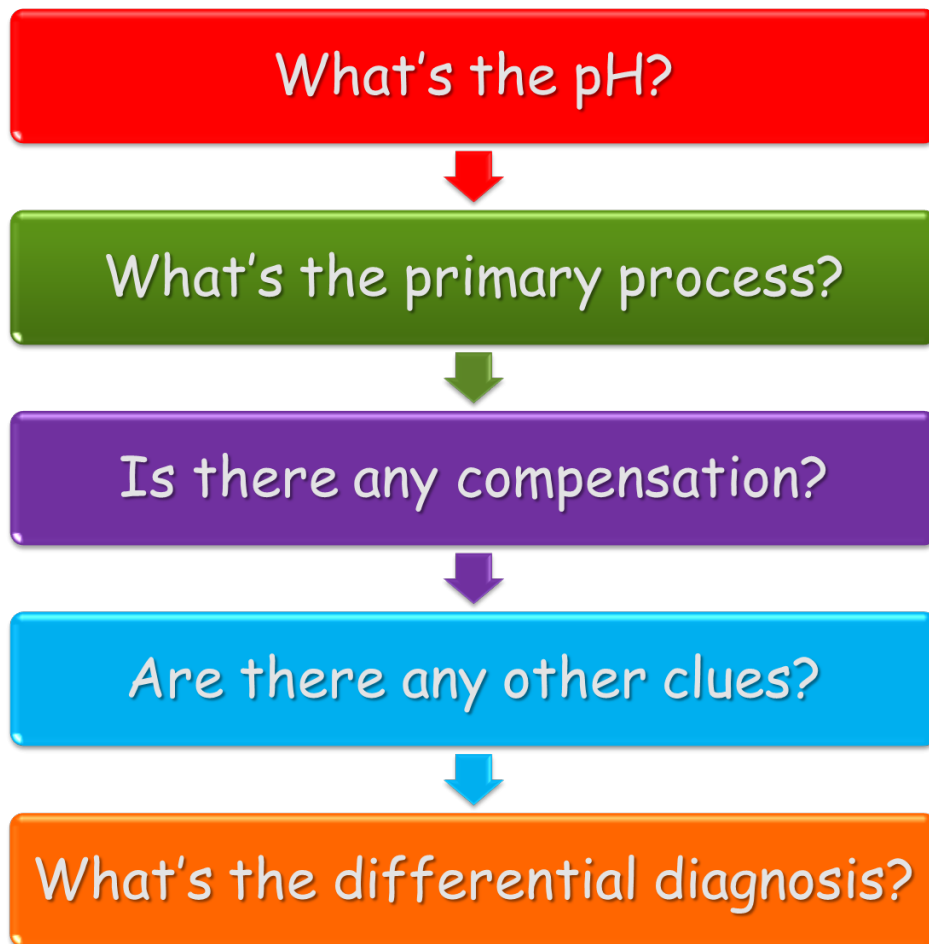


Blood Gas #5

History: A 67-year-old man presents with respiratory distress. Below is his arterial blood gas on arrival:

pH 7.31	Na 142 mmol/L
pCO ₂ 107 mmHg	K 4 mmol/L
pO ₂ 47 mmHg (FiO ₂ 0.21)	Cl 89 mmol/L
HCO ₃ 52 mmol/L	Glucose 10 mmol/L

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What's the pH?

7.31 = acidaemia

What's the primary process?

pCO₂ = 107

∴ this is a primary respiratory acidosis

Is there any compensation?

Acute respiratory acidosis: 1 for 10 rule

Expected HCO₃ = 24 + (measured pCO₂ – 40)/10

= 24 + (107 – 40)/10

= 30.7

Chronic respiratory acidosis: 4 for 10 rule

Expected $\text{HCO}_3^- = 24 + 4((\text{measured } \text{pCO}_2 - 40)/10)$

$= 24 + 4((107 - 40)/10)$

$= 50.8$

Actual HCO_3^- is 52, which is consistent with a chronic, maximally-compensated acute-on-chronic respiratory acidosis.

Are there any other clues?

Electrolyte clues:

Chloride is low, glucose mildly elevated, sodium and potassium within normal limits.

Expected $\text{PAO}_2 = 150 - (\text{pCO}_2 \times 1.25)$

$= 150 - (107 \times 1.25)$

$= 16.25$

A-a gradient = $\text{PAO}_2 - \text{PaO}_2$

$= 16.25 - 47$

$= -30.75$

Therefore there is no A-a gradient.

What's the differential diagnosis?

Description: This arterial blood gas shows a maximally-compensated acute-on-chronic respiratory acidosis. The chloride is low, contributing to the metabolic compensation, and glucose is mildly elevated.

Interpretation: In this clinical context, this arterial blood gas is consistent with an acute exacerbation of chronic obstructive pulmonary disease, with chronic, severe carbon

dioxide retention. Management may include intravenous antibiotics, inhaled/nebulised bronchodilators, non-invasive positive pressure ventilation (bilevel positive airway pressure/BPAP), and a titrated fractional inspired oxygen concentration targeted to a peripheral capillary oxygen saturation of 88 – 92%.

Additional information: Infective exacerbation of COPD. “Normal” pCO₂ is approximately 60 mmHg when “well”.