

ABG Steps

1. Check pH
 - a. $\text{pH} < 7.4 = \text{Acidosis}$
 - b. $\text{pH} > 7.4 = \text{Alkalosis}$
 - c. $\text{pH} = 7.4 = \text{normal or mixed disorder}$
2. Compare pCO_2 and HCO_3 (bicarb on BMP panel is more accurate than ABG)
 - a. Determine if primary disorder is respiratory or metabolic
 - i. If pCO_2 or HCO_3 are high = respiratory acidosis OR metabolic alkalosis
 - ii. If pCO_2 or HCO_3 are low = respiratory alkalosis OR metabolic acidosis
 1. In acutely ill patients a low bicarb should be considered metabolic acidosis! Skip to step 4 to check for a gap.
 - iii. If pCO_2 and HCO_3 move in opposite direction = a mixed disorder is present
3. Calculate Compensation
 - a. pH changes by 0.08 for every 10 mmHg pCO_2 change in either direction
 - i. In ACUTE situations only...DO NOT USE IT IN CHRONIC CASES. Usually, in chronic situations pH corrects/compensates to normal
 - b. Acute Respiratory Acidosis: 1 for 10 rule (1 mEq HCO_3 change for 10 mmHg pCO_2)
 - c. Acute Respiratory Alkalosis: 2 for 10 rule (2 mEq HCO_3 change for 10 mmHg pCO_2)
 - d. Chronic Respiratory Acidosis: 4 for 10 rule (4 mEq HCO_3 change for 10 mmHg pCO_2)
 - e. Chronic Respiratory Alkalosis: 5 for 10 rule (5 mEq HCO_3 change for 10 mmHg pCO_2)
 - f. Metabolic Acidosis: **Winter's Formula** = $(1.5 \times \text{HCO}_3) + 8 \pm 2$
 - g. Metabolic Alkalosis: $0.7 \times \text{HCO}_3 + 20 \pm 5$ (rarely used)
4. Compare Calculated to Real Anion Gap
 - a. **Calculated AG** = $(\text{Na}) - (\text{Cl} + \text{HCO}_3)$
 - b. **Real AG** = $(2 \times \text{albumin}) + (0.5 \times \text{phosphate}) \pm 2$
 - i. Alternatively, Real AG = $3 \times \text{albumin}$
 - c. If calculated AG > real AG = high anion gap acidosis is present
 - i. MUDPILES: Methanol, Uremia, DKA, Propylene Glycol (a solvent in drugs like Ativan and Phenytoin), Iron/Isoniazid, Lactate, Ethanol/Ethylene Glycol, Salicylate/Starvation
5. Calculate **Delta Gap** = $(\text{calculated AG} - \text{real AG}) + \text{HCO}_3$
 - a. If sum < 24 = NAGMA present
 - i. NAGMA: usually RTA, diarrhea, hyperchloremia
 - b. If sum > 24 = additional metabolic alkalosis present
 - i. Metabolic Alkalosis: GI losses, NG suction, diuretics, potassium depletion, Cushing's, or Bartter Syndrome
6. Additional differentials
 - a. Respiratory acidosis: CNS depression, hypoventilation, opioids, pulmonary issues (\uparrow dead space)
 - b. Respiratory Alkalosis: CNS stimulation, pain, agitation, drugs, hypoxia, sepsis, pregnancy, liver failure, thyroid problems