Acid base disorders

Steps for interpretation:
1. Acidemia or Alkalemia?
2. Respiratory or Metabolic?
3. Compensated? Acute or chronic?
4. Anion gap? Delta-delta?
5. Differentials?

ABG and BMP Normal values
- pH: 7.35-7.45
- PaCO2: 35-45 mmHg
- PaO2: 80-100 mmHg
- HCO3 (on BMP): 22-26 mmol/L

Step 1: pH < 7.35 = Acidemia
> 7.45 = Alkalemia

Step 2: Expected HCO3 (BMP) = 24 - (PaCO2 - 40) / 10

Step 3:
<table>
<thead>
<tr>
<th>Metabolic compensation</th>
<th>Respiratory acidosis</th>
<th>Respiratory alkalosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute</td>
<td>Chronic</td>
<td>Acute</td>
</tr>
<tr>
<td>24 + (PaCO2 - 40) / 10</td>
<td>X 1</td>
<td>24 + (PaCO2 - 40) / 10</td>
</tr>
<tr>
<td>Expected pH</td>
<td>7.4 - (PaCO2 - 40) / 10 X 0.008</td>
<td>7.4 - (PaCO2 - 40) / 10 X 0.003</td>
</tr>
</tbody>
</table>

Step 4: Anion Gap (AG) = {Na – (Cl + HCO3)}
- Normal = 12 +/- 2
- Corrected Anion Gap = AG + 2.5(4-albumin)
- Delta: Delta = AG - 12 / 24-HCO3

Step 5:
Causes of High Anion Gap Metabolic acidosis
- Glycol’s - ethylene glycol “antifreeze” and propylene glycol (present in IV benzodiazepines)
- Oxoproline (associated with acetaminophen dosing)
- L-lactate (common form of lactate)
- D-lactate (short bowel syndrome, intestinal bacterial overgrowth, propylene glycol)
- Methanol
- Aspirin (salicylates)
- Renal failure (uremia)
- Ketoacidosis (starvation, diabetic)

Causes of Normal Anion Gap Metabolic acidosis
- Diarrhea
- Vomiting, NG suction
- Renal tubular acidosis/Chronic renal failure
- Volume depletion (diuresis)
- Mineralocorticoid excess
- Adrenal insufficiency
- Rapid saline infusion
- Acetazolamide

Causes of Respiratory acidosis
- CNS depression (sedation, narcotics, CVA)
- Neuromuscular weakness (GBS, Myasthenia gravis)
- Obstructive or restrictive lung disease (COPD, OSA, Asthma, Obesity hypoventilation)
- Airway obstruction (foreign body, aspiration)