

OH YOU'RE TRYING TO SLEEP



LET ME PLAY YOU THE SONG OF MY PEOPLE



New York State
Volunteer Ambulance
& Rescue Association Inc.



Ah S%#T!!!

Deadly Overdoses That Die En Route

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Case 1 (and 2)

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

Case I

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

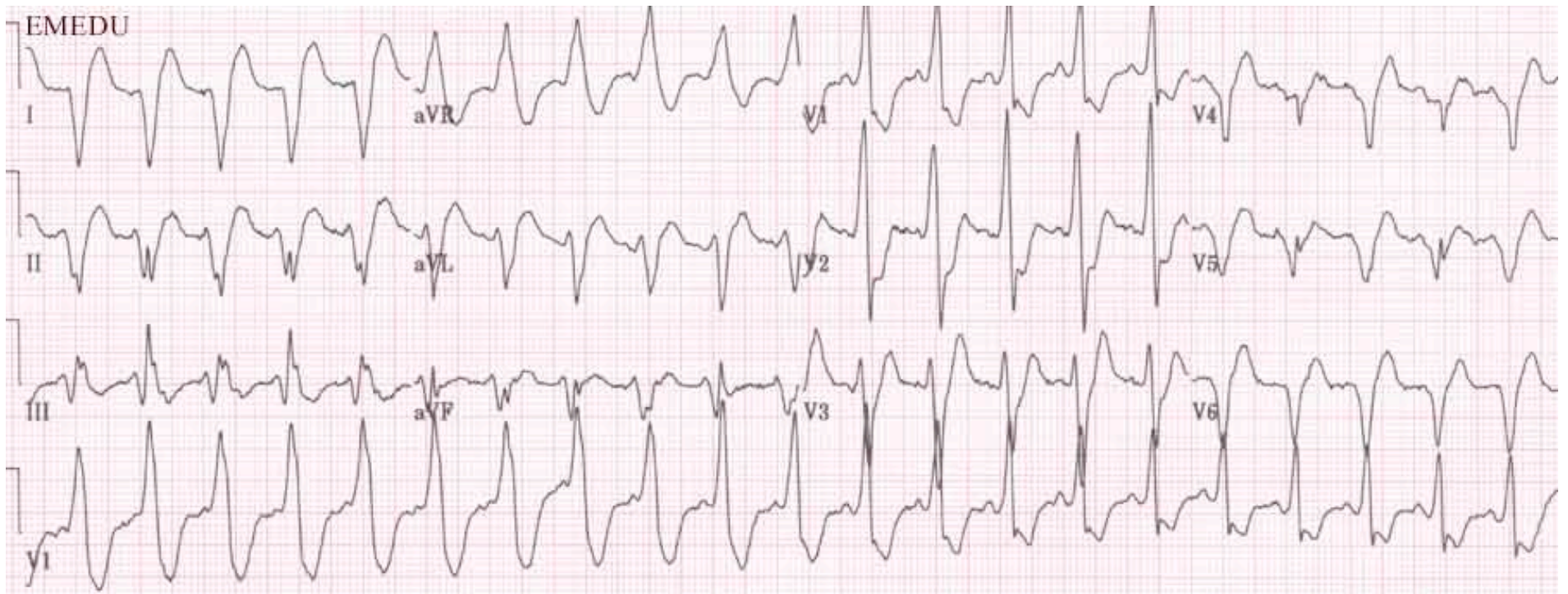
Case 2

- 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, SBP90, RR20, 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 I 00%
- “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

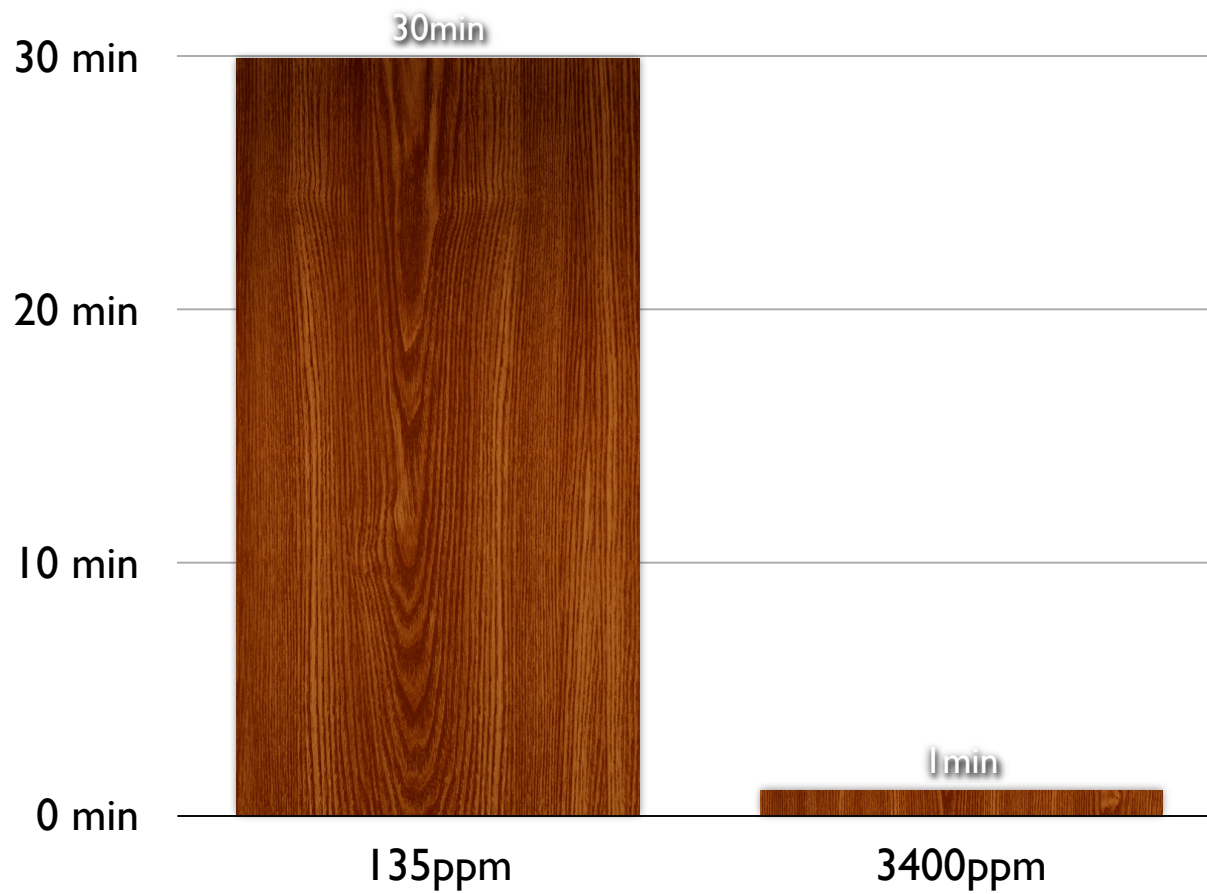
- “The King of Smoke Toxins”
 - 30 time deadlier than CO
 - Generated from the combustion of natural and synthetic materials
 - Anytime Hydrogen, Carbon and Nitrogen are involved in combustion cyanide is generated

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)



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 methemoglobin
- Problem with fire victims

Cyanide

- Nitrite creates methemoglobin - 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”

Jeyaratnam J; Acute pesticide poisoning: a major global health problem.
World Health Stat Q. 1990;43(3):139-44.

Litchfield MH; Estimates of acute pesticide poisoning in agricultural workers in
less developed countries. Toxicol Rev. 2005;24(4):271-8.

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
- MARK I 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, SBP90, RR20, 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 I 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

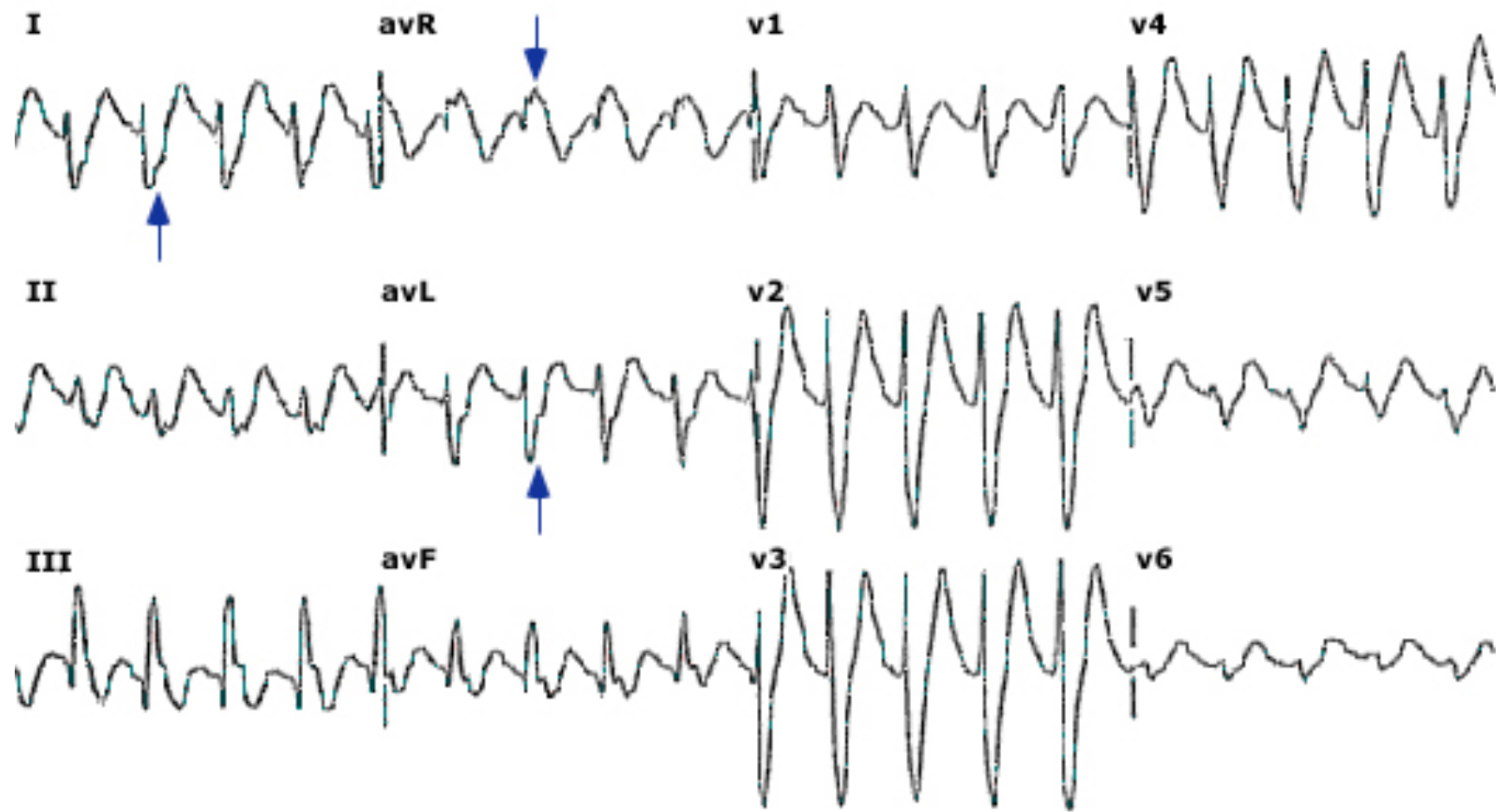
- Indications for bicarb are if the patient has evidence of a widened QRS
- Prior management was if the QRS was wider than 0.2s (1 big square on ECG)
- Now management is if QRS is bigger than 0.12s (3 small squares)
- Aggressive management change

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

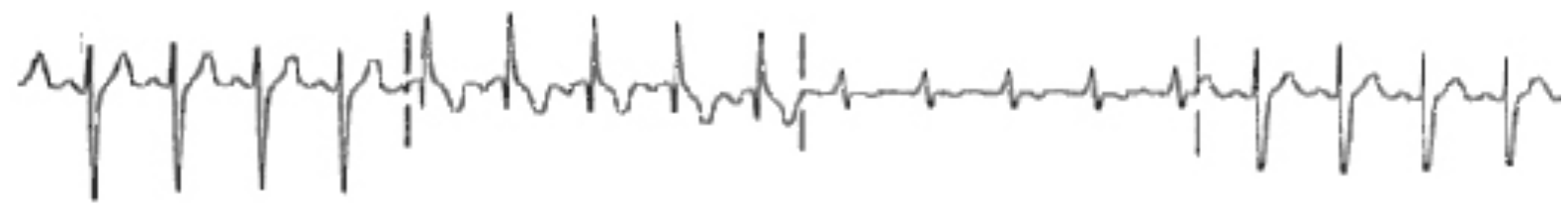


I

avR

v1

v4



II

avL

v2

v5



III

avF

v3

v6



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



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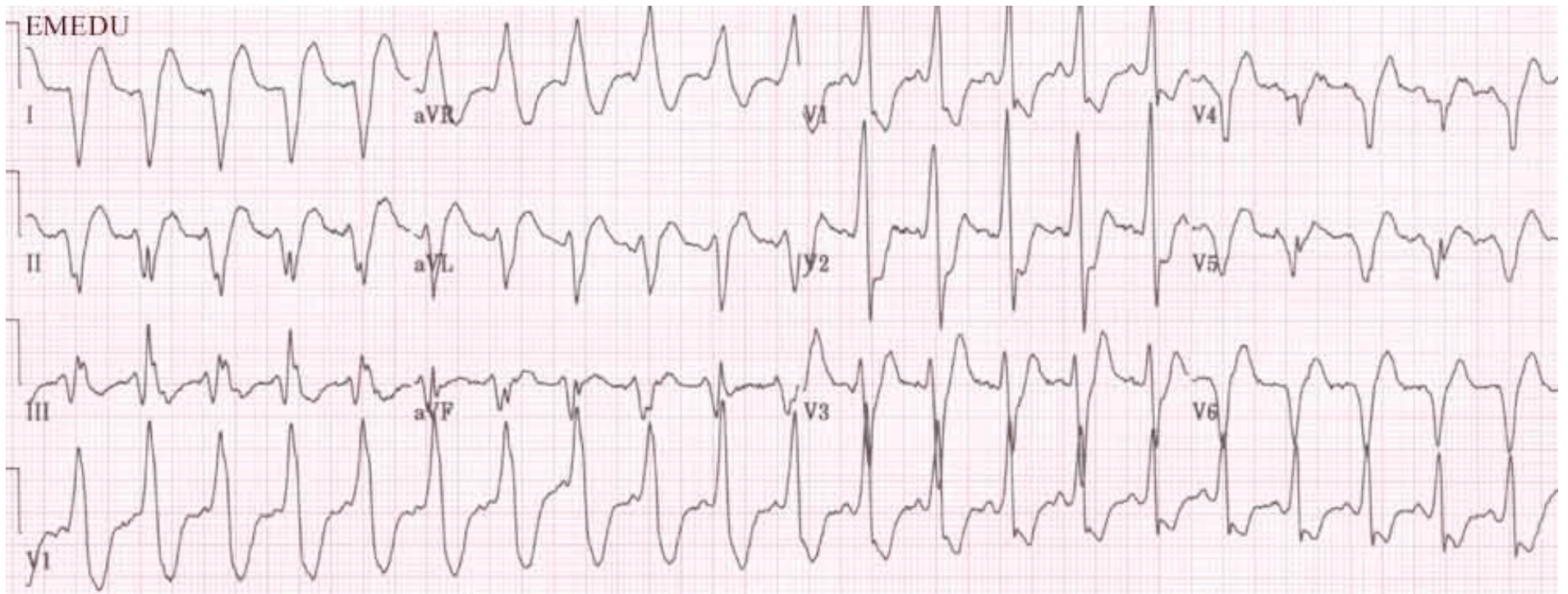
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www.highqualityems.com