



SingHealth
RESIDENCY
for the love of medicine



Partners in Academic Medicine



Members of the SingHealth Group



Major Participating Site



Case TWO



Mr N is a 64year old Chinese gentleman who is a heavy drinker, still actively drinking, and chronic smoker of >40pack year history. He has a past medical history significant for Hypertension, Hyperlipidemia, Type 2 Diabetes Mellitus (not on insulin), previous episodes of Acute Pancreatitis secondary to Alcohol.

He presents to the Emergency Department by his family following a three day cruise to Phuket for abdominal pain and vomiting for one day's duration. This is associated with drowsiness and lethargy. The abdominal pain is central, constant, with no radiation, associated with multiple episodes of vomiting, non bloody, non bilious fluid. There was not associated diarrhoea. There is no associated fever, chills or rigors. He did not notice any tea coloured urine. There was no fall, trauma or headache. He reports that he was indiscretionary with his diet and alcohol intake while on the cruise, and may have forgotten to take his medication. No one else on the cruise has been reported to be ill. He denies eating any raw seafood.

Case TWO



Vital Signs: Temperature 36.6degC BP 137/89 HR 110 SpO2 97% on Room Air

O/E Drowsy but rousable GCS E3V3M5

Moving all 4 limbs spontaneously against gravity but unable to cooperate fully for a comprehensive neurological examination

No facial droop, Pupils 2mm bilaterally, brisk and reactive

H S1+S2 no murmur

L Clear

A soft, non tender BS+ no guarding or rebound

Calves supple, no peripheral oedema

No rash

Case TWO



Question ONE: Which are the top 3 differentials for this gentleman?

1. Acute Gastroenteritis
2. Acute Alcoholic Pancreatitis
3. Peptic Ulcer Disease
4. Intra-abdominal Sepsis
5. Acute Intestinal Obstruction
6. Hyperglycaemic Crisis

Initial Investigations

Urea	35.2 (2.8-7.7)
Sodium	140 (135-145)
Potassium	6.0 (3.5-5.0)
Chloride	91 (96-108)
Bicarbonate	9 (19-31)
Glucose	58.2 (4.0-7.8)
Creatinine	256 (65-125)

pH	7.24 (7.35-7.45)
pO ₂	86.4 (75-100)
pCO ₂	28 (35-45)
Base Excess	-15

Total Bilirubin	7.8 (5.0-30.0)
Alkaline Phos.	115 (32-103)
Alanine Transam.	19 (10-55)
Aspartate Transam.	14 (10-45)

Haemoglobin	12.8 (13.0-17.0)
WBC	11.9 (4.0-10.0)
Platelet	457 (150-450)

Case TWO



Question TWO: What are the main metabolic derangements for this patient? (Can pick more than one)

1. Normal Anion Gap Metabolic Acidosis
2. High Anion Gap Metabolic Acidosis
3. Metabolic Alkalosis
4. Respiratory Alkalosis
5. Hypernatraemia
6. Hyponatraemia
7. Hyperglycaemia
8. Hypoglycaemia
9. Hyperkalaemia
10. Hypokalaemia

Case TWO



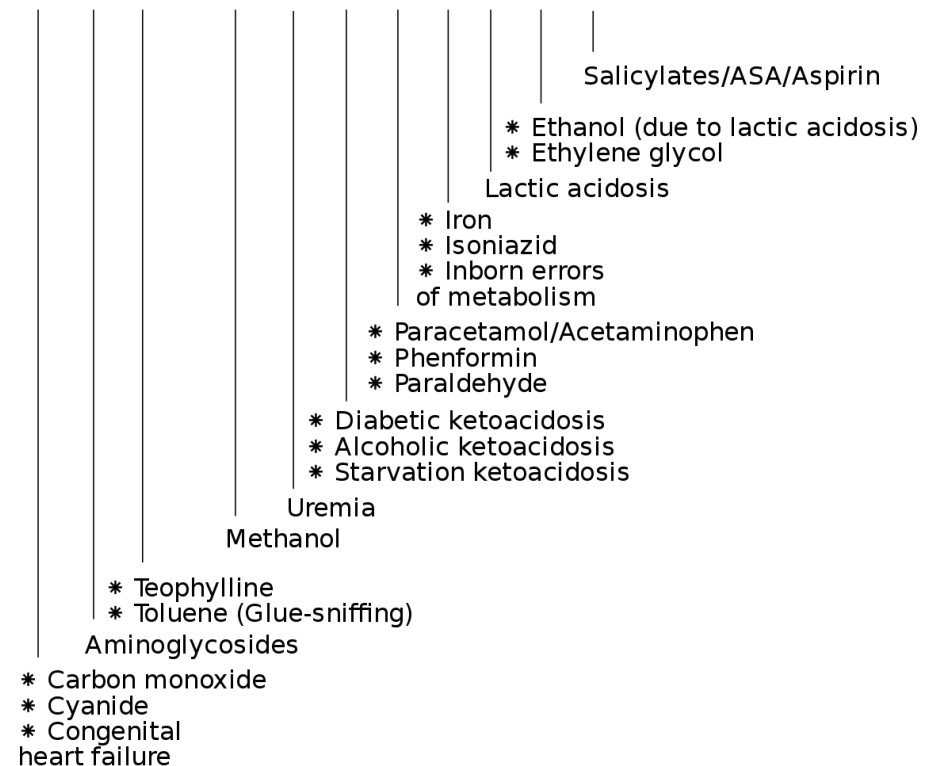
How to Calculate an anion gap?

Sodium – Chloride – Bicarbonate = Anion Gap

Normal: <12 High: >12

Causes of high anion-gap metabolic acidosis

C A T M U D P I L E S



Question THREE: What would be the **first** thing that you would do for this patient?

1. Start Intravenous Insulin
2. Start short acting sub-cutaneous Insulin as a sliding scale
3. Blood cultures and intravenous antibiotics
4. Aggressive intravenous fluid resuscitation
5. Computed Tomography of the brain
6. Lumbar Puncture
7. Abdominal Radiograph

Case TWO



Question FOUR: What fluid infusion would you choose for this gentleman's resuscitation?

1. Normal Saline
2. Half strength Saline
3. Hypertonic Saline
4. Normal Saline with added Potassium
5. Colloidal fluids e.g. Gelafundin
6. Blood Products

Case TWO

Correction of sodium for hyperglycaemia

- For every 5.6mmol/L of Glucose, there is a 1.6mmol/L drop in Sodium

Formula for glucose in mmol/L

$$\text{Corrected [Na}^+] = \text{Measured [Na}^+] + \frac{1.6 \times (\text{glucose in mmol/L} - 5.6)}{5.6}$$

Urea	35.2 (2.8-7.7)
Sodium	140 (135-145)
Potassium	6.0 (3.5-5.0)
Chloride	91 (96-108)
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Glucose	58.2 (4.0-7.8)
Creatinine	256 (65-125)

Case TWO



Question FIVE: What monitoring parameters would you implement for this gentleman?
(Pick 3 of the most appropriate)

1. Q1h parameters
2. Q2h parameters
3. Q4h parameters
4. GCS Charting
5. Fit Charting
6. Circulation Charting
7. Strict I/O charting with urosheath
8. Strict I/O charting with Indwelling Catheter

Case TWO



Subsequent blood results reveal a Lactate of 2.09 (0.5-2.20mmol/L), Ketones of 5.8 (<0.6mmol/L)

Question SIX: What is the most likely diagnosis for this gentleman?

1. Diabetic Ketoacidosis
2. Hyperosmolar Hyperglycaemic State
3. None of the above
4. Both of the above

Diagnostic Criteria and Management of DKA/HHS

DKA	HHS
Glucose >14mmol/L	
AND	Glucose >33mmol/L
HCO ₃ <18mmol/L	AND
AND	Effective serum Osmolality >320mOsm/kg
Serum Ketone >1, or Urine Ketone >2+	

Acute Management of Hyperglycaemia Crises

1. Aggressive fluid rehydration!!!
2. Intravenous Insulin therapy
3. Electrolyte replacement (Potassium/Phosphate)
4. Frequent monitoring
5. Watch for Headache, Decreased Consciousness, Dyspnoea, Hypoglycaemia, Arrhythmias

Case TWO

After 36 hours of being on Intravenous Insulin, the lab results are as follows:

Urea	11.0 (2.8-7.7)
Sodium	146 (135-145)
Potassium	3.5 (3.5-5.0)
Chloride	112 (96-108)
Bicarbonate	23 (19-31)
Glucose	7.2 (4.0-7.8)
Creatinine	117 (65-125)
Ketones	0.2 (<0.6)

On examination, Mr N is adequately fluid repleted. He is alert and conscious and extremely keen for discharge. He is keen to go back on his old medications and not keen for new medications. He has been seen by the Diabetic Nurse and the Dietitian in the ward

Question SEVEN: Which of the following is correct? (True or False)

1. The ketones have returned to normal therefore the DKA has resolved
2. The bicarbonate has returned to normal and therefore the DKA has resolved
3. The anion gap has resolved and therefore the DKA has resolved
4. The pH is normal and therefore the DKA has resolved
5. The calculated osmolarity has become normal and therefore the HHS has resolved
6. The hyperglycaemia has resolved and therefore the HHS has resolved
7. The patient's mentation has returned to normal and this means the HHS has resolved

Resolution criteria of HHS/DKA

DKA	HHS
Glucose <11.1mmol/L	
AND 2 OF THE FOLLOWING 3:	Normal serum Osmolality
HCO ₃ >15mmol/L	AND
OR	Normal Mental Status
pH >7.3	
OR	
Normal Anion Gap	

Question EIGHT: Which of the following is appropriate?

1. Restart his old medication and let him go home
2. Restart his old medication and observe for one day
3. Start Subcutaneous Insulin Sliding Scale
4. Start Subcutaneous Insulin (Long acting + Short acting)