Morning Report

Thursday, April 16, 2015
Danielle Eggie
Chief complaint:

16 year old female with altered mental status
What is your differential diagnosis?
Differential Diagnosis

• Infectious
  • Meningitis
  • Encephalitis
  • Sepsis
• CNS/Neuro
  • Increased ICP (tumor)
  • Trauma (ICH, SBS)
  • Seizures (post-ictal state)
  • ADEM (acute disseminated encephalomyelitis)
• Endocrine
  • DKA
  • Hypoglycemia
  • Hyperthyroidism (thyrotoxicosis)
• Electrolyte abnormalities
  • Hypo/hypernatremia
  • Hypo/hypercalcemia
  • Hypo/hypermagnesemia
• GI
  • Uremic encephalopathy
  • Hepatic failure
• Autoimmune
  • Anti-NMDA-receptor encephalitis
  • Limbic encephalitis
  • SLE
• Ingestions/Exposures
• Psych
  • Psychosis, conversion
What do you want to know about the patient?
HPI:

• Chief complaint: altered mental status

• 16 y/o F that initially woke up this morning with nausea followed by an episode of emesis. Had some stomach cramping throughout the day. Noted at school/dance class to be sleepy, shaking and unresponsive at one point.
HPI:

• PMHx: SJS (with Lamictal) 10/2014
• Psych Hx: depression/anxiety; x3 psych admits at Calhoun for cutting, SI (overdose)
• Fam Hx: HTN, DM, (-)psych
• Meds: Prozac 20mg daily
• Shots: UTD
What is at the top of your differential diagnosis?
Let’s examine the patient...
Physical Exam

• VS: (In ED) T 100, P 145, RR 24, BP 146/69
  T 98.6, HR 117, RR 25, BP 126/75, Wt 60kg

• GEN: Well-hydrated, alert

• HEENT: *pupils dilated and sluggish, mild vertical nystagmus with outward gaze*, MMM, pink oral mucosa

• NECK: supple

• SKIN: *diffuse healing hypopigmented lesions secondary to previous history of SJS*
Physical Exam

• CV: regular rhythm, **tachycardic**, I/VI murmur, 2+ pulses in all 4 extremities

• RESP: **tachypnea**, otherwise CTA bilaterally

• ABD: soft, non-distended, non-tender with normoactive bowel sounds

• EXT: warm and well perfused, no edema

• Neuro: **disoriented**, answers questions inappropriately, unable to walk unassisted, unable to perform strength or cerebellar testing
What would you like to order?
LABS

5.85  12.3  37.2  401
N63 L33 M3 E1

140  109  10  < 68  Ca 9.1  AST 22 / ALT 20
3.9  22  0.5

UA: (-)LE/nit, (-)protein, (-)gluc, (-)ketones, (-)wbc
LABS

Utox: prelim +PCP

Salicylates (-)
Acetaminophen (-)
Alcohol (-)

CPK: 203 (20-220)
TSH: 2.59
...she admits to taking some Robitussin
How would you manage this patient?
Management

• Notified Poison Control
• IVFs
• Benzos (symptomatic)
• EKG to evaluate for prolonged QT
• Charcoal + sorbitol
• Admit to PICU

16 yr  Vent. rate  146  BPM  *** Poor data quality, interpretation may be adversely affected
Female  PR interval  124 ms
Black  QRS duration  72 ms
Room:ER  QT/QTC  256/446 ms
P–R–T axes  55  59  38

Confirmed by SERNICH MD. STEFFAN (504) on 1/26/2015 4:29:48 PM

Technician: CKL
Test ind POSSIBLE OVERDOSE

Ref: 12/26/1968
DOB: 12/26/1968

25mm/s  10mm/mV  150Hz  7.1.1  12SL 239  CID: 1

SID: 9005872289  EID: 504  EDT: 16:29 26–JAN–2015 ORDER:
Ingestions
Management

• ABCs FIRST!

• Initial evaluation and stabilization
  • Rapid evaluation of mental status, vital signs, and pupils
    • Excitation: CNS stimulation, ↑temp, ↑HR, ↑BP, ↑RR
    • Depression: depressed mental status, ↓temp, ↓BP, ↓HR, ↓RR
    • Mixed physiologic state

• Look for occult trauma

• Notify poison control

• Decontamination?
Activated Charcoal

- An insoluble, nonabsorbable, fine carbon powder with an extensive network of interconnecting pores that bind and trap chemicals
- Preferred method of GI contamination in children
- Contraindicated in ingestion with:
  - nonabsorbable acidic or alkaline corrosives (eg, sodium or potassium hydroxide, or hydrochloric or sulfuric acid)
  - low-viscosity hydrocarbons (eg, gasoline, kerosene, liquid furniture polish)
  - Agent not bound by activated charcoal

<table>
<thead>
<tr>
<th>Agents for which AC NOT recommended:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Heavy metals</strong></td>
</tr>
<tr>
<td>Arsenic</td>
</tr>
<tr>
<td>Lead</td>
</tr>
<tr>
<td>Mercury</td>
</tr>
<tr>
<td>Iron</td>
</tr>
<tr>
<td>Zinc</td>
</tr>
<tr>
<td>Cadmium</td>
</tr>
<tr>
<td><strong>Inorganic ions</strong></td>
</tr>
<tr>
<td>Lithium</td>
</tr>
<tr>
<td>Sodium</td>
</tr>
<tr>
<td>Calcium</td>
</tr>
<tr>
<td>Potassium</td>
</tr>
<tr>
<td>Magnesium</td>
</tr>
<tr>
<td>Fluoride</td>
</tr>
<tr>
<td>Iodide</td>
</tr>
<tr>
<td><strong>Boric acid</strong></td>
</tr>
<tr>
<td><strong>Corrosives</strong></td>
</tr>
<tr>
<td>Acids</td>
</tr>
<tr>
<td>Alkali</td>
</tr>
<tr>
<td><strong>Hydrocarbons</strong></td>
</tr>
<tr>
<td>Alkanes</td>
</tr>
<tr>
<td>Alkenes</td>
</tr>
<tr>
<td>Alkyl halides</td>
</tr>
<tr>
<td>Aromatic hydrocarbons</td>
</tr>
<tr>
<td><strong>Alcohols</strong></td>
</tr>
<tr>
<td>Acetone</td>
</tr>
<tr>
<td>Ethanol</td>
</tr>
<tr>
<td>Ethylene glycol</td>
</tr>
<tr>
<td>Isopropanol</td>
</tr>
<tr>
<td>Methanol</td>
</tr>
<tr>
<td><strong>Essential oils</strong></td>
</tr>
</tbody>
</table>
Decontamination

• Gastric lavage
  • NOT recommended for routine use
  • What would be an indication to use gastric lavage?
    • A potential life-threatening ingestions that occurred within 60 minutes of seeking medical attention

• Syrup of Ipecac
  • NOT recommended for routine home use
  • Controversy
  • What would be an indication to use syrup of ipecac?
    • Alert, conscious patient who has ingested a substantial amount of a toxic substance within the previous 60 minutes ingestion and after consultation with a health care provider or poison control center
Decontamination

• Whole bowel irrigation
  • Indications include ingestion of:
    • Enteric-coated pills
    • Sustained-release preparations
    • Illicit drug packets
    • Large ingestions of substances poorly bound by charcoal (iron, lead, and lithium)

• Cathartics (Sorbitol)
  • accelerate the evacuation of the GI contents by increasing the fluid load in the intestine and stimulating bowel motility.
  • They should **never** be used as the sole method of GI decontamination.

Abdominal radiograph showing radiopaque drug packets ingested by a "body packer."
Lab studies

• CBC
• Electrolyte panel, blood glucose, serum blood urea nitrogen (BUN), creatinine, calcium, mag, phosphate
• Liver enzymes (ALT/AST, coag studies, bili, ammonia)
• ABG (acid/base & oxygenation/ventilation status)
• Acetaminophen and salicylate level, Utox, Lead
• Blood and CSF cultures
• EKG
Acute poisonings, ingestions, and exposures

- Unknown or multiple substances
- Acetaminophen
- NSAIDS
- Anticholinergic drugs
- Salicylates
- Antihypertensive drugs
- Tricyclic antidepressant drugs
- Ethanol, methanol
- Hydrocarbons
- Organophosphates
- Carbon monoxide
- Acids, alkali, and alkaloids
- Lead
- Button batteries, coins
- Magnets
- Iron
- Ethylene glycol
- Plants
- Substances of abuse
  - Opioids
  - Amphetamines
  - Hallucinogens
  - Cocaine
  - Inhalants

*Recognize the signs and symptoms of toxicity and manage appropriately*
Toxidromes
<table>
<thead>
<tr>
<th>Sympathomimetic</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental status</td>
<td>↑alertness, agitation, hallucinations, paranoia</td>
</tr>
<tr>
<td>Pupils</td>
<td>↑pupil size (mydriasis)</td>
</tr>
<tr>
<td>Vital signs</td>
<td>↑temperature, ↑HR, ↑BP, ↑RR, widened pulse pressure</td>
</tr>
<tr>
<td>Other manifestations</td>
<td>Diaphoresis, tremors, ↑reflexes, seizures</td>
</tr>
<tr>
<td>Examples of toxic agents</td>
<td>Cocaine, amphetamines, cathinones, ephedrine, pseudoephedrine, phenylpropanolamine, theophylline, caffeine</td>
</tr>
</tbody>
</table>
### Anticholinergic

<table>
<thead>
<tr>
<th>Mental status</th>
<th>Hypervigilance, agitation, hallucination, delirium with mumbling, speech, coma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pupils</td>
<td>↑pupil size (mydriasis)</td>
</tr>
<tr>
<td>Vital signs</td>
<td>↑temperature, ↑HR, ↑BP, ↑RR</td>
</tr>
<tr>
<td>Other manifestations</td>
<td>Dry flushed skin, dry mucus membranes, decreased bowel sounds, urinary retention, myoclonus, picking, seizures (rare)</td>
</tr>
<tr>
<td>Examples of toxic agents</td>
<td>Antihistamines, TCA, cyclobenzaprine, orphenadrine, anti-Parkinson agents, antispasmodics, atropine, scopalamine</td>
</tr>
</tbody>
</table>
TCAs

• Management?
  • Obtain EKG
    • Look out for dysrhythmias to develop within 24 hrs
    • Monitor for widening of QRS complex
    • Do not treat with cardiac meds
  • Alkalinization of urine (Sodium bicarbonate boluses)
  • Decontamination with activated charcoal
### Hallucinogenic

<table>
<thead>
<tr>
<th>Mental status</th>
<th>Hallucinations, perceptual distortions, depersonalization, synesthesia, agitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pupils</td>
<td>↑pupil size (mydriasis) – usually</td>
</tr>
<tr>
<td>Vital signs</td>
<td>↑temperature, ↑HR, ↑BP, ↑RR</td>
</tr>
<tr>
<td>Other manifestations</td>
<td>Nystagmus</td>
</tr>
<tr>
<td>Examples of toxic agents</td>
<td>Phencyclidine (PCP), mescaline, psilocybin, designer amphetamines (Ecstasy)</td>
</tr>
</tbody>
</table>
# Opioid

<table>
<thead>
<tr>
<th>Mental status</th>
<th>↓ alertness, CNS depression, coma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pupils</td>
<td>↓ pupil size (miosis) “pinpoint”</td>
</tr>
<tr>
<td>Vital signs</td>
<td>↓ temperature, ↓ HR, ↓ BP, ↓ RR, apnea</td>
</tr>
<tr>
<td>Other manifestations</td>
<td>↓ reflexes, pulmonary edema, needle marks</td>
</tr>
<tr>
<td>Examples of toxic agents</td>
<td>Opioids (heroin, morphine, methadone, oxycodone, hydromorphone), diphenoxylate</td>
</tr>
</tbody>
</table>
How do you treat opioid overdose?

Naloxone
## Sedative-hypnotic

<table>
<thead>
<tr>
<th>Mental status</th>
<th>CNS depression, confusion, stupor, coma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pupils</td>
<td>↓ pupil size (miosis) – usually</td>
</tr>
<tr>
<td>Vital signs</td>
<td>↓temperature, ↓HR, ↓BP, ↓RR, apnea</td>
</tr>
<tr>
<td>Other manifestations</td>
<td>↓reflexes</td>
</tr>
<tr>
<td>Examples of toxic agents</td>
<td>Benzodiazepines, barbiturates, carisoprodol, meprobamate, gluthethimide, alcohols, zolpidem</td>
</tr>
<tr>
<td>Cholinergic</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Mental status</td>
<td>Confusion, coma</td>
</tr>
<tr>
<td>Pupils</td>
<td>↓ pupil size (miosis)</td>
</tr>
<tr>
<td>Vital signs</td>
<td>↓HR, ↓or↑BP, ↓or↑RR</td>
</tr>
<tr>
<td>Other manifestations</td>
<td>Salivation, lacrimation, urination, defecation/diarrhea, emesis, diaphoresis, bronchospasms, fasciculations, weakness</td>
</tr>
<tr>
<td>Examples of toxic agents</td>
<td>Organophosphates and carbamate insecticides, nerve agents, nicotine, pilocarpine, physostigmine, edrophonium, bethanechol</td>
</tr>
</tbody>
</table>
Organophosphates

• Mechanism of action: inhibits acetylcholinesterase, leading to acetylcholine overload

“SLUDGE”
• Salivation
• Lacrimation
• Urination
• Defecation or Diarrhea
• Gastrointestinal
• Emesis
Cholinergic

• Management ?
  • Cholinergic effects are broken down into 2 categories
  • Muscarinic
    • Primary pulmonary effects – bronchospasms and increased pulmonary secretions
    • Tx: Atropine
  • Nicotonic
    • Primarily neuromuscular effects
    • Tx: Pralidoxime
## Serotonin Syndrome

<table>
<thead>
<tr>
<th>Mental status</th>
<th>Confusion, agitation, coma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pupils</td>
<td>↑ pupil size (mydriasis)</td>
</tr>
<tr>
<td>Vital signs</td>
<td>↑ temp, ↑ HR, ↑ BP, ↑ RR</td>
</tr>
<tr>
<td>Other manifestations</td>
<td>Tremor, myoclonus, hyperreflexia, clonus, diaphoresis, flushing, trismus, rigitidy, diarrhea</td>
</tr>
<tr>
<td>Examples of toxic agents</td>
<td>MAOI +/- SSRI, meperidine, dextromethorphan, TCAs, L-tryptophan</td>
</tr>
</tbody>
</table>
Dextromethorphan

• A cough suppressant (antitussive)
  • a semisynthetic morphine derivative that does not have analgesic properties and does not respond consistently to naloxone (Narcan) administration.
• High doses may cause it to react as a CNS depressant and a dissociative anesthetic (similar to ketamine)
• A clear toxidrome may not be present in cough and cold preparations that contain multiple active ingredients.
  • antihistamines (anticholinergics) and decongestents
• Effects usually peak within 2-3 hours; the drug has a half-life of four hours.
• AKA: skittles, candy, Robo, Red Devils, dex, C-C-C or Triple C (Coricidin Cough & Cold), Vitamin D and DXM.
Other important ingestions
Acetaminophen ingestion

• Signs and Symptoms?
  • Initial manifestation
    • Anorexia, nausea and vomiting OR asymptomatic
    • Lasts the first 24 hours
  • Latent phase
    • In significant toxicity, elevation in liver enzymes
    • Can last 1-4 days
      • Even in severe overdose, LFTs can be normal 2-3 days later.
      • Sometimes we don’t see a rise until 3-4 days after ingestion.

• Following the latent phase
  • Jaundice
  • Liver tenderness
Acetaminophen ingestion

• Management
  • #1 – Reduce absorption with activated charcoal.
  • If indicated, treatment with N-acetylcysteine.
    • Prevents the accumulation of toxic metabolites of acetaminophen.
    • If ingestion >150mg/kg, give without obtaining levels.
  • Acetaminophen level 4 hours post ingestion.
    • $\geq 150$ = moderate hepatoxicity
    • $\geq 300$ = severe hepatoxicity

**Note: charcoal is typically not given with antidotes because it interferes with the absorption. For acetaminophen ingestion, activated charcoal and N-acetylcysteine are exceptions.**
Salicylates

• Signs and symptoms?
  • Fever, “wintergreen” odor on breath
  • Anion gap metabolic acidosis, respiratory alkalosis
  • Encephalopathy – lethargy, seizures, coma, respiratory depression, delirium

• Management?
  • Activated charcoal
  • Salicylate level 3-6 hours post-ingestion
  • Sodium bicarbonate (alkalinize the urine)
Antihypertensive drugs

• **Beta-blockers

• Signs and symptoms ?
  • Depressed sensorium, bradycardia, hypotension, possible diaphoresis

• Management ?
  • Close observation
Ethanol

• Signs and symptoms?

• Management?
  • Monitor for hypoglycemia and electrolyte imbalance

• *Remember ethanol intoxication may mask toxicity caused by ingestion of other drugs
Methanol

• Signs and symptoms?
  • Similar to ethanol ingestion, CNS depression
  • Anion gap metabolic acidosis

• Management?
  • Ethanol
    • Methanol $\rightarrow$ formic acid + formaldehyde
      • (acts on the liver and optic nerve)
    • Ethanol acts as an alcohol dehydrogenase antagonist, slowing this conversion.
  • Sodium bicarbonate
    • To help counter formic acid
Ethylene Glycol

• Signs and symptoms?
  • Phase 1
    • Nausea, vomiting, tachycardia, hypertension, metabolic acidosis
    • Drunken appearance without odor of alcohol on the breath
    • Oxylate crystals on urinalysis, leading to hypocalcemia
  • Phase 2
    • Coma and cardiorespiratory failure due to acidosis and hypocalcemia
  • Phase 3
    • Within 1-3 days, renal failure due to ATN
    • May require dialysis
Iron

- Management of ingestion of iron pills?
  - Serum Iron levels
    - 4 hours post-ingestion, >350 significant
    - Elevated WBC/glucose correlates
  - Abdominal Xray
    - Look for not yet absorbed iron tablets
  - Deferoxamine chelation treatment
    - Severe symptoms
    - Anion gap acidosis
    - Serum iron >500
    - Significant number of pills on Xray

Abdominal radiograph showing radiopaque iron (ferrous sulfate) tablets visualized in the stomach of an intentional overdose patient (arrow).
Hydrocarbons

• Signs and symptoms?
  • Nonspecific (nausea, vomiting)
  • History of choking or gagging
  • Persistent cough, tachypnea
  • Hypoxia, bilateral infiltrates on CXR

• Management?
  • Asymptomatic – observation for 6 hours, CXR not necessary
  • Supportive care
    • Oxygen, bronchodilators (can lead to ARDS)
Carbon Monoxide

• Signs and symptoms?
  • Flu-like symptoms (fatigue, headache, dizziness, nausea)
  • Afebrile
  • May progress to confusion
  • PE may have “cherry red mucous membranes” or “singed nose hairs”
Carbon Monoxide

• Management?
  • Obtain carboxyhemoglobin level
    • Symptoms don’t always correlate with level
  • High flow oxygen through non-rebreather
  • Hyperbaric chamber in severe cases
    • Pregnancy, acidosis, cardiac/neurologic involvement

• Are oxygen saturations reliable?
  • No, oxygen sats do not distinguish between carboxyhemoglobin and oxygenated hemoglobin
Cyanide poisoning

• What would you be concerned about if presented with a patient thought to have CO poisoning (lethargic, confused, in distress), but FAILURE to respond to 100% oxygen?
  • Can result from any smoke exposure

• What is the treatment?
  • Hydroxocobalamin
  • Previously used, sodium thiosulfate or nitrate
Caustic substances: Acids, Alkali, and Alkaloids

• Signs and symptoms?
  • Coughing, crying, drooling, difficulty swallowing, chest pain
  • Alkali → esophageal injury/perforation
  • Acidic → esophageal and stomach injury
    • not neutralized in the stomach as alkali substances are

• Management?
  • If symptomatic, endoscopy within 24-48 hours
  • If asymptomatic, observation for 6 hours
  • Gastric lavage is CONTRAindicated
  • Activated charcoal is NOT indicated (will not absorb, and will inhibit endoscopic examination)
The End!

Noon conference:
Child Abuse lectures
Across the street
Lead

• Multiple sources of exposure to lead
• Outcomes associated with lead poisoning
• Management of increased blood lead concentration
Button Batteries

• Management
  • Observation
  • Removal?
    • If it has been more than 48 hours, and the battery is still in the esophagus or has not passed the stomach
Coins

- Most commonly ingested foreign bodies
- What % will pass within 4-6 days?
  - 95%

Management
- When do coins need to be removed?
  - Symptomatic
  - If they do not progress past the stomach within 24 hours

Pennies
- Those minted after 1982 are not pure copper and have significant zinc content (corrosive to esophagus)
- Proximal Esophagus – removed by endoscopy ASAP
- Middle-lower esophagus – observe 12-24 hours