

Steps for ABG analysis

- 3 cases -

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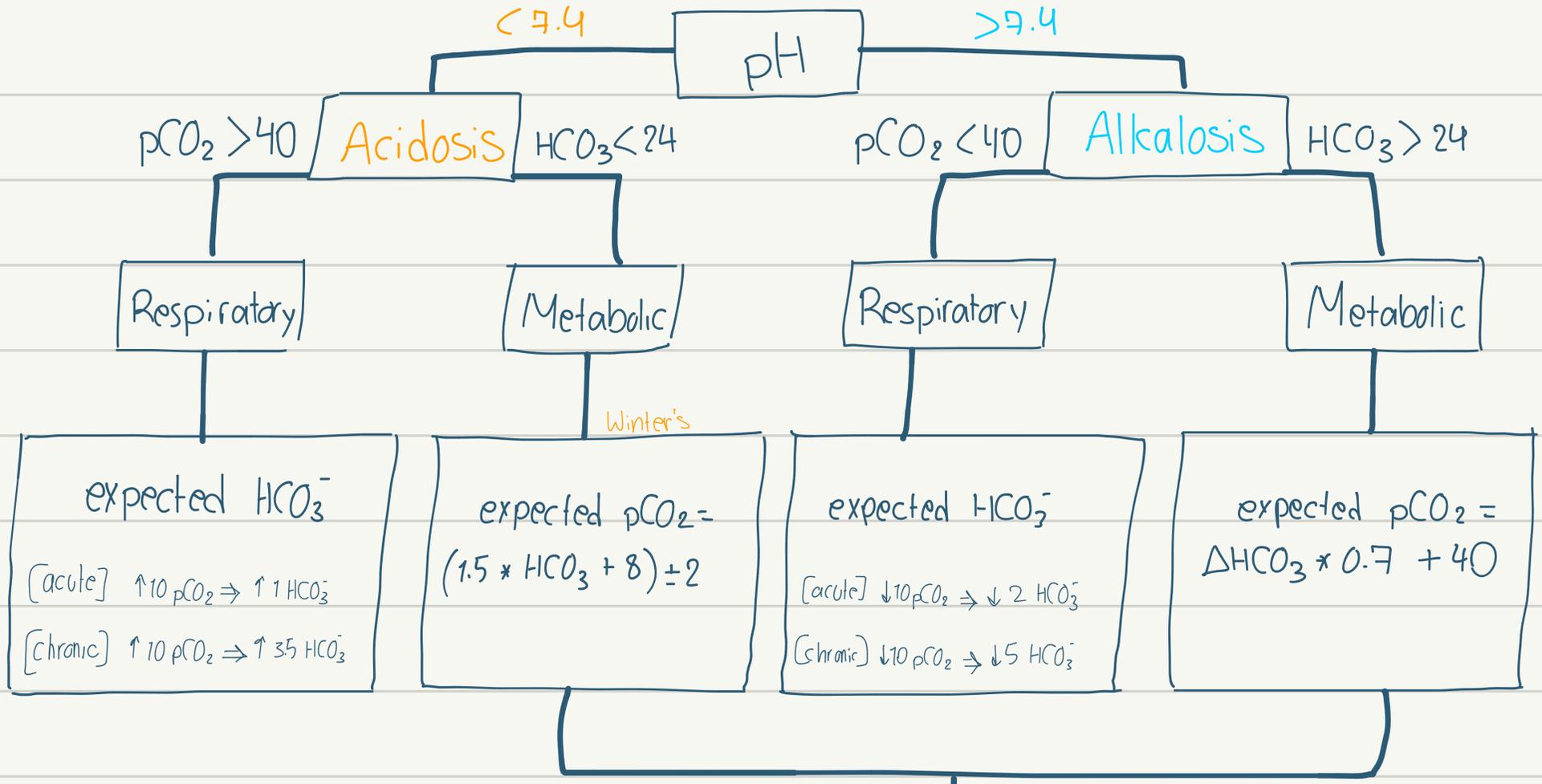
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Steps for ABG Analysis

- 1] What is the pH? $\begin{matrix} \text{acidosis} \\ \text{alkalosis} \end{matrix}$
- 2] What is the primary disorder present? $\begin{matrix} \text{metabolic} \\ \text{respiratory} \end{matrix}$
- 3] Is there appropriate compensation?
- 4] Compensation acute / chronic? [only in resp. disorders]
- 5] Is there an anion gap? سجل هو الابل!
- 6] Yes! check delta-delta gap
- 7] What is your differential for this clinical process?

Normal Values

• pH	7.35 - 7.45	7.4
• pCO ₂	35 - 45	40
• HCO ₃ ⁻	22 - 26	24
• AG	8 - 12	10
• Albumin	4	4



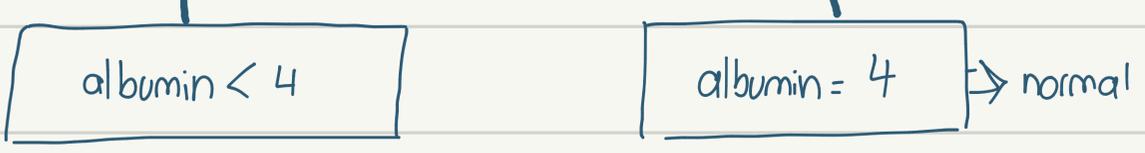
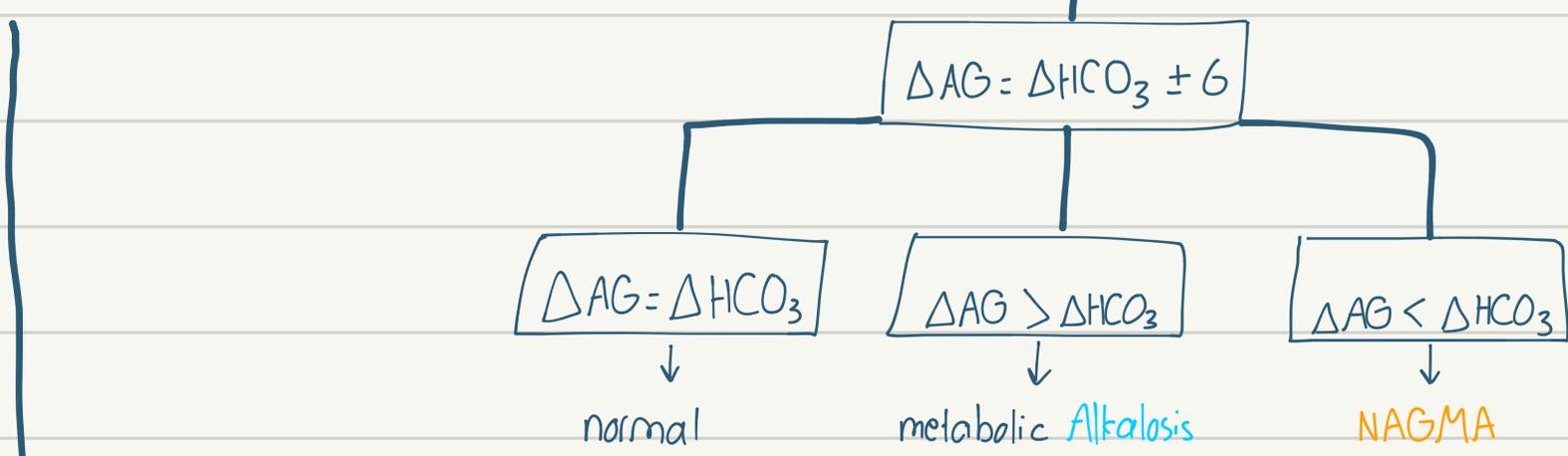
if expected pCO₂ > given → concomitant respiratory **Alkalosis**

if expected pCO₂ < given → concomitant respiratory **Acidosis**

if expected pCO₂ = given → NO underlying pathology

سواء ايجابي

AG = Na - Cl - HCO₃



corrected AG = Δalbumin * 2.5

- The End -

Example 1:

70 year old male smoker complains of acute onset

SOB you did an ABG with the results shown below:

$$\text{pH} = 7.3 \quad \text{pCO}_2 = 60 \text{ mmHg} \quad \text{Na} = 135 \quad \text{Cl} = 100 \quad \text{HCO}_3 = \underline{30}$$

acidosis

respiratory

* expected HCO_3

- acute $\uparrow 10 \text{ pCO}_2 \rightarrow \uparrow 1 \text{ HCO}_3 \Rightarrow \text{HCO}_3 = 24 + 2 = 26$

- chronic $\uparrow 10 \text{ pCO}_2 \rightarrow \uparrow 3.5 \text{ HCO}_3 \Rightarrow \text{HCO}_3 = 24 + 7 = 31$ chronic ✓

↳ chronic respiratory acidosis pH must be normal!

.. we have acute on top of chronic

* $\text{AG} = \text{Na} - \text{Cl} - \text{HCO}_3$

$$= 135 - 100 - 30 = \boxed{5} \downarrow$$

∴ check albumin levels to calculate corrected AG

* not given in the question *

Example 3:

65 y/o male with CKD presented with nausea, diarrhea and acute respiratory distress

- ABG: 7.23, 17, 235 on 50% VM
- BMP: Na=123 Cl=97 HCO₃=6 BUN=119 Cr=5.1

* acidosis

* metabolic

$$\begin{aligned} * \text{ expected } p\text{CO}_2 &= (1.5 * \text{HCO}_3 + 8) \pm 2 \\ &= 1.5 * 6 + 8 = \underline{16} \pm 2 \quad \checkmark \text{ compensation} \end{aligned}$$

$$* \text{ AG} = 123 - 97 - 6 = \boxed{20} \uparrow$$

∴ HAGMA

$$* \Delta \text{AG} \stackrel{?}{=} \Delta \text{HCO}_3 \pm 6$$

$$20 - 12 \stackrel{?}{=} 24 - 6$$

$$8 < 18 \pm 6$$

↳ HAGMA with appropriate compensation
and NAGMA

⊗ may be seen in cases of hypoalbuminemia

Example 4.

68 y/o man who recently took antibiotics for skin infection presented with 10 episodes of watery diarrhea for 5 days

• ABG: 7.34, 34, 80

• BMP: Na = 135 Cl = 108 HCO₃ = 18

‡ acidosis

‡ metabolic

$$\begin{aligned} * \text{ expected } p\text{CO}_2 &= (1.5 \times \text{HCO}_3 + 8) \pm 2 \\ &= 35 \pm 2 \quad \checkmark \text{ compensation} \end{aligned}$$

$$\dagger \text{ AG} = 135 - 108 - 18 = \boxed{9} \quad \checkmark \text{ normal}$$

↳ NAGMA with appropriate respiratory compensation

severe diarrhea from antibiotics

→ probably pseudomembranous colitis!

Example 5:

20 y/o student presented with excessive vomiting after binge drinking

• ABG : 7.5 , 44 , 100

• BMP : Na = 138 Cl = 100 HCO₃ = 30

• Urine Na = 10

≠ Alkalosis

≠ Metabolic

≠ expected pCO₂ = ΔHCO₃ + 0.7 + 40
= 44.2 ✓ compensation

≠ AG = 138 - 100 - 30 = 8 ✓ normal

↳ metabolic alkalosis with appropriate resp. compensation

Case 1

35 y/o man, DM, presented with diarrhea and cough
CXR showed infiltrations

• ABG: 7.31, 10, 67

• BMP: Na=123, Cl=99, HCO₃=5

* acidosis

* metabolic

* expected pCO₂ = (1.5 * HCO₃ + 8) ± 2

$$= 15.5 \pm 2 > 10$$

no compensation = respiratory alkalosis

$$* AG = 123 - 99 - 5 = \boxed{19} \uparrow$$

∴ HAGMA

$$* \Delta AG \stackrel{?}{=} \Delta HCO_3 \pm 6$$

$$19 - 12 \stackrel{?}{=} 24 - 5$$

$$7 < 19 \rightarrow \text{NAGMA}$$

↳ HAGMA with respiratory alkalosis & NAGMA



DKA / lactic acidosis



pneumonia



due to diarrhea

- The End -