OH YOU'RE TRYING TO SLEEP

LET ME PLAY YOU THE SONG OF MY PEOPLE
Ah S%#T!!!

Deadly Overdoses That Die En Route

Jamie Syrett, MD
Office of Prehospital Care
Rochester General Health System
Case 1 (and 2)

- Male - mid 30s, pulled from a burning building by a fire-fighter without SCBA
Case 1

- Male 30s
- Unconscious
- HR30, BP 70/50, Sats 82% (to 100% with BVM)
- RR - shallow/ineffective
- No cyanosis
- Had a seizure
Case 2

- Firefighter/Smoker
- Dizzy, weak, headache, vomits
- HR 160, RR 40, BP 120/80, Sats 100%
- Gave the patient mouth to mouth in the building
Case 3

- Male - 50yo
- Spilled something on arm, no local pain or burn
- Tingling/twitching/screaming in pain
- HR 130, BP 160/100, Sat 100%, RR 20
- Wide complex tachycardia on monitor
Case 3
Case 4

- Farmer found at the roadside
- Unconscious
- Covered in vomit and drooling at the mouth, pupils are pinpoint, wheezing
- HR 130, BP 140/90, RR 30, Sats 94%
Case 5

- 34F unresponsive
- Suicide note that the antidepressants are not working
- HR 130, SBP 90, RR 20, Sats 100%
- Wide complex on the monitor
- Then seizes in the ambulance
Case 6

- 6YO-M
- Temp 40°C, P155, RR50(deep), sat100%
- “Got into the pill box”
Case 7

- 6YO-M twin
- P20, SBP60, RR20, Sat 100%
- “Got into the prescriptions”
Plan

- Cyanide
- Hydrofluoric Acid
- Sarin, tabin and Organophosphates
- TCA
- Aspirin
- Beta Blockers/Ca channel blockers
- Bath Salts
Cyanide

- A few years ago smoke had a different composition
- Today with plastics and other synthetics smoke generates a more toxic mix of chemicals
Cyanide

- In a typical structure fire
  - Oxides of nitrogen
  - Hydrogen sulphide
  - Carbon dioxide and monoxide
  - Hydrogen cyanide
Cyanide

• “The King of Smoke Toxins”
• 30 time deadlier than CO
• Generated from the combustion of natural and synthetic materials
• Anytime Hydrogen, Carbon and Nitrogen are involved in combustion cyanide is generated
Cyanide

- Burning computers, TVs, carpets, cushions, insulation, foams, laminates
- It doesn’t take much to kill you!
- Zyklon B in Nazi Germany
Cyanide

Time to die (min)

- 0 min
- 1 min
- 10 min
- 20 min
- 30 min

135ppm

3400ppm
Cyanide

• 2006 NFPA study - fire fatalities
  • 86% of victims had toxic cyanide levels
  • “Smoke kills them a long time before the fire does”
  • “Bitter Almonds” - often undetectable till 600ppm
  • 40% can’t smell it at all
Cyanide

- Rapid breathing
- Restlessness
- Dizziness
- Weakness
- Headache
- Nausea and vomiting
- Rapid heart rate
Cyanide

- Convulsions
- Low blood pressure
- Slow heart rate
- Loss of consciousness
- Lung injury
- Respiratory failure leading to death
Cyanide

- Questionable risk/benefit of mouth to mouth
- Decontaminate and ventilate
Cyanide

• Binds to the “Cytochrome” System
• Inactivates it - can’t generate ATP
• “Chemical asphyxiant”
Cyanide

- Lilly Kits - Amyl Nitrite, Sodium Nitrite, Sodium Thiosulphate
- Nitrite - Induces methemaglobin
- Problem with fire victims
Cyanide

• Nitrite creates methemaglobin - high affinity for cyanide
• Enzyme in the liver (rhodanase) then metabolizes cyanide with sulphate (extra supplied by thiosulphate)
• But fire victims have - Hb, Hb-CO
Hydrofluoric Acid

- Really Bad News for EMS
- Classified as a corrosive
- Unique in its degree of action and toxicity
Hydrofluoric Acid

• Found in
  • High Octane Fuel Production
  • Etching Glass
  • Semiconductors
  • Dyes/Plastics
  • Fireproofing
Hydrofluoric Acid

• Rapidly Penetrates Skin
• Dissociates to release fluoride ions
• Under 20% do not cause initial pain
• Fluoride binds to everything - calcium, magnesium and potassium
• Sudden rapid drop in calcium
Hydrofluoric Acid

• 20% exposure to a 5 inch by 5 inch area of skin is painless and rapidly fatal

• Pain occurs when the calcium-fluoric salt precipitates in the tissues
Hydrofluoric Acid

• Management
  • Decontamination with copious irrigation
  • Local - Calcium gluconate gel
  • Local - Injection of calcium gluconate into the tissues
  • Systemic - Infusions of calcium and magnesium
EMS

- Calcium Gluconate gel - 1 amp of calcium and a tube of surgilube (!)
- Can also nebulize calcium solutions
EMS

• Systemic management should be started with any cardiac changes on the ECG

• Look at the Q-T and QRS intervals and if they increase then initiate IV
Last Word

- It takes 10cc of 100% HF to bind all the calcium in a 70kg male
- HF can painlessly enter thru a pin hole in a glove
Organophosphates

- Nerve agents (Tabin, sarin)
- Organophosphates
- Carbamates
Utilization of Nerve Agents

• Iraq
• Japan in 1990s
Organophosphates

• “25m incidents of organophosphate poisoning worldwide each year in agriculture workers”


Organophosphates

- Small or pinpoint pupils.
- Painful, blurred vision.
- Runny nose and eyes.
- Excess saliva.
- Eyes look 'glassy'.
- Headache.
- Nausea.
- Mild muscle weakness.
- Localised muscle twitching.
- Mild agitation.
Organophosphates

- Pinpoint pupils, conjunctival injection.
- Dizziness, disorientation.
- Coughing, wheezing, sneezing.
- Drooling, excess phlegm, bronchorrhea, bronchospasm.
- Breathing difficulty.
- Marked muscle twitching or tremors.
- Muscle weakness, fatigue.
- Vomiting, diarrhea, urination.
Organophosphates

- Pinpoint pupils.
- Confusion and agitation.
- Convulsions.
- Copious excess secretions.
- Cardiac arrhythmias.
- Collapse, respiratory depression or respiratory arrest.
- Coma.
- Death.
Organophosphates

- “SLUDGE”
  - Salivation
  - Lacrimation
  - Urination
  - Defecation
  - Gastric Upset
  - Emesis
Toxidrome

• Narcotic/opiate
• Sympathomimetic
• Cholinergic - SLUDGE
• Anticholinergic - “Mad as a hatter”
Health Protection Agency (UK)

1. Could this be cyanide?

2. Could this be a nerve agent or organophosphate?
Smells

- Garlic
Management

• Decontaminate there and then
• Charcoal for ingestion
• Atropine (20mcg/kg in children) IV
• 2-PAM (Pralidoxime) IV
• MARK1 NAAK replaced with ATNAA
Gulf War Syndrome?

- Neuropsychiatric symptoms are known to occur - both in Gulf War and Tokyo Victims
The Old Favorite

• What drug still strikes fear into the “experienced” paramedic?
Case 5

- 34F unresponsive
- Suicide note that the antidepressants are not working
- HR 130, SBP 90, RR 20, Sats 100%
- Wide complex on the monitor
- Then seizes in the ambulance
- What information is important to determine in this case?
Case

- Vital Signs
- Level of Consciousness
- Time and amount of ingestion
- QRS duration
Tricyclics

• Increasingly being used in medicine after being out of favor due to risks
  • Depression/OCD
  • Chronic pain/Migraine
  • Bed wetting
  • Child behavior
Clinical Presentation

- CNS effects - Altered level of consciousness, seizures (bad)
- Cardiac effects - Tachycardia, widening QRS
- Respiratory - Tachypnea due to acidosis
Actions

- Non-selective agents with multiple sites of action.
  - Inhibit amine uptake (nor-epi, serotonin)
  - Anticholinergic actions (only muscurinic)
  - Inhibit adrenergic receptors (alpha 1 and 2)
  - Block sodium channels
  - Antagonize potassium channels
  - Antagonize GABA/Cl channels.
Actions

• TCAs are Sodium Channel Blockers
  • Class 1 medications
  • Competitive type action
  • Causes the cardiac issues
Toxicity in 2500 cases

- Tachycardia (51%)
- Coma (35%)
- Widening QRS (21%) ***
- Hypotension (14%) ***
- Seizures (8%) ***
- Arrhythmias (6%) ***
Management

• Symptomatic management - but NOT lidocaine
• Early benzodiazepines and proactive management
• Bicarb
Bicarb

- Indications for bicarb are if the patient has evidence of a widened QRS
- Prior management was if the QRS was wider than 0.2s (1 big square on ECG)
- Now management is if QRS is bigger than 0.12s (3 small squares)
- Aggressive management change
Bicarb

- Unknown actions
  - Probably NOT due to correcting the pH
  - Probably due to being a massive sodium donator
Bicarb

- Dose is unknown and guided by the QRS and the pH of the patient
Other Management

- Early intubation
- Delayed washout of stomach
- Charcoal does not work
Other Management

- Patients receiving early benzodiazepines did better than those that did not
Aspirin

- Many actions
  - Anti-pyretic/analgesic/anti-platelet
  - Cleared by liver, excreted by kidney
  - Can cause GI irritation, nausea, vomiting, tinnitus, metabolic acidosis
In Overdose

- Patients exhibit
  - Fever (?)
  - Diaphoresis
  - Confusion
  - Hyperventilation
Fever

- Fever is caused by the aspirin causing metabolism to be “uncoupled” creating heat rather than ATP (energy)
Respiration Rate

- Metabolic Acidosis - Causes increased RR
- Central stimulation of respiratory center also causes increased RR
- Fever causes increased RR
- Hypoxia may hint at pulmonary edema
Clinically

- CNS signs may be varied
  - irritability, confusion, delirium, vertigo, seizures (hint at brain edema)
Causes of Overdose

• Pepto-bismol
• Oral - Deliberate or Accidental
• Dermal
• Oil of Wintergreen (1 tsp=7g)
Management

• Charcoal (One of the few that charcoal works for - may use repeat charcoal)
• Lavage (Due to concretions)
• Alkaline Diuresis (Bicarbonate therapy)
Alkaline Diuresis

• Aspirin is a weak acid

• In presence of strong acid it will be associated (no charge) - can cross a membrane

• In presence of alkaline is will dissociate (splits to H+ and Base-) and cannot cross membrane
Given Bicarb

- Bicarb is excreted in the urine making the urine alkaline
- When aspirin gets in to the urine it dissociates and stays there (alkaline trapping)
Beta-Blockers

• Actions?
Beta-Blockers

• Beta 1,2 and 3 receptors exist
  • Beta 1 - More in the heart
  • Beta 2 - More in the lungs (smooth muscle)
  • Beta 3 - Fat tissue
Beta Stimulation

• Beta 1 stimulation
  • Increases force and rate of heart contraction.
  • Increases AV conduction velocity.
  • Increases renin release.

• Beta 2 stimulation
  • Relaxes smooth muscle in blood vessels, bronchial tree and GI system.
  • Induces gluconeogenesis.
Beta-Blockers

- Frequently prescribed for
  - Hypertension.
  - Ischemic heart disease.
  - Cardiac arrhythmias.
  - Migraine.
  - Glaucoma.
Common Beta-Blockers

- Propranolol (1 and 2) - Inderal
- Atenolol (selective 1) - Tenormin
- Metoprolol (selective 1) - Lopressor
Clinically

- Absorbed rapidly from the stomach.
- Signs of overdose in 20 minutes.
- Bradycardia and hypotension.
- Jeopardizes cardiac circulation - leads to more negative inotropy.
- Mental status changes are common.
- Range from delirium to coma, can seize.
Clinically

- Bronchospasm is NOT common in overdose.
- Congestive Cardiac Failure and Pulmonary edema are far more likely.
- Can induce a hypoglycemic event in unstable diabetics.
Management

- Charcoal is indicated
- Remember rapid absorption
Specific Treatment

• Aimed at countering the beta blockade.
  • Atropine
  • Catecholamines
  • Dobutamine - beta 1
  • Dopamine - both beta 1 and 2
• Glucagon - now considered drug of choice.
• Pace
Glucagon

- Beta blockers cause decrease in cAMP
- Glucagon increases cGMP
- Boluses of 3-10mg have been used with success.
- Dose has not been determined.
- Problem - In 1995 a survey found glucagon in 0% of ED and 26% of hospitals.
EMS Management

- Glucagon - Will make the patient vomit when given IV and pushed
- Symptomatic management may require IV dopamine and continuous epi
EMS Management Plan

- Fluid Boluses to “Fill Up the Tank”
- Give Glucagon IV
- Start dopamine drip as needed
- Use IV epi - 1mg in 1000cc at 1cc/min then increase
Calcium Channel Blockers

- Introduced in 1981 - increased prescribing has led to increased toxicity issues
- 3 most common are
  - Verapamil (calan), diltiazem (cardizem), nifedipine (adalat, procardia)
Calcium Channel Blockers

- Extensively 1st pass metabolized which is protective for oral ingestions
- Largely protein bound
- Spread out throughout the whole body
Clinically

- Toxicity is an extension of the therapeutic effect
- Decreased calcium into the myocardium and vascular smooth muscle cells
- Decreased AV conduction and sinus discharge
- Decreased heart contractility
- Vasodilation and hypotension
Clinically

- Bradycardia and conduction delay (1AVB, 2AVB, asystole)
- Hypotension - Some blockers cause more hypotension and may cause a reflex tachycardia (Nifedipine)
- Lethargy, slurred speech, N/V, coma
EMS Management

• Symptomatic management
• Specific antidotes

• In an unknown overdose you may want to give glucagon since calcium channel and beta-blocker overdose appear the same
Give Calcium?

- In general giving calcium is “anecdotally” not described as working but should still be considered.

- Another anecdote says give calcium prior to giving cardizem in a hypotensive patient in rapid atrial fibrillation.
Management

- Similar to beta-blockers
  - Fluid bolus
  - Glucagon
  - Calcium
  - Dopamine and Epi drips
Bath Salts
Case 1 (and 2)

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jsyrett@rochester.rr.com

www.highqualityems.com