Toxicology Mistakes

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Objective

To Save a Life

Introduction

- Toxic Alcohols
- Salicylate
- Verapamil
- Carbon Monoxide
- Snake Bites
- Urine Drug Screens
- Renal Function

"Ladies and gentlemen: the stories you are about to hear are true. Only the names have been changed to protect the innocent."

Case 1

- 56 yo M with hx of EtOH abuse and depression
- Presented to the ED
- 10 hours after ingesting 8 oz of Sterno

Case 1

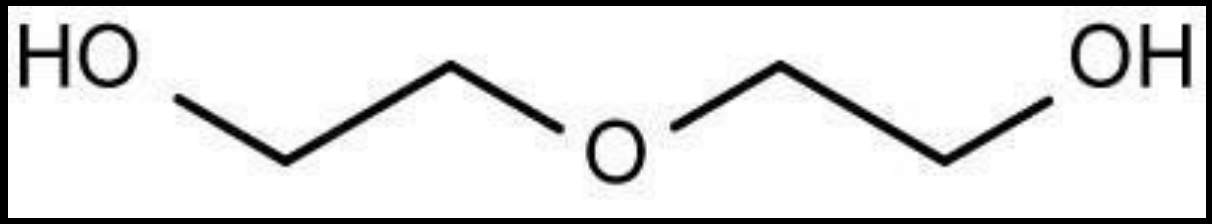
- Diffuse abdominal pain
- Dysarthric, intoxicated
- Serum ethanol was 342 mg/dL
- Serum glucose and electrolytes were normal, anion gap 14

Case 1

- Toxic alcohol screens (methanol, ethylene glycol, and propylene glycol) were negative
- Salicylate level was negative
- Admitted to inpatient psychiatry for suicidal ideation

Case 1

- On day 2, the patient complained of worsening abdominal pain, was tremulous on exam, and febrile (38.1^{o}C)
- Bicarbonate 15, anion gap 20, ABG 7.34/26/82
- AST 353 and ALT 258, creatinine 3.8 mg/dL
- Treated for presumed EtOH withdrawal



- Started on fomepizole
- Sterno can recovered and found to contain diethylene glycol (DEG)
- Day 3, serum DEG undetectable
- On day 4, creatinine peaked at 7 mg/dL, hemodialysis initiated

Case 1

- Day 5 develops diffuse weakness
- Day 6 he became increasingly agitated, suffered an episode of respiratory arrest for which he was intubated
- Over days 9-12, he becomes unresponsive, increasingly hyporeflexic, with increasingly dilated pupils, dysconjugate gaze, roving eye movements, and decreasing DTRs

Case 1

- On day 13, loss of all brainstem and peripheral reflexes, no spontaneous movements
- EMG and nerve conduction studies demonstrated severe demyelinating neuropathy
- Family requested that all care be withdrawn

Fulminant ascending paralysis as a delayed sequela of diethylene glycol (Sterno) ingestion

Y. D. Rollins, C. M. Filley, J. T. McNutt, et al.

Neurology 2002;59;1460

Case 1

- Diethylene glycole
- Sterno, brake fluid, fog solution, wallpaper stripper, pharmaceuticals
- Founding father of the FDA
- Parent compound may be toxic
- Block and dialyze

Case 2

- 34y/o male reports drinking antifreeze in order to “get drunk”
- BAL = 342, Bicarb 22, Anion gap 11
- What do you do?

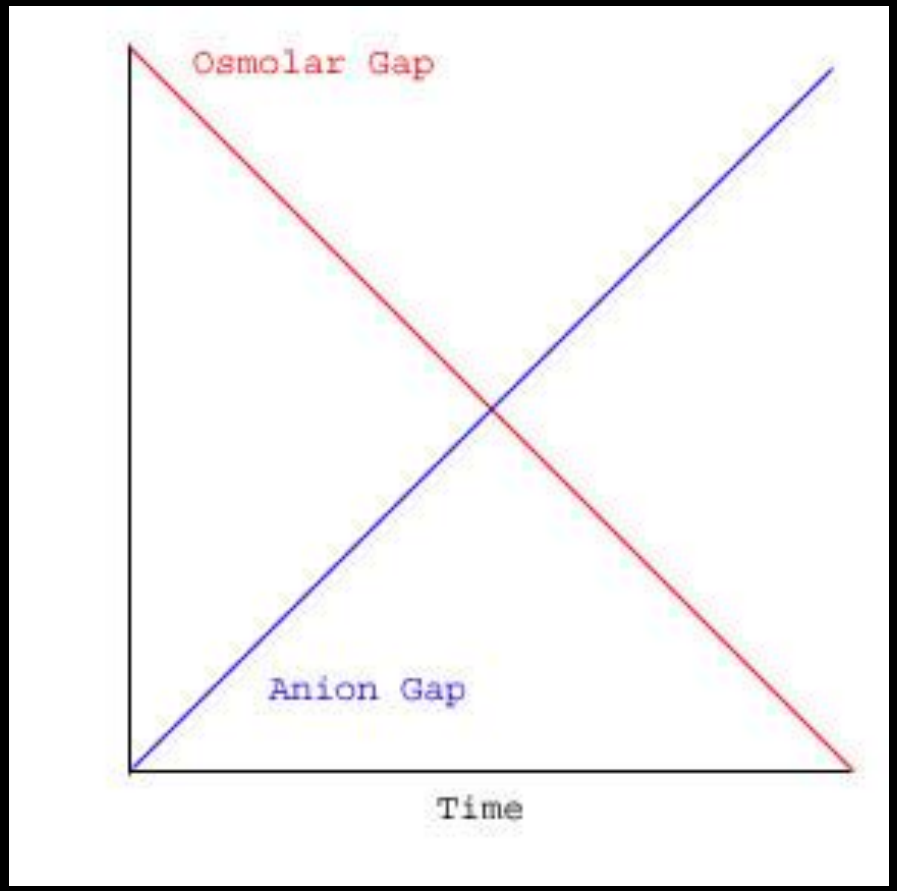
Case 2

- Physician observes patient until BAL = 0
- Bicarb 21, Anion gap 11
- Now what?

Case 2

- Physician DC'd pt to home
- Pt returns the next day
  - Acidotic
  - Renal failure
- What happened?

The Gaps



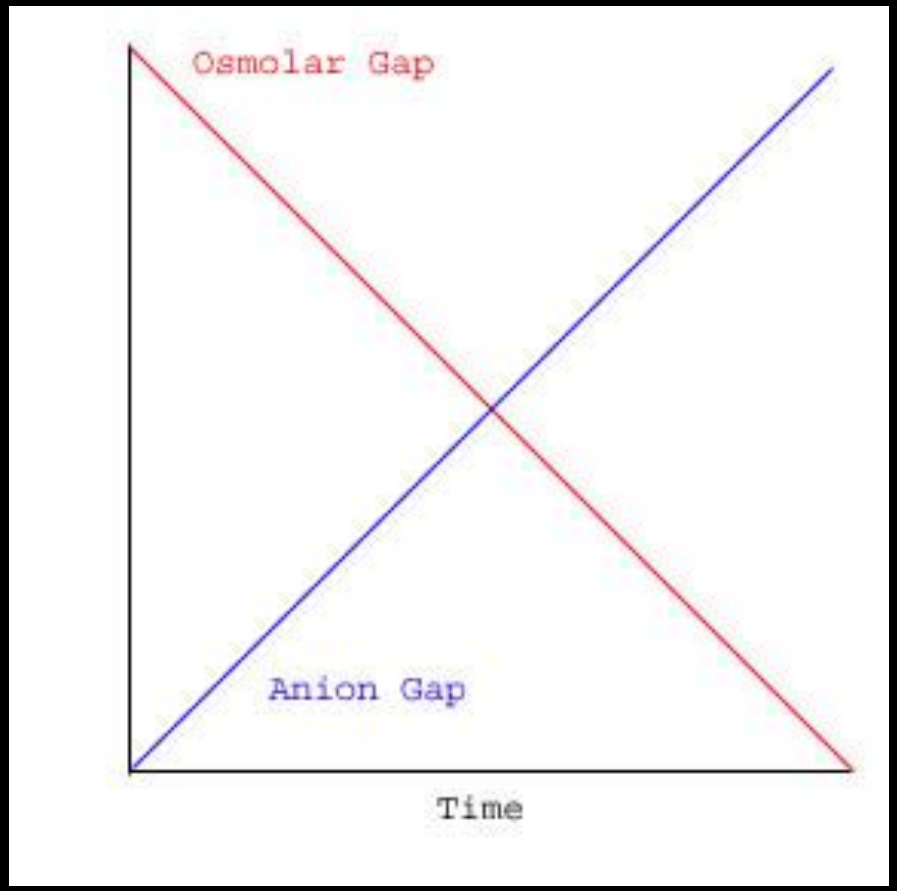
Case 2

- When, and only when, the BAL = 0
- Check bicarb q4 hours x
  - 8-12 hours for ethylene glycol
  - 12 hours for methanol

Other Mistakes

- Zebra hunting (AKA, DKA)
- No EtOH in osm gap
- AGMA w/ BAL=200
- Anion gap metabolic alkalosis?
- Really giving the patient their moneys worth out of their Jack Daniels

The Gaps



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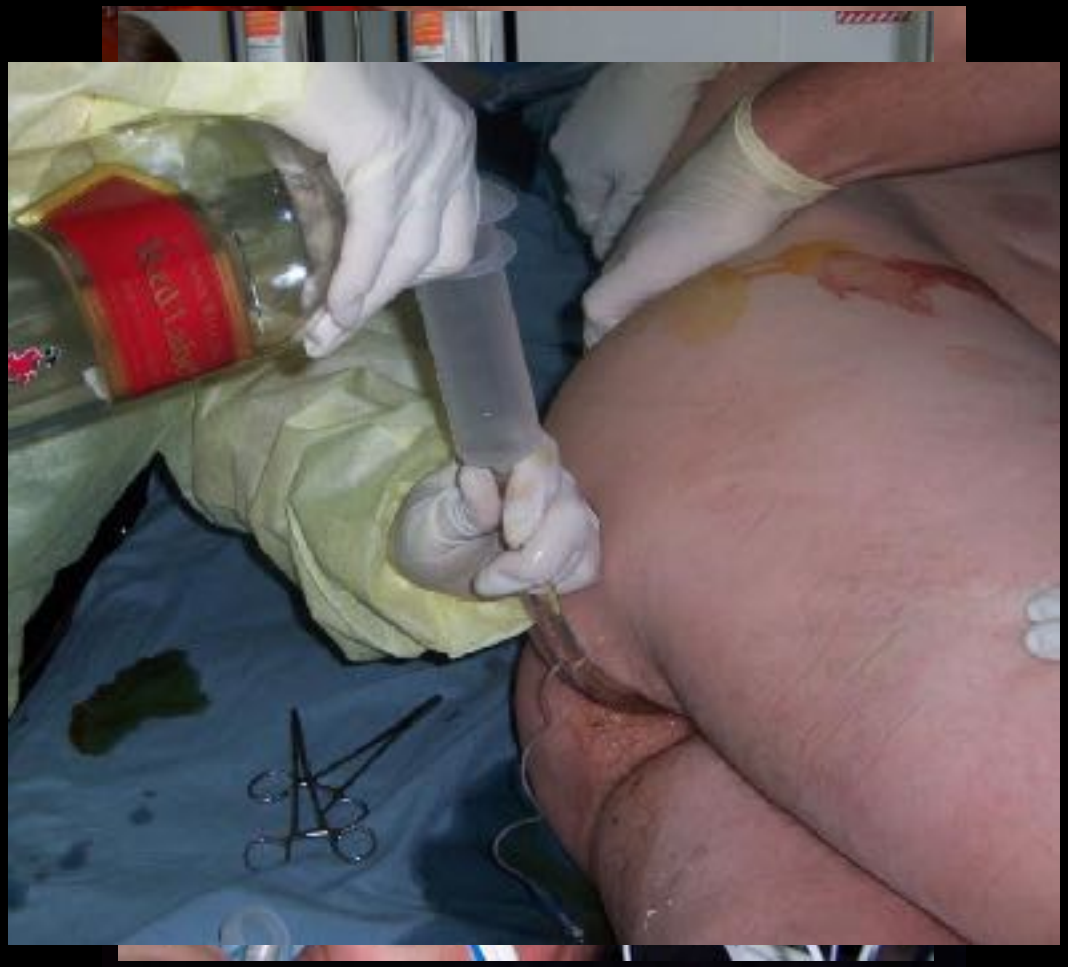
Don't Drink EG in Iraq



Case 3

- 30 yo male found altered at home
- EMS intubated in the field and bagged at a respiratory rate of 14
- Initial labs
  - pH 7.26
  - ASA 60 mg/dL

- What do you do?

ASA

- I FEAR ASA!!!!!!!!!
- You should FEAR ASA!!!!!!!!
- **Do not blow off ASA!!!!!!!!!!!**

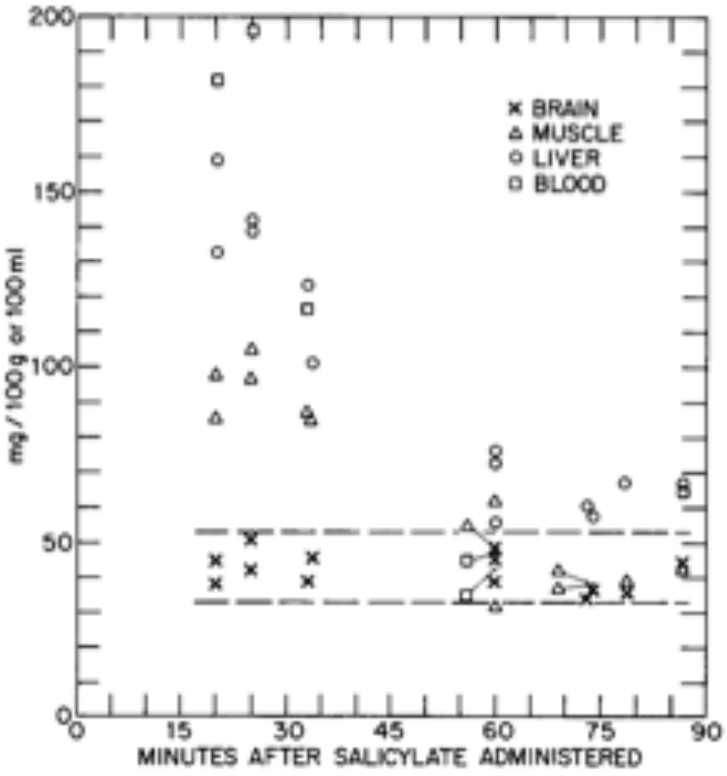
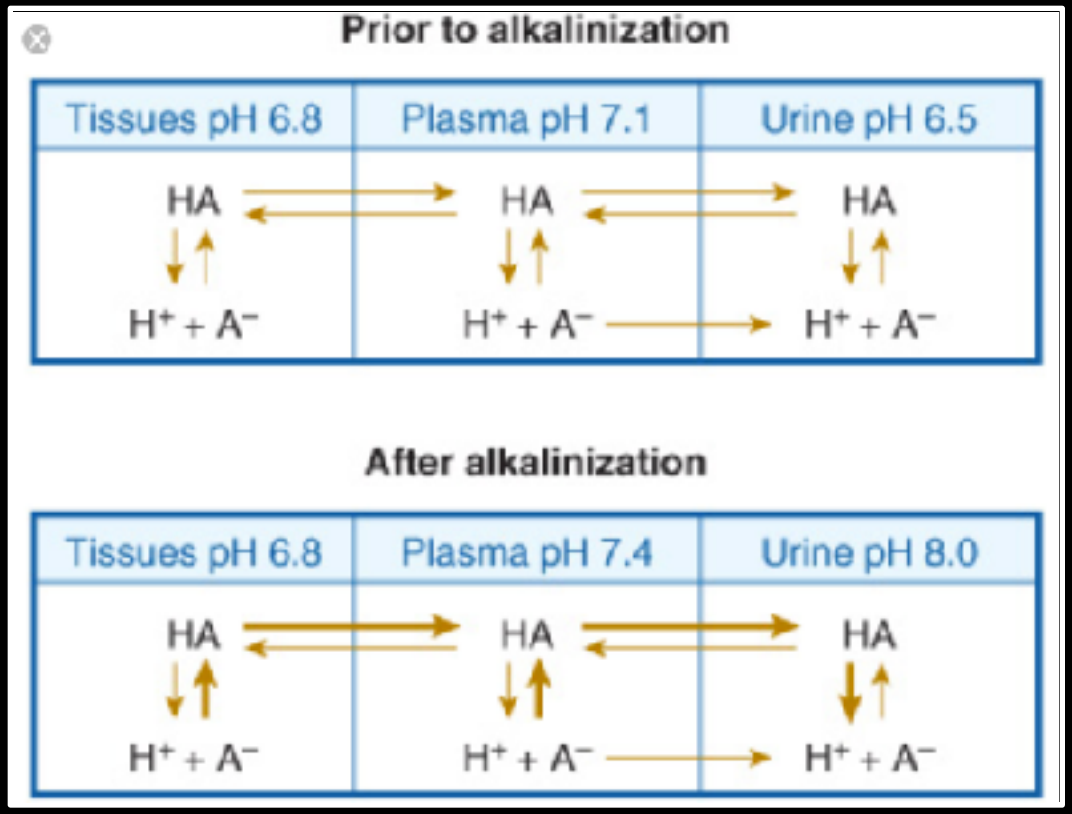


Figure 1. Post-Mortem Blood and Tissue Salicylate Levels Obtained from Rats as Soon as Possible after Death from Salicylate Overdoses.

The dashed lines include all the brain levels.

Hill JB. Salicylate intoxication. N Engl J Med. 1973 May 24:288(21):1110-3



Flomenbaum NE. Saliclylates. *Goldfrank's Toxicologic Emergencies*, Ninth Edition. McGraw-Hill.(2010-07-16)

Laboratory and Outcome Data on Salicylate-poisoned Patients Who Received MV

Patient	Peak ASA Concentration (mg/dL)	pH	PCO_2 (mm Hg)	Comments
1				
Pre-MV	143	NA	NA	Good outcome—received HD, alkalinization, and pressors
Post-MV		7.35	16	
2				
Pre-MV	122	7.47	20	Good outcome-received peri-intubation HD
Post-MV		7.30	53	
3				
Pre-MV	85	NA	NA	Death; ventilatory rate at 14/min with tidal volume of 600 mL
Post-MV		7.14	69	
4				
Pre-MV	84	7.42	26	Very poor neurological outcome; HD
Post-MV		7.14	66	
5				
Pre-MV	79	NA	NA	Death
Post-MV		6.79	71	
6				
Pre-MV	74.6	7.4	NA	Good outcome
Post-MV		7.11	NA	
7				
Pre-MV	67	7.47	24.7	Good outcome; no HD
Post-MV		7.25	67	

ASA = acetylsalicylic acid; HD = hemodialysis; MV = mechanical ventilation; NA = not applicable.

Stolback AI, et al. Mechanical ventilation was associated with acidemia in a case series of salicylate-poisoned patients. Acad Emerg Med. 2008 Sep;15(9):866-9

Case 3

- Pt's ventilator rate increased to 22-24/ min
  - ARDS Net
- Started on bicarb ggt
- Recommended repeat labs q1 hour
- Labs rechecked 3.5 hours later
  - pH 7.33, ASA 100mg/dL

Case 3

- Recommended vent rate of 30/min, large TV
- Recommended emergent dialysis
- Pt coded and died while physician was placing dialysis catheter

6 Fatal Errors of ASA

- “It’s just aspirin”
- 76 yo female w/ AMS, tachy = sepsis
  - 4 yo with AGE
- “But they don’t have an anion gap”
- Checking labs q6 hours
- Intubation = ARDS Net protocol
- “I started the bicarb” = pt is cured

Case 4

- 45 yo female presenting to the ED 30 minutes after taking 4800mg of verapamil ER and a “handful” of temazepam, nortiptyline, and Norco

- What do you want to do?
  - Charcoal, gastric lavage, whole bowel?
  - Ca, epi, HIE, intralipid, bypass/ECMO?

Case 4

- Pt lavaged and given AC x 2
- Pt asymptomatic/VSS at
  - 6 hours?
  - 8 hours?
  - 10 hours?

Case 4

- Pt treated with IVF
- At 12 hours s/p ingestion pt became hypotensive and bradycardic
- Treated with glucagon, calcium, norepi, and HIE (1 U/kg/hr)
- Cardiac arrest x 2, given intralipid
- Insulin titrated up to 6 U/kg/hr
- Pulmonary edema, resp failure, death

Case 4

- CCB Mistakes
  - Thinking you have a good antidote
    - Failure to decontaminate
  - Failure to transfer
  - Parking in the back hall
  - Saving HIE for when you have maxed out pressors
  - Starting HIE at 0.1 U/kg/hr

High Dose Insulin Euglycemia

- Initial dose: 1U/kg IV w/ 1-2 amps of D50
- Infusion: 1-10 U/kg/hr IV
- Avoid too much D5/ D10

Case 4

- CCB Mistakes
  - Premature dispo
  - Too much volume
  - Flogging with the pacemaker

Case 5

- A 67-year-old man w/ light-headedness, vertigo, stabbing chest pain, cough, chills and headache
- His wife had experienced similar ailments over the past week
- He was admitted, evaluated and discharged with a diagnosis of viral syndrome

Case 5

- Ten days later he returned to the ER with vertigo, palpitations and nausea but was sent home for outpatient follow-up
- Four days later he again returned to the ER with diarrhea and severe chest pain, collapsing to the floor
- Admitted to the CCU w/ MI

Case 5

- Routine ABG shows COHb = 15.6%
- Wife's COHb = 18.1%
- A rusted furnace was found to be the source

Carbon Monoxide

- Think about it
  - Headache
  - Flu like illness
  - N/V/D

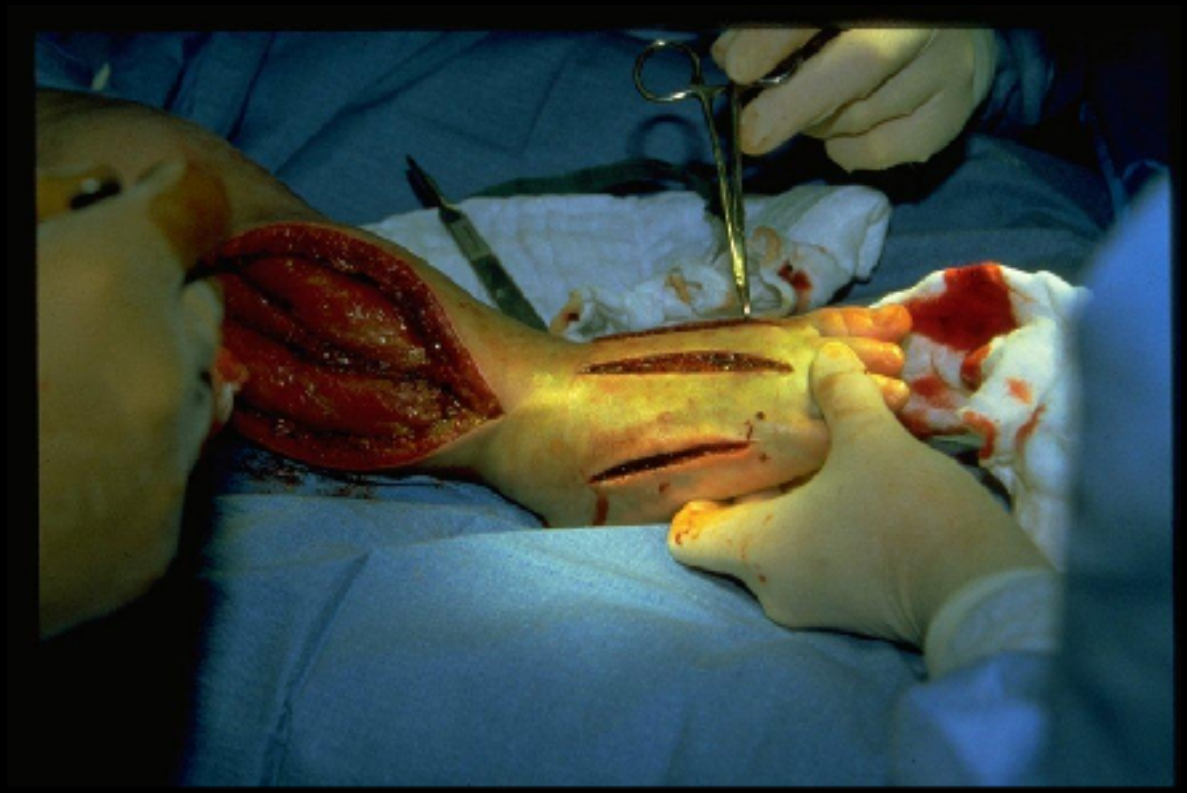
- Do you have a CO detector
- Generators, 2 stroke motors
- Check a level

Case 6

- 3 yo presents to ED w/ isolated puncture wound to the foot
- Mild allergic rxn
  - Dx w/ bee sting
  - Tx w/ diphenhydramine
  - DC'd after 2 hours of obs
- Returns to the ER, hypotensive, significant leg swelling

Case 6

- Dies despite antivenom and fasciotomy



Case 7

- 7 yo playing hide and seek, reports a brown snake bit him
  - Has a 1cm lac to his hand
  - Wound suture (given lidocaine w/ epi)
  - DC'd to home

- Pt vomited at home
- Arrested en route to ED

Snake Bites

- Maintain high index of suspicion
  - Don’t bank on 2 puncture sites
  - Obs for 8 hour minimum
  - Check coags

Case 8

- 3 yo male presents to the ED after found with open bottle of suboxone
- UDS negative for opiates
- Child asymptomatic

- What do you do?

Case 8

Opiate UDS

- Codeine
- Morphine
- Heroin

Long acting opioids

- Peds
- Adults requiring narcan

- Step 1) Turn your brain off
- Step 2) Admit to ICU

Case 9

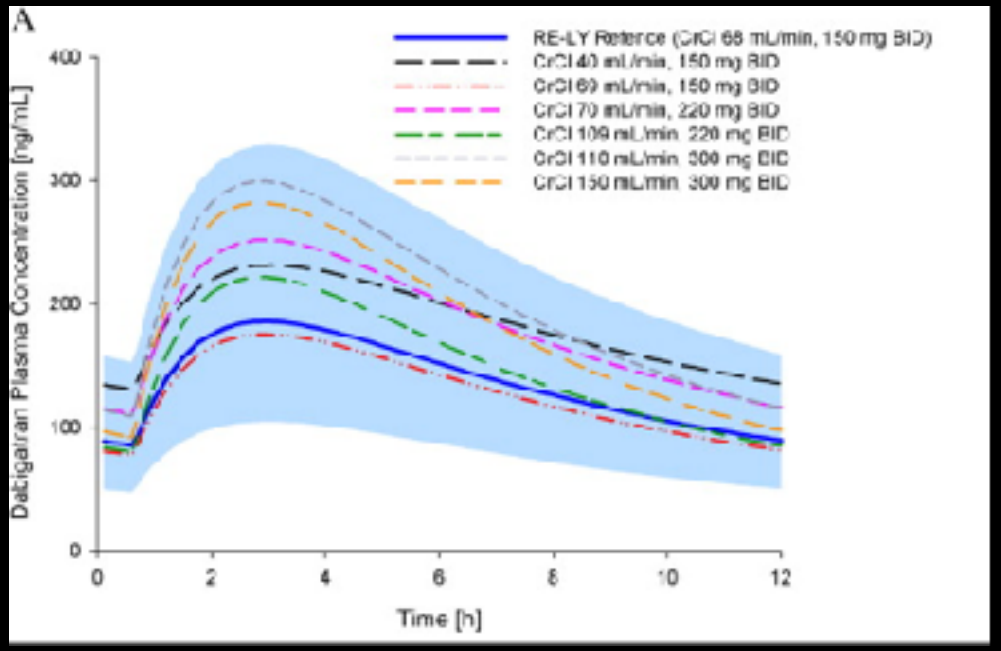
- 74 yo male w/ h/o A-fib w/ RVR, treated with dabigatran
  - Taking indomethacin for gout
  - Presents to ED for coffee-ground emesis, presumably from dental extraction, found to have Cr of 1.7, baseline 0.9
  - DC'd after tx

Case 9

- Returns to the ED 1 week later s/p 20 mL of hematemesis
  - INR = 11.9, PTT = 99
  - Despite therapy with FFP, PRBCs, PCC, rfVIIa, and dialysis, pt expires 2/2 GI bleed
- What did the first ED doc miss?

Dabigatran

- No reversal
- Renal elimination
- Gastritis



Case 10

- 65 yo female w/ HTN, HLP, and DM2
  - Presents to ED w/ 3 day h/o n/v/d
  - Cr = 2.1 (baseline 0.9)
  - Bicarb 9, AG 23, pH 6.9, lact 12
  - Walkie-talkie, no abdominal pain

- What's wrong?

Metformin Toxicity

- pH < 7.1 and alive = think tox
- Do not delay this diagnosis
- Treat for DKA
- Do not delay dialysis

Renal Elimination

- If you have a bump in the Cr
  - Check the med list
  - Adjust dosing/hold the medication
  - Call the pharmacist
  - Call the PCP

Case 11

- 2 yo F s/p ingestion of ammonium bifluoride
  - Presents to the ED after episode of vomiting
  - In ED child asymptomatic
  - ED doc want to DC
  - PCC recommends ICU admit
  - Pt arrests on the heli-pad

HF, NaF, [NH4][HF2]

- Minimal symptoms
- Hypocalcemia
- Sudden death

- Tx aggressively with calcium

Conclusion

- Toxic Alcohols
- Salicylate
- Verapamil
- Carbon Monoxide
- Snake Bites
- Urine drug screens
- Save the Kidneys
- Fluoride

Questions?