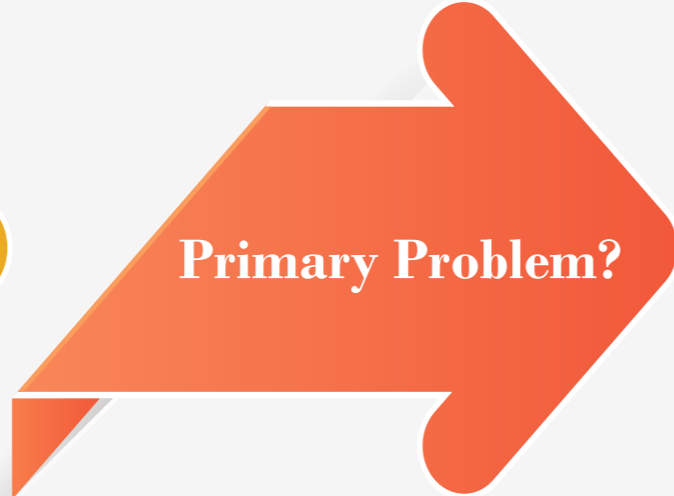
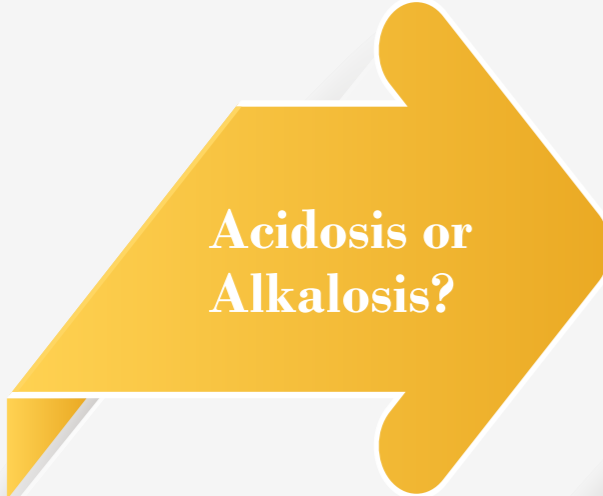




Stepwise Approach to Acid-base Disorders



pH?

$[H^+] = 10^{(9-pH)}$
 If {
 $[H^+] \approx \frac{24(PaCO_2)}{[HCO_3^-]}$
 }
 then pH is valid

< 7.35
Acidemia

> 7.45
Alkalemia

01

HCO₃ & PaCO₂?

Respiratory Acidosis
↑PaCO₂

Respiratory Alkalosis
↓PaCO₂

Metabolic Acidosis
↓HCO₃

Metabolic Alkalosis
↑HCO₃

02

Expected PaCO₂, pH, & HCO₃

	Δ PaCO ₂ *	Δ pH	Δ HCO ₃ **
Acute	↑ 10	↓ 0.07	↑ 1
Chronic	↑ 10	↓ 0.03	↑ 3-4
Acute	↓ 10	↑ 0.08	↓ 2
Chronic	↓ 10	↑ 0.03	↓ 5

HCO₃ < expected HCO₃: combined **metabolic acidosis**
 HCO₃ > expected HCO₃: combined **metabolic alkalosis**

PaCO₂ = (1.5 * [HCO₃]) + 8 ± 2

PaCO₂ = 0.7 * ([HCO₃] - 24) + 40 ± 2

PaCO₂ > expected PaCO₂: combined **respiratory acidosis**
 PaCO₂ < expected PaCO₂: combined **respiratory alkalosis**

03

Anion Gap?

AG = Na⁺ - (Cl⁻ + HCO₃⁻)

Hypoalbuminemia?
 Add 2.5 meq/L for each 1 gm/dL drop in albumin

- ↑ AG
Added acid:
 Methanol
 Uremia
 Diabetic ketoacidosis
 Paraldehyde/propylene glycol
 Iron/pyroglutamate/Isoniazid/
 Inborn errors of metabolism
 Lactic acid
 Ethanol
 Salicylates

- ↔ AG
HCO₃ Loss:
 Renal
 GI
HCO₃ Dilution

04

Δ Δ?

Δ AG compared to Δ HCO₃⁻

- Δ AG = Δ HCO₃⁻
No other metabolic abnormality coexists
- Δ AG > Δ HCO₃⁻
Metabolic alkalosis coexists
- Δ AG < Δ HCO₃⁻
Non AG Metabolic acidosis coexists

05

* Change of PaCO₂ from 40 mm Hg
 **Change of HCO₃ from 24 mEq/L
 Use serum total CO₂ for HCO₃ value