**Acid/Base Made Simple**

**Step 1:** Is there an anion gap? I look at this BEFORE ANY OTHER NUMBER!!! Because, if there IS INDEED an anion gap, then you 100% have an anion gap metabolic acidosis (AGMA). If you 100% have an AGMA, then your ddx is as follows - note, I do not like MUDPILES, bc M, I, and E are all alcohols and P is paraldehyde and who has ever even seen paraldehyde?

* Top 3 causes of AGMA are: lactic acidosis, ketoacidosis, and uremia
  + Uremia is the easiest to evaluate, just look at your BUN and decide renal failure vs GIB
  + Ketoacidosis is easy too, it's usually either DKA or starvation/EtOH ketosis
  + LA is a bit more complicated, it's either type A, B, or "D"
    - A is anything that causes hypoperfusion
    - B is anything that causes LA withOUT hyperperfusion (usually drugs esp metformin and IV lorazepam gtt, cancer esp lymphoma - see the Warburg phenomenon, or thiamine deficiency - see the importance of thiamine pyrophosphatase in oxidative phosphorylation!)
    - D is type D lactate, happens in short gut syndrome, LA will be negative, have to check a D-LA (enantiomer)
* If your patient is a drinker or came in "found down", consider alcohols, check an EtOH and serum Osm
* If your patient has elevated LFTs, or also came in "found down", or has an unexplained concomitant respiratory alkalosis, consider salicylate toxicity and check a level

**Step 2:** Is my patient more acidy or more alky than I would expect based on their anion gap? This is where the "delta/delta" comes into play, and this is when I actually look at the bicarb. All the "delta/delta" is, is comparing the difference between the change in bicarb and the change in anion gap. For these examples, 24 is normal bicarb, 12 is normal anion gap. This is what trips people up, but bear with me!!!

* If your decrease in bicarb is MORE than your increase in anion gap, then you're MORE ACIDY than you'd expect, thus you've also got a non-anion gap metabolic acidosis (NAGMA).
  + Ie, bicarb 6 (delta 24-6 = 18) with anion gap 18 (delta 18-12 = 6), delta bicarb > delta AG, thus NAGMA
  + Note, there's also a trick where you can add your DELTA AG to your bicarb and if it's below 24 you've got a concomitant NAGMA and if it's above 24 you've got a concomitant metabolic alkalosis. For this patient, delta AG is 6, plus actual bicarb (6), equals 12 --> which is < 24 so again, NAGMA!

**Acid/Base Made Simple (continued)**

* If your decrease in bicarb is LESS than your increase in anion gap, then you're MORE ALKY than you'd expect, thus you've also got a metabolic alkalosis.
  + Ie, bicarb 24 (delta 24-24 = 0), with anion gap 18 (delta 18-12 = 6), delta bicarb < delta AG, thus alkalosis
  + Using 2nd method above, delta AG is 6, plus actual bicarb (24), equals 30 --> which is >24 so alkalosis!
* If your decrease in bicarb is EQUAL to your increase in anion gap, then you've got a pure AGMA, and congrats, you are done.
* Ie, bicarb 18 (delta 24-18 = 6), with anion gap 18 (delta 18-12 = 6), delta bicarb = delta AG, PURE AGMA!

**Step 3:** Ddx for NAGMA and metabolic alkalosis is essentially the same, and it's just 5 things.

* Volume loss (GI) - diarrhea, ECF (acidosis) vs vomiting, NGT (alkalosis)
* Volume loss (renal) - acetazolamide (acidosis) vs loop diuretic ie Lasix (alkalosis)
* Iatrogenic - normal saline (acidosis) vs TUMS ie CaBicarb or AlkaSeltzer ie NaBicarb (alkalosis)
* Adrenal - low ie Addison's (acidosis) vs high ie Conn's (alkalosis)
* "3 weird things" - RTA 1, 2, 4 (acidosis) vs Bartter's, Liddle's, Gitleman's (alkalosis)