella*, *Salmonella*, *Cryptosporidium*), arsenic, gasoline, nitrites/nitrates, pesticides in well water?**
Sample Screening Questions**

• Sun exposure?
  – Minimize exposure, use sunscreen**

• Toxic chemical exposures?
  – Occupational (parents or child?)
  – Neighborhood—industrial waste, pesticide, air pollution?
  – Hobbies—solvents?
Sample Screening Questions**

- Second hand smoke? (in the home, car)
- Radon?
- Diet? **
  - Pesticides on fruits and vegetables
  - Bacterial contamination of foods (Salmonella, E. Coli)
  - Fish contaminated by methylmercury
Bioterrorism
Anthrax

• Easily found in nature
• Can be produced in a lab
• Long lasting
• Inhalation anthrax is most deadly
  – 2001 bioterrorist attacks, 22 infected, 5 died
Cutaneous anthrax, most common, least dangerous

- Painless
- Initially small, often pruritic papule enlarges quickly → central vesicle followed by erosion
- Leaves a painless, necrotic ulcer with a black eschar**

From the CDC; http://phil.cdc.gov/phil/details.asp
Poisonings—Significant Pediatric Concern

- Yearly, ~3 million calls to US poison centers
  - >2 million human exposures
- Majority are *unintentional* in all age groups except 13-19 years (suicide and abuse/misuse)
Rarely Life-threatening in Children

- Overall ~70% of exposures are managed in a **non-**healthcare facility
- ~15% of exposures in children <13 years are treated in a healthcare facility
Prevention**

• Keep potential poisons in original packaging and in locked cabinets/containers
• Re-engage child-resistant closures after use
• Safely dispose of unused/unneeded medications
• Secure remote controls, key fobs, musical greeting cards or books (button batteries)
Prevention, Continued**

- Do not refer to medicines as candy
- Empty and rinse all glasses that contained alcohol immediately; keep alcohol in a locked cabinet
- Working smoke and carbon monoxide detectors
- Post poison control center number
Poison Control Centers (PCCs)**

• Nationwide 55 centers
  – Provide exposure management, data collection, public and professional education
  – Confidential
  – Free
  – Available 24 hours a day, every day of the year
  – 1-800-222-1222
Poison Centers Data Collection

• National Poison Data System products database
  – >427,000 products including chemicals and drugs
  – Maintained and continuously updated at Micromedex Poisindex System®
  – Provides evidence based management protocols**
    • Life support
    • Clinical effects
    • Laboratory/monitoring
    • Treatment overview
    • Range of toxicity
    • Pharmacology/Toxicology
Unknown Pill?

• Online pill identifiers
  – Allow you to search based on imprints, shape and size
Initial Approach/Management for Unknown or Multiple Substances**

- Presentation: critically ill → asymptomatic
- Think about it—may not be in history
  - Un-witnessed exploratory behavior in toddlers
  - Suicide attempts
  - Misuse/abuse
  - Child abuse
- Don’t forget possibility of trauma as well
First, evaluate and stabilize—for any ingestion
Management of Poisoning by Unknown or Multiple Substances**
Stabilize...

Remember: A, B, C’s
• **Airway**
  – Patent?
  – Protective reflexes intact?

• **Breathing**
  – Decreased drive?
  – Impaired muscle contraction?
  – Pulmonary edema or damage to parenchyma?

• Early intubation if needed

• Reassess frequently, may quickly deteriorate
• Circulation
  – HR and BP changes
    • May help narrow possibilities for ingestion
    • IV in all patients
  – Conduction abnormalities
    • Minor QT – widened QTC
    • EKG in all unknown ingestions
• Disability/mental status changes
  – Hypoxemia
    • Pulse oximeter, may consider blood gas
    • Oxygen in all patients with altered mental status
  – Hypoglycemia
    • Bedside glucose
  – Suspected opiate intoxication
    • Depressed mental status, depressed respirations, miotic pupils
    • Naloxone
Patient’s History

• Current medications including herbals**
  – 12% of exposures are therapeutic errors; >50% of these were patients <20 y/o
  – 20-70% of patients use complementary/alternative medicine
    • Often used in addition to conventional therapy
    • May interact with other medications
    • Not always reported
  – History may be inaccurate (attempted suicide)
Circumstances

- Paramedics’ report (open bottles, drugs etc.)
- Potential exposures/location of ingestion
- Medications, toxins in the home
Decontamination**

- Ipecac should **not** be administered routinely
- Activated charcoal (single-dose) should **not** be administered **routinely** in the management of poisoned patients
  - *May be considered* if ingestion of a potentially toxic amount of a poison up to one hour previously
  - No evidence that it improves clinical outcome
  - Patient must be awake and *able to protect airway*
Patient presents...
2 year old female found to have altered mental status.

– “Appears drunk” (i.e. inebriation, ataxia, sedation, nystagmus, disinhibition/euphoria)

After initial stabilization...what drugs are you concerned about?
**Ethanol—Signs and Symptoms**

<table>
<thead>
<tr>
<th>Mild/Moderate Toxicity</th>
<th>Severe Toxicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Intoxication</td>
<td>• Coma</td>
</tr>
<tr>
<td>• Euphoria</td>
<td>• Respiratory depression</td>
</tr>
<tr>
<td>• Ataxia</td>
<td>• Pulmonary aspiration</td>
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<tr>
<td>• Nystagmus</td>
<td>• Hypoglycemia</td>
</tr>
<tr>
<td>• Nausea/vomiting</td>
<td>• Hypothermia</td>
</tr>
<tr>
<td>• Flushing</td>
<td>• Hypotension</td>
</tr>
<tr>
<td>• Tachyarrhythmias (primarily atrial fibrillation)</td>
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</tbody>
</table>
Ethanol—Management**

- Obtain an ethanol level
- Check a bedside glucose if any altered mental status *(very common in young children and may lead to seizure)*
- Head CT if comatose or any concerns for trauma
- Consider other ingestions—especially in older patients
  - Frequent co-ingestant
  - May mask signs of other ingestions**
What if her ethanol level is negative?
Think toxic alcohols

- Relatively nontoxic until oxidized—metabolites are highly toxic
  - Metabolized by alcohol dehydrogenase
- Methanol
  - Found in windshield wiper fluid, gas line antifreeze, solvents, adulterant in homemade ethanol distillates
- Ethylene glycol
  - Primarily an engine coolant
Methanol—Signs and Symptoms**

• Mild/moderate toxicity
  – Intoxication similar to ethanol

• Severe toxicity
  – Severe metabolic acidosis ➔ hypotension, tachycardia, dysrhythmias, seizures, coma, pancreatitis
  – Ocular toxicity (may lead to blindness)
Methanol—Management**

**Evaluation**
- Methanol levels, BMP
  - Expect anion gap acidosis and osmolal gap
- Blood gas if CNS depression or metabolic acidosis
- EKG

**Treatment**
- Fomepizole
  - Alcohol dehydrogenase antagonist
- Ethanol
  - Competes for alcohol dehydrogenase
- Hemodialysis
  - Severe acidosis, severe acid-base or fluid-electrolyte disturbances, visual symptoms, levels >50 mg/dl
Ethylene Glycol—Signs and Symptoms**

• Mild/moderate toxicity
  – Intoxication similar to ethanol
    • CNS depression, nystagmus, ataxia, somnolence, nausea and vomiting

• Severe toxicity
  – Coma, cerebral edema
  – Metabolic acidosis
  – Renal failure
  – Seizures
Ethylene Glycol—Management**

**Evaluation**
- Ethylene glycol level, BMP, UA for *calcium oxalate crystals*
  - Anion gap metabolic acidosis
- Anything more than a lick/sip/taste requires levels
  - If unable to obtain levels—8-12 hour observation; pH, bicarbonate and creatinine q2 hours if asymptomatic

**Treatment**
- Fomepizole
  - Alcohol dehydrogenase antagonist
  - Thiamine and pyridoxine
- Ethanol
  - Competes for alcohol dehydrogenase
- Hemodialysis
  - Severe metabolic acidosis, renal failure, level >=50 mg/dL
Patient presents...
19 month old male with altered mental status and concern for ingestion.

— He is somnolent.

After initial stabilization—what drugs are you concerned about?
Opioids—Signs and symptoms**

**Mild to Moderate Toxicity**
- Euphoria
- Drowsiness
- Constipation, nausea/vomiting
- **Miosis**
- Mild bradycardia or hypotension

**Severe toxicity**
- Respiratory depression → apnea, hypoxia, coma, bradycardia, acute lung injury, noncardiogenic pulmonary edema
- Hypoxia → seizures rarely
- Coma or seizure → rhabdomyolysis → acute tubular necrosis
- Hypotension
- Arrhythmias (methadone)
Opioids—Antidote**

• **Naloxone**
  – Pure opioid antagonist, safe in mixed or unknown overdose
  – Reverses coma and respiratory depression
  – IV/IO, can be given IM, SC, ET, intranasal
  – 0.1 mg/kg, maximum dose 2 mg, may repeat q2-5 minutes
Opioids—Management**

• Assume opioid naivety in pediatric patients
  – Observe at least 4 hours for any ingestion; 24 hours for sustained release or long acting
  – Fentanyl patches, methadone and buprenorphine longer lasting—observe any ingestion for at least 8 hours (12 hours for buprenorphine)

• Drug screens often don’t detect methadone and buprenorphine
Antihypertensive Drugs—Signs and Symptoms**

Mild/moderate toxicity
- Bradycardia
- May have reflex tachycardia
- Dizziness/lightheadedness

Severe toxicity
- Dysrhythmias
- Hypotension → end-organ dysfunction, cardiogenic shock, altered mental status
- Hypoglycemia (beta-blockers)
- Hyperkalemia (ACE inhibitors)
Antihypertensive drugs—Management**

- Serial EKGs
- Cardiac monitoring
- IV access
- Isotonic fluids to correct hypotension
- Glucose level (beta-blockers)
- Electrolytes (ACE inhibitors)
Patient presents...
14 year old male with altered mental status.

— He’s agitated and hallucinating.

After initial stabilization—what drugs are you concerned about?
## Anticholinergic Drugs—Signs and Symptoms**

<table>
<thead>
<tr>
<th>Mild/moderate toxicity</th>
<th>Severe toxicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Fever (Hot as a hare)</td>
<td>- Agitated delirium, psychosis, hallucinations</td>
</tr>
<tr>
<td>- Mydriasis (Blind as a bat)</td>
<td>- Seizures</td>
</tr>
<tr>
<td>- Dry mouth (Dry as a bone)</td>
<td>- Hyperthermia</td>
</tr>
<tr>
<td>- Flushing (Red as a beet)</td>
<td>- Coma</td>
</tr>
<tr>
<td>- Agitation confusion, hallucinations</td>
<td>- Rhabdomyolysis and renal failure</td>
</tr>
<tr>
<td>- Decreased bowel sounds</td>
<td></td>
</tr>
<tr>
<td>- Tachycardia, hypertension</td>
<td></td>
</tr>
<tr>
<td>- Nausea/vomiting</td>
<td></td>
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</tbody>
</table>
Anticholinergic drugs—Management**

- Predominantly supportive
- Sedation with benzodiazepines for agitation or delirium
- Hypertension and tachycardia generally well tolerated
- Physostigmine can establish diagnosis
  - Short lasting
  - If co-ingested with tricyclic antidepressants, may precipitate seizures and dysrhythmias
Tricyclic Antidepressants—Signs and Symptoms**

Mild/moderate toxicity
- Anticholinergic effects at lower doses
- Drowsiness, sedation
- Tachycardia
- Hallucinations

Severe toxicity
- Coma
- Seizure
- QRS prolongation with ventricular dysrhythmias
- Respiratory failure
- Hypotension
Tricyclic Antidepressants—Management**

- EKG
- **Serum alkalinization** with sodium bicarbonate if any QRS widening
- Electrolytes, hepatic function test, creatine phosphokinase level, venous blood gas if severe toxicity, urinalysis if concern for rhabdomyolysis
- Benzodiazepines for seizures, behavioral control
Patient presents...
15 year old female after texting a friend “goodbye” after a suicide attempt.

– She is nauseous, but otherwise is basically fine...

After initial stabilization—what drugs are you thinking about?
Acetaminophen—Signs and Symptoms**

• Initially → asymptomatic/only nausea, vomiting, abdominal pain
• ~24 hours → elevated LFTs
• 3-4 days → Clinical signs of hepatotoxicity
  – Liver failure, coagulopathy, hepatic encephalopathy

• Can have renal injury
• Massive overdose can cause coma, hyperglycemia (rare), lactic acidosis
Acetaminophen—Management**

- Early presentation (within 8 hours of ingestion)
  - Obtain 4 hour level
- Unknown or >8 hours from ingestion
  - Obtain serum acetaminophen level, electrolytes, renal function tests, liver enzymes and an INR
- Rumack-Matthew nomogram to determine need for antidote (predicts risk for delayed hepatotoxicity)
  - Levels must be 4-24 hours after ingestion
Acetaminophen—antidote**

• N-Acetylcysteine—give if:
  – Toxic range on nomogram
  – Unable to obtain 8-10 hour levels and acute ingestion of 10 g or 200 mg/kg
  – Strongly consider for measurable level >24 hours after ingestion
NSAIDs—Signs and Symptoms**

**Majority**
- Asymptomatic
- Mild nausea/vomiting
- Abdominal pain
- Occasionally hematemesis

**Massive overdose (rare)**
- Seizures
- Delirium
- Coma
- Hypotension
- Renal failure
- Hepatic dysfunction
- Gastrointestinal bleeding
- Hyperkalemia
- Metabolic acidosis
NSAIDs—Management**

- Rarely life threatening
- May consider activated charcoal within one hour but high risk for airway issues if at risk for seizure
- Electrolytes, BUN and creatinine in patients with intentional overdose
- Symptomatic and Supportive
  - Benzodiazepine for seizure
  - Airway management if needed
  - Isotonic fluid for hypotension
    - Dopamine or norepinephrine
### Salicylates—Signs and Symptoms**

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<thead>
<tr>
<th>Mild/moderate toxicity</th>
<th>Severe toxicity</th>
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<tbody>
<tr>
<td>• GI upset</td>
<td>• Metabolic acidosis (primary in severe)</td>
</tr>
<tr>
<td>• Tinnitus</td>
<td>• Hyperpnea</td>
</tr>
<tr>
<td>• Tachypnea</td>
<td>• Diaphoresis</td>
</tr>
<tr>
<td>• Respiratory alkalosis (early)</td>
<td>• Fever</td>
</tr>
<tr>
<td></td>
<td>• Altered mental status/coma</td>
</tr>
<tr>
<td></td>
<td>• Seizures</td>
</tr>
<tr>
<td></td>
<td>• Cerebral edema</td>
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<tr>
<td></td>
<td>• Pulmonary edema</td>
</tr>
</tbody>
</table>
Salicylates—Evaluation**

- May have delay (>24 hours) of clinical and lab findings if enteric-coated

- Salicylate levels and BMP q1-2 hours until declining

- CBC, hepatic function panel, PT/PTT/INR if moderate or severe toxicity
Salicylates—Management**

- **Urine alkalinization** for severe poisoning
  - Level >30 mg/dl and rising, metabolic acidosis or altered mental status
- Head CT if altered mental status, mannitol for cerebral edema
- Consider hemodialysis
  - Renal failure
  - Congestive heart failure
  - Altered mental status
  - Seizures
  - Worsening acidosis
  - Cerebral edema
  - Persistently rising levels (>50-60 in chronic or >90-100 acute)
Patient presents...
6 year old male with profuse vomiting and diarrhea and concern for toxic exposure.

After initial stabilization—what drugs or toxins are you considering?
Organophosphates—Signs & Symptoms**

Pesticide, occasionally from contaminated crops/food

- **Muscarinic effects**
  - Diaphoresis, diarrhea
  - Urination
  - Miosis
  - Bradycardia, bronchorrhea, bronchospasm
  - Emesis (or GI)
  - Lacrimation
  - Salivation

- **Nicotinic effects**
  - Muscle fasciculations
  - Weakness
  - Respiratory failure

- **Central effects**
  - CNS depression/coma
  - Seizures
  - Hypotension
  - Ventricular dysrhythmias
Organophosphates—Management**

- Decontamination (clothes, wash with soap and water—dermal)
- Moderate to severe toxicity $\rightarrow$ airway management
- Serial EKGs
  - Prolonged QTc or PVCs $\rightarrow$ worse prognosis, respiratory insufficiency
- Antidotes/Treatment
  - Atropine for muscarinic manifestations
  - Pralidoxime for nicotinic manifestations
  - Benzodiazepines for seizures or agitation
Iron—Signs and Symptoms

**Toxicity after 40 mg/kg elemental iron**

- **Mild/moderate toxicity**
  - Vomiting and diarrhea within 6 hours

- **Severe toxicity**
  - **Phase I:** 30 min-2 hours
    - Vomiting, hematemesis, abdominal pain, diarrhea, hematochezia, lethargy, shock, acidosis, coagulopathy
  - **Phase II**
    - Apparent recovery

- **Severe toxicity continued**
  - **Phase III:** 2-12 hours after phase I
    - Shock, severe acidosis, cyanosis, fever
  - **Phase IV:** 2-4 days
    - Possible hepatotoxicity, acute lung injury
  - **Phase V:** days to weeks
    - GI scarring, strictures
Iron—Management**

- Mild/moderate toxicity
  - Supportive care, IV hydration
  - Abdominal x-rays looking for tablets
    - Consider gastric lavage (although nasogastric tubes may not be large enough to remove pill in children)
    - Whole bowel irrigation for large amount of tabs
    - Consider endoscopic removal in stomach
  - Iron concentration 4-6 hours after with repeat in 2-4 hours

- Severe toxicity
  - Chelation with deferoxamine
Patient presents...
2 year old male brought to care with concerns that he “got into something” at home.

After initial stabilization—what substances are you thinking about?
Hydrocarbons

• Fuels, solvents, spot removers, dry cleaning solutions
  – Young kids ingesting lamp oils, gasoline etc.
  – Older kids
    • “Sniffing”—directly inhaling
    • “Huffing”—inhaling from a saturated rag
    • “Bagging”—inhaling from a plastic bag filled with hydrocarbon vapor
Hydrocarbons—Signs and Symptoms

• Low viscosity/highly volatile (kerosene, gasoline, liquid furniture polish)
  – Ingestions → aspiration risk, pulmonary damage

• Ingestion of chlorinated and aromatic hydrocarbons
  – CNS
  – Respiratory depression
  – Dysrhythmias

• Inhalation
  – Cardiac dysrhythmias
  – CNS depression
  – Sudden death from huffing/sniffing
  – Encephalopathy/residual neurologic impairment
  – Nephrotoxicity
  – Hepatotoxicity
  – Acid-base disturbances
Hydrocarbon—Management**

- Remove from source—clothing/skin
- Oxygen for inhalational
- EKG
- Chest x-ray if any respiratory symptoms
  - May be negative
  - Acute lung injury may be delayed up to 24-72 hours
- If asymptomatic observe 6-8 hours—admit if any respiratory symptoms (cough, tachypnea), admit to PICU if in respiratory distress
Acids, Alkali and Alkaloids

• Cleaners, hair straighteners, drain openers (alkali)**
• Signs and symptoms**
  – Ranges from irritation of oropharynx, esophagus or stomach to deep burns and necrosis
  – Alkaline may have esophageal burns without visible oral burns
  – Complicated by perforation, fistula or stricture formation, gastrointestinal bleeding
Acid, Alkali, Alkaloids—Management**

- If no burns, asymptomatic
  - Observe 4-6 hours and discharge if tolerates PO
- Manage airway for moderate/severe
- Consider early endoscopy—especially alkali
- Hydrofluoric acid – industrial cleaning, glass etching, home rust removers
  - One pediatric death in 2015
  - Hypocalcemia, hypomagnesemia, acidosis and ventricular dysrhythmia—give empiric calcium
Laundry Detergent Pods

- Widely available by 2012
- >11,000 exposures ≤5, 2015
- Majority ingestions
- Higher odds of admission (OR 4.8) higher odds of serious medical outcomes (OR: 8.4) than other detergent exposures
Laundry Detergent Pods—Toxicity

- Majority of cases do not require admission
  - Vomiting
  - Coughing
  - Ocular irritation, pain, red eye/conjunctivitis, corneal abrasions
  - Drowsiness or lethargy
- 4.6% required admission, 2% to intensive care
  - Coma (17), pulmonary edema (4), respiratory arrest (6)
- Two confirmed deaths, >100 intubations 2013-14
Patient presents...
A mother presents concerned her children are becoming ill from their home.

After initial stabilization—what toxins are you thinking about?
Carbon monoxide (CO)

• Odorless, colorless, from combustion

• Signs and symptoms**
  – **Headache (most common)**, nausea, dizziness, vomiting, weakness, confusion
  – Coma, syncope, seizure, cardiac dysrhythmia
Carbon Monoxide—Management**

- Oxygen!
  - 100% until asymptomatic and level below 5% (5 times longer for pregnant women to assure elimination from fetal circulation)
- Half-life in RA 4-6 hours, 100% oxygen 60-75 minutes, hyperbaric 20 minutes
- Will have normal pulse oximetry
- Carboxyhemoglobin level
- Hyperbaric oxygen treatment is controversial
Lead—Potential Exposures**

- Chipping paint or renovation in pre-1978 homes
- Leaded gasoline or industry (refugees/immigrants)
- Living near lead mines, smelters, battery recycling plants
- Working with lead
- Lead-glazed ceramic pottery

- Complimentary/alternative medicine (herbs, therapies)
- Imported cosmetics and some foods (imported)
- Some hobbies
- Drinking water (leaded pipes)
- Toys and toy jewelry
- Eating nonfood substances
Lead–Screening

• Reference level based on 97.5\textsuperscript{th} percentile of National Health and Nutrition Examination Survey-generated blood lead level

• Reassessed every 4 years.
  – Watch for possible new guidelines.
Lead—Screening

• Recommendations vary state to state
  – CDC and AAP recommend universal screening if >27% of housing was built before 1950 or prevalence of levels ≥10 μg/dL in ≥ 12% of children 12-36 months

• Refugee children
  – Upon arrival (6 months-16 years)
  – Within 3-6 months post-resettlement
Lead—Outcomes**

• Neurodevelopmental** (<5 µg/dL)
  – Intellectual deficits/diminished academic abilities
  – Attention-related behavior problems
  – Antisocial behaviors

• Other Outcomes (<10 µg/dL)
  – Delayed puberty
  – Reduced postnatal growth
  – Decreased hearing
Lead—Management per AAP**

- < 5 µg/dL
  - Discuss with family (US mean for 1-5 y/o is < 2 µg/dL)
  - Repeat in 6-12 months if high risk
  - If screened before 12 months, consider retesting in 3-6 months if high risk
  - Assess nutrition, physical, mental development
  - Consider risk factors for iron deficiency
  - Anticipatory guidance
Lead—Management per AAP**

• 5-14 µg/dL
  – Confirm with venous sample within 1-3 months
    • If stable or decreasing, repeat in 3 months
  – Report to state health department
  – Environmental history
  – Nutritional counseling (iron and calcium)
  – Screen for iron sufficiency (CBC, ferritin, CRP), treat, consider MVI
  – Developmental screening (long term)

• 15-44 µg/dL
  – Confirm with venous sample within 1-4 weeks
  – Consider x-ray if pica
Lead—Management**

- 45-70 µg/dL
  - Confirm (venous) within 48 hours
  - Outpatient chelation (oral succimer) if asymptomatic
  - Admit if significant CNS or protracted GI symptoms

- Levels >70 µg/dL or encephalopathy
  - Hospitalization
  - Whole bowel irrigation (polyethylene glycol) if lead visible on x-ray
  - Parenteral chelation (IM dimercaprol followed by IV edetate calcium disodium)
Liquid Nicotine

- Significant increase in exposure
- ~3,000 cases in 2015
  - ~70% in kids
- FDA began regulating 2016
- Risk of nicotine toxicity
  - Mostly vomiting
  - 1 teaspoon potentially fatal
  - 3 case reports of deaths in adults (suicide)
Plants
Plants

• Most will cause, at worst, GI toxicity and/or mouth irritation
  – Most risk from suicidal ingestion, foraging mistakes or intentional recreational use

• Mushrooms—those with serious affects generally are asymptomatic for ≥6 hours
  – Amatoxins (Amanita)
    • 6 hours after ingestion: nausea, vomiting and diarrhea
    • 48-72 hours: hepatitis (possibly fulminant)
Plants—Potentially Toxic**

- Cardioactive glycosides
  - Foxglove, Lily of the valley, Oleander
  - Digoxin toxicity— hyperkalemia, CNS depression, cardiac conduction abnormalities
  - Usually have to eat >4 leaves
  - Healthy asymptomatic children with taste/exploratory ingestion can be observed at home

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Plants—Potentially Toxic**

- Anticholinergic toxins
  - Deadly nightshade, Jimson weed, Angel Trumpet
  - Recreational use
    - Flushing, hyperthermia, blurred vision, dry mouth, hallucinations
    - Poisoning is common but rarely severe

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Foreign Body Ingestions
Foreign Body Ingestions

• ~95,000 reported to PCCs in 2015;
  – >68,000 of those were children ≤5 years
• Usually asymptomatic
• Witnessed or reported ingestions
• Rarely intervene (unless very large or sharp)
• Complications mostly from esophageal impaction
Coin Ingestion—Management**

- Most common foreign body ingested by children
- Obtain x-ray to determine location
  - Thoracic inlet, most common
  - Mid-esophagus
  - Lower esophageal sphincter at gastroesophageal junction
- Removal is commonly performed endoscopically
Coin Ingestion—Management**

• **Urgent removal**
  – Signs of airway compromise
  – Signs of near complete esophageal obstruction

• **Expectant—stomach**
  – Generally pass in 1-2 weeks
  – Removal after 4 weeks or if signs of obstruction

• **Expectant—esophagus**
  – Asymptomatic
  – <24 hours
  – No respiratory compromise
  – No history of esophageal disease or surgery
  – Observe 12-24 hours
Button Batteries

• 5 pediatric deaths in 2015, 16 “major” effects
• Batteries >12 mm highest risk
• May be mistaken for coins by history or x-ray
• Lodged in esophagus may cause serious burns in 2 hours
Button Batteries

• High level of suspicion
• Consider when:
  – Airway obstruction or wheezing
  – Drooling
  – Vomiting
  – Chest discomfort
  – Difficulty swallowing, decreased appetite, refusal to eat
  – Coughing, choking or gagging with eating or drinking
Button Battery—Management**

<12 years or >12 years & >12 mm
- X-ray immediately
- Esophagus → immediate removal, preferably endoscopic removal
- Stomach, asymptomatic, and no other ingestions, may observe closely at home

May observe if (all the below):
- Asymptomatic
- No history of esophageal disease
- >12 years old
- Reliable family
- Only ingestion is battery ≤12 mm
Magnet Ingestions

- Neodymium or “rare-earth” magnets
  - Invented in 1982
- 5-10 times stronger than traditional magnets
- Small—easily ingested
- 5-fold increase in emergency visits for magnets from 2002/3-2010/11
  - 15.7% of multiple magnet ingestions were admitted
Magnet Ingestion—Risks

- Single magnet unlikely to cause harm
- Concern is ingestion of more than one or one with another metallic object
  - Bowel loops trapped between magnets
  - CDC reported 19 cases requiring surgery and one death from 2003-2006 from multiple magnet ingestions; CPSC reports 22 incidents from 2009-2011, 11 requiring surgical intervention
Magnet Ingestion—Management**

- Ask about exposure to magnets in patients with unexplained GI symptoms
- Obtain x-ray if known magnet ingestion or GI symptoms and exposure
- Determine if single magnet or multiple
  - Be cautious—multiple views are needed to be sure single magnet
    - May stick together and overlap, appearing as solitary on single view x-ray
Single Magnet—Management**

**In stomach or esophagus**
- Follow closely as outpatient with serial x-rays
- Remove and avoid any magnetic objects (clothes with metallic buttons, belts etc.)
- Consider removal if high risk for further ingestion

**Beyond stomach**
- Follow closely as outpatient with serial x-rays
- Remove and avoid any magnetic objects
- Consider removal if able and high risk patient
- Consider laxative prep
Multiple Magnets—Management**

In stomach or esophagus
- Removal by endoscopy especially if ingestion <12 hours
- May need surgical intervention if ingestion >12 hours

Beyond stomach
- Symptomatic
  - Surgical removal
- Asymptomatic
  - Removal (enteroscopy or colonoscopy) if no signs of obstruction or perforation
  - Completely asymptomatic
    - Repeat x-ray 4-6 hours later. Close outpatient follow up if progressed

Close outpatient follow up if progressed
Practice Changes You May Wish to Make

- Institute screening for environmental exposures beyond secondhand smoke
- Educate families about common ingestion risks beyond the medicine cabinet and cleaning supplies
  - Button batteries
  - Magnets
  - Laundry pods
Thank You!

Brett.McAninch@chp.edu