

1. Lead examiner

Candidate No:

2. Co-examiner

Final Mark:

A 4 year old boy presents with a 2-day history of increasing nausea, vomiting and epigastric pain. Some of his preliminary results are depicted below:

pH	7.08		(7.35 – 7.45)	Na ⁺	140	mmol/L	(134 – 146)
pCO ₂	30	mmHg	(35 – 45)	K ⁺	4.1	mmol/L	(3.4 – 5)
pO ₂	135	mmHg	(80 – 95)	Cl ⁻	100	mmol/L	(98 – 106)
HCO ₃	10	mmol/L	(22 - 28)	Creatinine	160	mcmol/L	(50 – 100)
Base excess	- 20		(- 3 to +3)	Urea	20	mmol/L	(3 – 8)
O ₂ sats	98%		(>95)	Lactate	4.7	mmol/L	(<1.3)

Question 1: Describe and interpret the results (included in stem). 1.5 min

Expected Response	Details & Comments	
Severe acidaemia	Mixed metabolic with inadequate respiratory compensation. Expected PCO ₂ is approx 20 - some hypoventilation	
Anion gap	140 - (100 + 10) = 30 = elevated (allow some variation in actual number)	*
A-a gradient	Unable to determine without FiO ₂	
Renal function	Significantly deranged creatinine and elevated urea → pre renal issue predominantly Likely total body K ⁺ deficit	
Severe elevated anion gap met (and resp) acidosis. Critically unwell child. Candidate should outline a reasonable differential for a wide AG metabolic acidosis		*
Differentials	DKA : needs serum glucose. If high, has implications for serum Na. Dehydration Pre renal impairment Lactic acidosis → Infection/↓ tissue perfusion Other: toxic alcohols, iron, isoniazid, pyroglutamic acidosis from paracetamol repeated doses, salicylates	2+1

Question 2: The serum glucose result is 40 mmol/l. Outline the key management principles in this patient. 2.5 min

Expected Response	Details & Comments	
Paediatric Resus	Get help. Team response. Assume leadership. Delegate tasks. Assign staff to support parent(s).	
Fluid Management	On average – water deficit will be 100ml/kg (or accept around 10% dehydrated) Sodium deficit 7 – 10mmol/kg	
Adjuncts - IDC	Weight likely 15-20 kg Initial resus should be with 0.9% saline then move to ½ normal saline (maintenance) Likely will require 2 x 10ml/kg boluses of 0.9% saline in the first 30 minutes then rest of deficit plus maintenance should be calculated and replaced more slowly over 48 hours .. Rough aim → replace 50% water deficit over first 12 hours, and next 50% water deficit over 12 – 24 hours. Key is to avoid rapid fluid overreplacement - risk cerebral oedema	*
Insulin	Commence infusion 0.1 units/kg/hr Once glucose <15mmol/L commence dextrose in fluid replacement Continue insulin until ketonaemia has cleared and anion gap has normalised	*
Potassium replacement	K⁺ replacement is invariably needed in DKA – often K ⁺ deficit → 3-5mmol/kg Rough guide = initial serum K ⁺ level >3.3mmol/l and <5.0mmol/l with adequate urine output calls for 10mmol KCl every hour for at least 4 hours.	*
Identify and treat any precipitants	Infection – pneumonia; UTI Meningitis	*
Other	Endocrine input; explanation and support for parent(s)	
Disposition	HDU or ICU. Regular monitoring, esp of gluc and K ⁺	

Question 3. You are urgently called back to the resuscitation area 60 minutes after treatment commencement. The patient is suffering a generalised seizure. Describe your management.

2 min

Expected response	Details and comments	
Initial response	High flow O ₂ , left lateral, blood glucose, Stop seizure ? Benzodiazepines (consider phenytoin 18 mg/kg)	*
Seek & treat causes.	Consider causes: cerebral oedema, hypoglycaemia, hypoNa, intracerebral cause CT head as soon as stable Slow / stop IV fluid administration momentarily. Calculate fluid amount given so far.	*
Airway/ventilation	Ensure adequate ventilation and oxygenation Inform that seizure has stopped	
Possible raised ICP and cerebral oedema	Mannitol 0.25 to 1 g/kg Tight fluid, glucose and electrolyte balance	
Other	Full explanation and support to family of child	
Disposition	ICU, Paed endocrinology. Other invasive measures may be required in an ICU setting – ICP monitoring etc	

Question 4: Discuss the role of bicarbonate in this patient.

1 min

Expected Response	Details & Comments	
If severe metabolic acidosis persists – other causes for refractory acidosis should be sought		
Cons	Limited role for DKA as acidosis will resolve on its own, with appropriate Rx. Potential risks of bicarbonate administration in this setting - paradoxically increase CNS acidosis and worsen hypokalaemia and hypernatraemia - shift the O ₂ dissociation curve to the left thereby causing relative tissue hypoxia	
Pros	Severe acidosis threatens to cause cardiac dysrhythmias / decreased cardiac contractility.	

Comments: (if you fail the candidate, please state why)

If the candidate fails the exam overall, what feedback would you suggest regional censor provide for this SCE?

SCENARIO

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