SAQ - Dr John Larkin - Joondalup Health Campus WA

SAQ 6

An 84 year old man is brought to your emergency department following a high speed car accident. He has signs of multiple left rib fractures. Two hours after arriving in the emergency department he becomes more breathless and distressed.

His observations are:

- GCS 14
- HR 75 bpm
- BP 100/60
- RR 24

An arterial blood gas is performed

			Reference Range
pH	7.14		(7.35-7.45)
pCO_2	60	mmHg	(35-45)
pO_2	114		
HCO_3^-	17	mmol/L	(21-28)
Lactate	1.4	mmol/L	(< 2.0)
FiO_2	50	%	
Na^+	139	mmol/L	(135-145)
K^+	4.8	mmol/L	(3.2-4.3)
Cl^-	116	mmol/L	(99-109)
Glucose	11.3	mmol/L	(3.0-6.0)

a. Calculate the patient's A-a gradient and show the formula/s used in the calculation (3 Marks)

1 Mark for each of the two formulas and 1 mark for A-a gradient calculation

Formulas:
A-a gradient = pAO_2 - paO_2
PAO_2 = FiO_2 x (P_{atm} - P_{H2O}) - pCO_2 / 0.8 or PAO_2 = FiO_2 x (P_{atm} - P_{H2O}) - 1.25 x pCO_2

Calculation:
$PA0_2$ = 0.5 x (760 - 47) - 60 / 0.8 = 0.5 x 713 - 75 = 356.5 - 75 = 281.5
A-a gradient = 281.5 - 114 = 167.5 (Accept 160-175)

b. Calculate the patient's expected pCO_2 and show the formula/s used (2 Marks)

1 Mark for correct formula and 1 mark for correction calculation

> *Expected pCO_2 = Winter's formula = 1.5 x HCO_3^- + 8 (+/- 2)*
>
> *Calculation = 1.5 x 17 + 8 = (+/- 2) = 16.5 (Accept 14-19)*

c. Calculate the patient's expected HCO_3^- increase assuming all changes are acute, show the formula/s used (2 Marks)

1 Mark for correct formula and 1 mark for correction calculation

> *Acute respiratory acidosis - Every 10mmHg increase in pCO_2 the HCO_3^- should increase by 1 mmol/L*
>
> *pCO2 increase by 20 (+/- 5) expected HCO_3^- increase of 1.5-2.5*

d. List 6 potential causes of the patient's ABG results (3 Marks)

1/2 Mark each for any 6 from:

- *Causes of raised A-a gradient / respiratory acidosis*
  - *Rib #*
  - *Flail segment*
  - *Pulmonary contusion*
  - *Haemothorax*
  - *Pneumothorax*
  - *Tension pneumothorax*
  - *Drugs*
  - *Pre-existing lung disease e.g. CAL*
- *Causes of metabolic acidosis (normal anion gap, AG = 6)*
  - *Fluid resuscitation - note hyperchloraemia*
  - *Others not likely given stem such as GI loss, drugs, endocrine, RTA*

Question adapted from FACEM VAQ question 2011.1.8