Seven ABG steps, by Alex Flaxman, MD, MSE

1. Calc A-a gradient = 150 – [1.25 x PaCO2] – PaO2
2. Alk or acid
3. 1° disturb resp or metab
4. if resp, ac or ch

    Expected pH chg

    ac resp acid pH decrease = .08(pCO2 – 40) / 10
    ch resp acid pH decrease = .03(pCO2 – 40) / 10
    ac resp alk pH increase = .08(40 – pCO2) / 10
    ch resp alk pH increase = .03(40 – pCO2) / 10

    Expected bicarb

    ↑ ac resp acid .1 (pCO2 – norm pCO2)
    ↑ ch resp acid .35 (pCO2 – norm pCO2) some say coefficient 0.4
    ↓ ac resp alk .2 (norm pCO2 –pCO2)
    ↓ ch resp alk .5 (norm pCO2 –pCO2)

    Can also use

    Resp acidosis Ac for ea 10 ↑ of pCO2, HCO3 ↑ by 1
    Ch for ea 10 ↑ of pCO2, HCO3 ↑ by 2
    Resp alk Ac for ea 10 ↓ of pCO2, HCO3 ↓ by 1
    Ch for ea 10 ↓ of pCO2, HCO3 ↓ by 5

Metab acid pCO2 = (1.5 x HCO3) + 8 ± 2

Another way: for ea 1 ↓ in bicarb from 24, pCO_2 ↑ by 1

Metab alk = for ea ↑ in HCO3 by 1, pCO2 ↑ by ½

5. If metab, is there an AG? Na – (Cl + HCO3)
    - For every 1 g/dL decrease in albumin below 4, the AG should be raised by 2.5 mEq/L
    - (this is generally not on med school- or residency-level exams)
6. If AG metab acidosis exists, is there another metab proc going on? Use δ-δ or corrected HCO_3.
7. δ/δ = chg in AG/ chg in HCO_3 = (AG-12)/(24-HCO_3)

    For med school- and residency-level exams:

    δ/δ > 1 → concurrent metab alk
    δ/δ < 1 → concurrent non-AG (hyperchloremic) metab acid

    < 0.4 then there is a concomitant hyperchloremic normal anion gap acidosis
    0.4-0.8 then consider combined high AG and normal AG acidosis but ratio is often < 1 in acidosis associated with renal failure
    1-2 is usual for uncomplicated high AG acidosis
    Lactic acidosis yields an average value of 1.6
    DKA yields value closer to 1 b/c of urine ketone loss (espec if pt not dehydrated)
    If > 1 or definitely 2 then concurrent metabolic alkalosis (maybe a pre-existing one?)

[corrected HCO3 = measured HCO3 + AG – 12]

-6 → mixed high and normal AG acidosis
-6 to 6 only a high AG acidosis exists
over 6 mixed high AG acidosis and metabolic alkalosis