



RC-178

ABG Interpretation

1. Decide on Acidity vs Alkalinity
2. Determine Primary Cause
3. Determine complication vs compensation.

Acids & Bases

Chemist vs Clinician

- pH = negative log of the hydrogen ion concentration.
- Acid = hydrogen ion donor.
- Base = hydrogen ion acceptor.
- pH = how we tell if patient's blood is acidotic or alkalotic.
- acid = substance that makes pH go down if added to blood.
- base = makes pH go up if added to blood.

pH Chemist vs Clinician

- $\text{pH} = \text{pK} + \log$ of the H^+ concentration.
- $\text{pH} = 6.1 + \log 20/1$
- $\text{pH} = 6.1 + 1.3$
- $\text{pH} = 7.40$
- pH is proportional to metabolic component over the respiratory.
- $\text{pH} = \text{met./resp.}$
- $\text{pH} = \text{Kidney/lungs}$
- $\text{pH} = \text{HCO}_3/\text{PaCO}_2$

Acids and Bases

- PaCO₂ is an acid.
- PaCO₂ is controlled primarily by respiratory system.
- Minute alveolar ventilation is the way we manipulate the PaCO₂ directly.
- HCO₃ is a base.
- HCO₃ is controlled primarily by the metabolic system. (the Kidney)
- Control of HCO₃ or base excess is how we manipulate the HCO₃ level.

Normals for ABGs

Arterial vs Venous

- pH= 7.38 -- 7.42
 - PaCO₂ = 38 -- 42
 - HCO₃ = 22 -- 26
 - Base = -2 -- +2
 - PaO₂ = 95
 - Age corrected, for each year over 20 subtract .4 from 95.
 - Sat% = 97
- pH= 7.32 -- 7.36
 - PaCO₂ = 43 -- 47
 - HCO₃ = 20 -- 24
 - PaO₂ = 40
 - Sat% = 75
 - Basically should be more acid than the patient would show in arterial blood.

Equations to remember:

- PaCO₂ is proportional to:
 - CO₂ production / Minute Alveolar Ventilation
 - See illustration...
- pH is proportional to:
 - HCO₃ / PaCO₂
- $V_A = V_t - V_d \times RR$
 - 500 - 150 x 12

Interpretation Guide

- Check pH 1st and classify as acidosis or alkalosis.
- pH must be out of the normal range.
- The body does not normally overcompensate.
- Look for primary cause of pH abnormality.
- Look at other factor in pH balance for normal?, compensation?, or complication.

Practice:

- pH = 7.60
- PaCO₂ = 55
- HCO₃ = 15
- Base = -10
- PaO₂ = 95
- Sat % = 97



Practice:

- Respiratory Alkalosis with no metabolic compensation.
- Decrease HCO_3 to compensate.
- Decrease minute alveolar ventilation to correct pH.
- $\text{pH} = 7.50$
- $\text{PaCO}_2 = 30$
- $\text{HCO}_3 = 24$
- $\text{Base} = -1$
- $\text{PaO}_2 = 100$
- $\text{Sat}\% = 98$

Practice:

- Respiratory Acidosis with no metabolic compensation.
- Increase HCO_3 to compensate.
- Increase minute alveolar ventilation to correct pH.
- $\text{pH} = 7.29$
- $\text{PaCO}_2 = 56$
- $\text{HCO}_3 = 25$
- $\text{Base} = +1$
- $\text{PaO}_2 = 80$
- $\text{Sat}\% = 92$

Practice:

- Metabolic Acidosis with no respiratory compensation.
- Increase minute alveolar ventilation to compensate pH.
- Increase HCO_3 to correct pH.
- $\text{pH} = 7.27$
- $\text{PaCO}_2 = 39$
- $\text{HCO}_3 = 14$
- $\text{Base} = -11$
- $\text{PaO}_2 = 100$
- $\text{Sat}\% = 98$

Practice:

- Metabolic Alkalosis with no respiratory compensation.
- Decrease minute alveolar ventilation to compensate pH.
- Decrease HCO₃ to correct pH.
- pH = 7.51
- PaCO₂ = 42
- HCO₃ = 32
- Base = +11
- PaO₂ = 100
- Sat% = 98

Practice:

- Metabolic and Respiratory Acidosis.
- Increase minute alveolar ventilation and increase HCO_3^- to correct pH.
- $\text{pH} = 7.23$
- $\text{PaCO}_2 = 52$
- $\text{HCO}_3^- = 14$
- $\text{Base} = -12$
- $\text{PaO}_2 = 80$
- $\text{Sat}\% = 92$

Practice:



- pH = 7.25
- PaCO₂ = 35
- HCO₃ = 29
- Base = +10
- PaO₂ = 95
- Sat % = 97

See ABG Drill Program

- Developed by RCP
- Values come up, you check classification.
- Note the scale he is using for normals and moderate, severe hypoxemia.
- Get ABG's from your patients and then classify, ask instructors for feedback or bring to class.



End of ABG Review

Take a 10 minute break!