Epidemiology

- What percentage of cases called to Poison Centers nationally involve “pediatric” cases (< 20 years)?

  - A. 25%
  - B. 33%
  - C. 50%
  - D. 67%
  - E. 75%
Poisoning Epidemiology

- 2.2 million exposures reported to Poison Centers in 2013
  - 47.9% in children < 6 years old
  - 1218 fatalities overall with Top 7:
    - Sedative/Hypnotic/Antipsychotics
    - Cardiovascular Medications
    - Opioids
    - Stimulants and Street Drugs
    - Miscellaneous Alcohols
    - Acetaminophen (alone or in combination)

Clinical Toxicology 2014; 52: 1032-1283
Epidemiology

- What types of ingestions are called to Poison Centers nationally in "pediatric" cases (< 20 years)?

  - A. Alcohols
  - B. Antidepressants
  - C. Cardiac medications
  - D. Cleaning substances
  - E. Hormones

---

Table A. Adolescent Cases Most Frequently Involved in "Pediatric" Cases by Source, 2013

<table>
<thead>
<tr>
<th>Substance Type</th>
<th>Number</th>
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Table B. Adolescent Cases Most Frequently Involved in "Pediatric" Cases by Source, 2013

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Pediatric Poisonings: Children < 6 years old
- Ingestions tend to be single agent, exploratory
  - Though children < 6 years account for 47.9% of all exposures, they represented only 2.4% of reported fatalities
  - 2013 – 29 fatalities in children < 6 reported
    - 24/29 unintentional
    - 3/29 malicious
    - 2/29 unknown

Pediatric Poisoning: Children > 6 years old
- 6 fatalities reported in children ages 6-12
  - 4 environmental, 2 unknown
- 64 fatalities reported in children ages 13-19
  - 25% due to presumed suicides
  - 42% due to substance abuse/misuse

Clinical Toxicology 2014; 52: 1032-1283
Epidemiology: Toddlers vs. Adolescents

- Male
- Unintentional
- Single Substance
  - Fatalities
- Substance Type
  - Household
    - Plants
    - Analgesics
    - OTC meds
- Female
- Intentional
- "Polypharmacy"
- Fatalities
- Substance Type
  - Drugs of Abuse
  - Prescription Meds

Difficult History:
- Uncooperative/preverbal patient
- Abuse
- Fear of parental discipline
- Get the Bottle!
- Safety/Prevention

BCH Poisoning Admissions

Outline

- Epidemiology
- Approach to the Poisoned Patient: A,B,C,D,E
  - Exam (Toxidromes)
  - Work-Up: Labs (D-stick), EKG
- Cases
- Poisoning Prevention
Approach to the Poisoned Patient

STEP ONE: Remember your ABCs...
- **A** = Airway
- **B** = Breathing
- **C** = Circulation
- **D** = Disability, Distick, Decontamination
- **E** = Exposure (Pockets, Needles, Tattoos)
  "Evaluation" (Labs, EKG, XR, Antidotes, Enhanced Elimination)

STEP TWO: Take an AMPLE history....
- **A** = Allergies
- **M** = Medications, including all medications in the home/place where the patient was found. Any visitors with medications? (ie Grandparents, etc)
- **P** = Past medical history
- **L** = Last meal
- **E** = Events leading up to presentation. Where was the patient found? Description of the scene by first responders. Intentional or unintentional?

The Physical Exam: Toxidrome
- **Vital signs** (HR, BP, RR, O2 sat)
- **Pupils** – size? reactivity?
- **Mental status** – Agitated? Sedated? Confused? Psychotic? Comatose?
- **Skin** – Flushed? Diaphoretic? Dry?
- **Bowel sounds** – Increased? Decreased?
Anticholinergic Toxidrome

- Hot as a Hare – febrile, warm to touch
- Mad as a Hatter – agitated delirium, hallucinations
- Blind as a Bat – mydriasis
- Dry as a Bone – dry skin and mucous membranes
- Red as a Beet – flushed

Examples: diphenhydramine, tricyclic antidepressants, atropine, Jimson weed

Sympathomimetic Toxidrome

- Agitated
- Mydriasis
- Hyperthermia
- Hypertension
- Tachycardia
- Diaphoresis
- Normal to increased bowel sounds

Examples: Cocaine, amphetamines, pseudoephedrine

Anticholinergic vs. Sympathomimetic Toxidrome?

- 1) SKIN EXAM:
  - Anticholinergic?
  - Sympathomimetic?
- 2) BOWEL SOUNDS:
  - Anticholinergic?
  - Sympathomimetic?
Cholinergic Toxidrome

- D – Diarrhea
- U – Urination
- M – Miosis
- B – Bronchorrhea
- B – Bronchospasm
- E – Emesis
- L – Lacrimation
- S – Salivation

Examples:
- Nerve Gases
- Organophosphates
- Alzheimer’s meds
  (Cholinesterase inhibitors)

Opioid Toxidrome

- CNS Depression
- Respiratory Depression
- Miosis
- Bradycardia
- Hypothermia

Examples: morphine, methadone, heroin, suboxone

Serotonin Syndrome

- A Triad of:
  - Autonomic instability: hypertension, tachycardia
  - Mental status changes: agitation to coma
  - Neuromuscular hyperactivity: clonus and hyperreflexia,
    Lower Ext>>Upper Ext
  - Exposure to pro-serotonergic meds: ?????
Serotonin Syndrome

- A Triad of:
  - Autonomic instability: hypertension, tachycardia
  - Mental status changes: agitation to coma
  - Neuromuscular hyperactivity: clonus and hyperreflexia, Lower Ext>>Upper Ext

- Exposure to pro-serotonergic meds: SSRIs, MAOIs, Lithium, Linezolid, Tramadol, Meperidine, etc

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Labs: Importance of the D-stick

- **Hyperglycemia:**
  - Methylxanthines
  - Corticosteroids, Epi
  - β2 receptor agonists

- **Hypoglycemia:** “HOBBIES”
  - Hypoglycemic
  - Other (unripe ackee fruit, antimalarials)
  - BB: Beta blockers (low glycogen stores)
  - I: Insulin (iatrogenic)
  - E: Ethanol (low glycogen stores)
  - S: Salicylates (late in course)
**EKG**

- **QRS**: Na channel
  - TCA
  - Cocaine
  - Carbamazepine
  - Diphenhydramine

- **QTc**: K channel
  - Antipsychotics
  - Azithromycin
  - Ondansetron
  - Cisapride

**Cases**

- Incorporate History and Exam
- Differential: Toxidromes
Case

- A 2 year old male presents to your ED with MGM.
- Vitals: 36.7, 120, 12, 100/62, 95% RA
- Pupils: 3 mm B
- Mental Status: “Acting funny”, sleepy
- Skin: Warm and dry, no lesions

Opioid Toxidrome

- CNS Depression
- Respiratory Depression
- Miosis
- Bradycardia
- Hypothermia

Ingestion: suboxone

Buprenorphine

- Approved for treatment of opioid addiction.
- Partial agonist-antagonist: demonstrates partial agonism at mu (euphoria) receptors and weak antagonism at kappa (dysphoria) receptors.
- Combination products with naloxone intended to decrease recreational misuse by injection.
- Naloxone has poor oral bioavailability, so has essentially no effects when taken PO.
- Typically taken sublingually (increased bioavailability)
- Peak effects seen 100min post-ingestion
- Elimination half-life (sublingual) = 37hrs

"Between 2003 and 2004, there was a 7-fold increase in the number of buprenorphine containing tablets distributed by US pharmacies." Geib et al. 2006.
Baby Boy Dies; Was Given Pills as a Toy
The New York Times
October 14, 2011

• A 13-month-old boy died after he swallowed pills from a bottle of Suboxone® that his parents had given him to play with as a rattle.
• 9 PM put to bed: Checked “short time later”-Bottle open, pills in crib, one pill wet, bottle of milk
• 7:45 AM: Unconscious in crib; DOA in Hospital after 911 called
• Parents charged with reckless endangerment, 4 y/o sib custody of Children’s Services

The Growing Impact of Pediatric Pharmaceutical Poisoning
G. Teitelbaum, MD,1, T. Woodard,1, and R. R. Levy, MD,1

Objective To understand which medications, under which circumstances, are responsible for the noted increase in pediatric medication poisonings, hospitalizations, and mortality.

Methods A retrospective 3-year review of the National Poison Data System of the American Association of Poison Control Centers. In-hospital deaths were excluded. Pediatric poisonings were classified into four categories: 1) over-the-counter, 2) prescription-strength, 3) prescription-strength in child-proof bottles, and 4) unauthorized child exposure. The percentage of cases with ED visits, hospitalizations, and deaths were calculated for each substance category. Results Pediatric poisonings are a common problem in emergency departments. Pediatric poisonings were responsible for 95% of visits. Child self-exposure to prescription products dominated the self-care-unintended with 264 (20%) of the cases (510), followed by analgesics (39%), and 911 admissions (7%). The percent increase in ED visits, hospitalizations, and deaths for pediatric poisonings was 36%, 5%, and 21%, respectively.

43% increase in Moderate/Serious Injuries
36% increase in Admissions
28% increase in ED visits

95% Self-Ingestions
**Pediatric Risk Factors: Major Outcome & Death**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Death major outcome</th>
<th>Other outcome</th>
<th>Headache OR CI</th>
<th>Infantile OR CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure to a smoking parent</td>
<td>2.8 (1.5, 5.0)</td>
<td>2.0 (1.3, 3.0)</td>
<td>4.4 (3.0, 6.3)</td>
<td>3.0 (1.5, 6.2)</td>
</tr>
<tr>
<td>&lt; 12 yrs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

J Pediatr 2010; 157: 832-6

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**NAS Clinical Features**

**Opioid Receptors: CNS & GI**

<table>
<thead>
<tr>
<th>NAS Clinical Features</th>
<th>Manual Features of the Neonatal Abnormal Behavior Syndrome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Neurologic Comorbidity</td>
</tr>
<tr>
<td></td>
<td>Caffeine withdrawal</td>
</tr>
<tr>
<td></td>
<td>Motor suppression</td>
</tr>
<tr>
<td></td>
<td>Hypoxia</td>
</tr>
<tr>
<td></td>
<td>High pitched cry</td>
</tr>
<tr>
<td></td>
<td>Decreased oral intake</td>
</tr>
<tr>
<td></td>
<td>Respiratory distress</td>
</tr>
<tr>
<td></td>
<td>Kayser–Fleischer plaques</td>
</tr>
<tr>
<td></td>
<td>Hypertension</td>
</tr>
<tr>
<td></td>
<td>Pancytopenia</td>
</tr>
<tr>
<td></td>
<td>Sepsis</td>
</tr>
<tr>
<td></td>
<td>Poor feeding</td>
</tr>
<tr>
<td></td>
<td>Uncoordinated and constant sucking</td>
</tr>
<tr>
<td></td>
<td>Poor weight</td>
</tr>
<tr>
<td></td>
<td>Increased irritability</td>
</tr>
<tr>
<td></td>
<td>Increased crying</td>
</tr>
<tr>
<td></td>
<td>Increased stooling</td>
</tr>
<tr>
<td></td>
<td>Increased dehydration</td>
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</tr>
<tr>
<td></td>
<td>Poor social support</td>
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Pediatrics 2012; 129 (2): e540-559

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**Differential Diagnosis of NAS**

- Neonatal sepsis/meningitis
- Hypoglycemia/hypocalcemia
- Non-accidental trauma
- Corneal abrasions
- Hair tourniquet
- “Colic”
- Poor social support
A 16 year old female presents to your ED.

- Vitals: 37.7, 160, 24, 140/100, 99% RA
- Pupils: 6 to 4 mm B reactive
- Mental Status: Agitated
- Skin: Warm but wet, no lesions
**Sympathomimetic Toxidrome**

- Agitated
- Mydriasis
- Hyperthermia
- Hypertension
- Tachycardia
- Diaphoresis
- Normal to increased bowel sounds

Examples: bupropion (amphetamine nucleus) + proserotonergic

---

**Serotonin Syndrome**


---

**EKG**

- **QRS**: Na channel
  - TCA
  - Cocaine
  - Carbamazepine
  - Diphenhydramine
- **QTc**: K channel
  - Antipsychotics
  - Azithromycin
  - Ondansetron
  - Cisapride
Case

- An 18 month old female presents to your ED.
- Vitals: 37.4, 140, 24, 105/60, 99% RA
- Pupils: 4 mm B reactive
- Mental Status: Hard to arouse
- Skin: Warm, diaphoretic, no lesions
- Dstick: 25 mg/dl
- Differential

The “3 E’s” of Injury Prevention

Education:
- Poison Prevention Week
- Healthy People 2020: 10% ↓ poisonings < 5 yrs

Engineering:
- Child resistant caps
- Needless syringes/one-way valve liquid preps

Enforcement:
- Social Work/Child Protection Teams
- Maternal & Infant Health

Injury Prevention Strategies

- Passive:
  - Child-Resistant Packaging Act 1970: CPSC
  - Smoke Detectors: Nicole’s Law

- Active:
  - Safe Medication Storage
  - DEA Take Back Program
Education: Prevention

Up and Away Medication Safety Tip Sheet

POISON HEALP
1-800-222-1222


Efficacy of Flow Restrictors in Limiting Access of Liquid Medications by Young Children


Objective To assess whether adding flow restrictors (FRs) to liquid medicine bottles can provide additional protection against unsupervised medication ingestion by young children, even when the child-resistant closure is not fully secured.


Figure 1. FR designs. The adapters are added to the neck of a standard liquid medicine bottle to limit the release of liquid. The FRs are attached to the bottle by a non-removable interlock on the adapter. Neither can be removed by the child. The 0.14 ml flow restrictor (top) is much smaller than the 1.0 ml flow restrictor (bottom).
Results

Outline

• Epidemiology

• Approach to the Poisoned Patient: A,B,C,D,E
  - Exam (Toxidromes)
  - Work-Up: Labs (D-stick), EKG

• Cases

• Poisoning Prevention
Questions

POISON Help™
1-800-222-1222