Metabolic Endocrine and Blood Gases

# Fellowship SAQ 2017

**Question 1**

**A 56 year old female is brought in by police with what is thought to be a psychiatric condition. She is appears to have an elevated mood and has been found in a shopping centre behaving erratically. She has grazes on her face and arms. The patient is unable to give you any useful information beyond this.**

**Observations**

**P 140**

**BP 150/100**

**Sats 99%**

**RR 30**

**T 39.9**

**GCS 14**

a) List your differential diagnosis (6 marks)

Thyroid Storm – (hyperthyroidism not enough)

Drug Overdose inc TCA/anticholinergic agents

Psychiatric Condition e.g. Bipolar

Sepsis due to any cause (note new Sepsis 3 definition – life threatening organ dysfuction secondary to dysregulated host response to infection, mention qSOFA score Hypotension <100, Altered Mental State <15, Tachypnea >/= 22)

Intracerebral bleed/SDH

Intracerebral infection e.g encephalitis/meningitis

Heat stroke

NMS/MH

**Blood results shown**

**Hb 140**

**WCC 12**

**Plts 140**

**TSH 0.00**

**Na 156**

**K 5.4**

**Ur 10**

**Cr 140**

**LFT Normal**

**CMP Normal**

**CRP 12**

**UA negative**

**CXR Normal**

**ECG Sinus Rhythm 130bpm, no changes to suggest hyperkalaemic effect**

b) List the initial emergency management steps (10 marks)

Oxygen – total body consumption increased

Benzodiazepines titrated in 5mg aliquots of midazolam – gain control and sedate patient to reduce heat production

IV fluids - cooled, to likely sig dehydration causing renal dysfunction

Evaporative cooling – fan and water mist

IDC to monitor UO

PTU 900-1200mg orally or via NG

Lugols Iodine 5 drops (must be > 30mins after PTU)

Na Iodide 1g bd

Hydrocortisone 100mg 6 hrly IV (or dexamethasone)

Propranolol 0.5-1mg/min IV up to max 10mg

HDU/ICU disposition

**Question 2**

**A 20kg 6 year old boy presents with 2 weeks of lethargy. He is now complaining of abdominal pain and his mother has noticed that he is breathing fast. He has vomited 3 times in the department. He has sunken eyes, reduced skin turgor and hasn’t passed any urine for 16 hrs. He has no history of medical illnesses.**

**P 160**

**BP 80/50**

**Sats 99%**

**RR 60**

**Temp 36.7**

**pH 7.01**

**pCO2 18**

**HCO3 6**

**Lact 7.1**

**Gluc 34**

**K 5.0**

**Na 129**

**Cl 90**

a) Interpret the blood gas including all calculations that you would perform (6 marks)

**HAGMA** due to **DKA**

**AG** = (129 + 5) – (6 + 90) = 134 – 96 = 38

(or without K included = 33)

**Corrected Na** = 129 + (34-5.5)/3 = 138.5

**Winters** = (1.5 x 6) + 8 = 17

Appropriate respiratory response

**Delta Ratio** = 33-12/24 – 6 = 21/18 = 1.16

Isolated HAGMA

b) List the management steps in the first hour (8 marks)

Commence fluid resuscitation – 10mls/kg NaCl then reassess, unlikely to need > 20mls/kg

Ongoing NaCl guided by calculation of percentage dehydrated (likely severe) – can use charts to calculate or calculate total defecit plus maintainence and replace over 48hrs

Insulin – 0.1 units/kg/hr

Potassium replacement – commenced at a rate of 20-40mmol/L once K <4.5 and urine output established

2 x Iv lines – 1 for sampling

Consider arterial line if ongoing haemodynamic upset

Strict fluid balance – IDC

NGT and NBM

Ondansetron

Close monitoring of glucose/ketones/obs/neurological status

**4 hours into the childs management you are still waiting for a bed on the paediatric HDU. The registrar tells you that the child became irritable and is now obtunded with a GCS of 6. He is becoming bradycardic and resp rate has fallen to 15.**

c) What is the likely cause (1 mark)

Child has cerebral oedema and may be coning

d) Outline your immediate management (6 marks)

0.5g/kg of 20% Mannitol stat

Intubate – any appropriate drugs but avoid sux

ETT 5.5, depth 15cm

Hyperventilate

Reduce rate of fluids by 1/3

Nurse head up

Arrange CT brain once stabilised

Urgently contact paeds and ICU

**Question 3**

**A 23 year old woman presents with postural dizziness, lethargy and anorexia. She has vomited several times and describes having been unwell for 3 weeks. She denies taking any medications. On examination she looks mildly dehydrated and has vitiligo. Examination is otherwise unremarkable.**

**Observations**

**P 120**

**BP 80/30 (despite 2L NaCl stat)**

**T 36.7**

**RR 22**

**Sats 98**

**pH 7.23**

**pCO2 28**

**Lact 2.3**

**HCO3 14**

**Na 126**

**K 7**

**Cr 120**

**Gluc 3.1**

**Cl 110**

**LFT normal**

**CMP normal**

a) Interpret the blood results including any calculations

NAGMA

AG = (126 + 7) – (14 + 110) = 133- 124 = 9

Hyponatraemia and Hyperkalemia

Relative Hyperchloraemia

Winters = 1.5 x 14 +8 = 29 (appropriate)

No need for delta gap calc as not HAGMA

b) List 3 differential diagnoses (3 marks)

Addisonian crisis

Diarrhoea of any cause inc villous adenoma, SB fistula, IBD, laxative abuse

RTA/Diuretic abuse

Other things such as burns/pancreatitis/bowel obstn/cirrhosis all unlikely given the clinical setting

Normovolaemic and hypervolaemic causes of low Na don’t fit the clinical picture

c) List the most important 3 immediate management steps (3 marks)

Hydrocortisone 200mg IV stat

Appropriate Rx of hyperkalaemia with insulin/dex, salbutamol, calcium gluconate

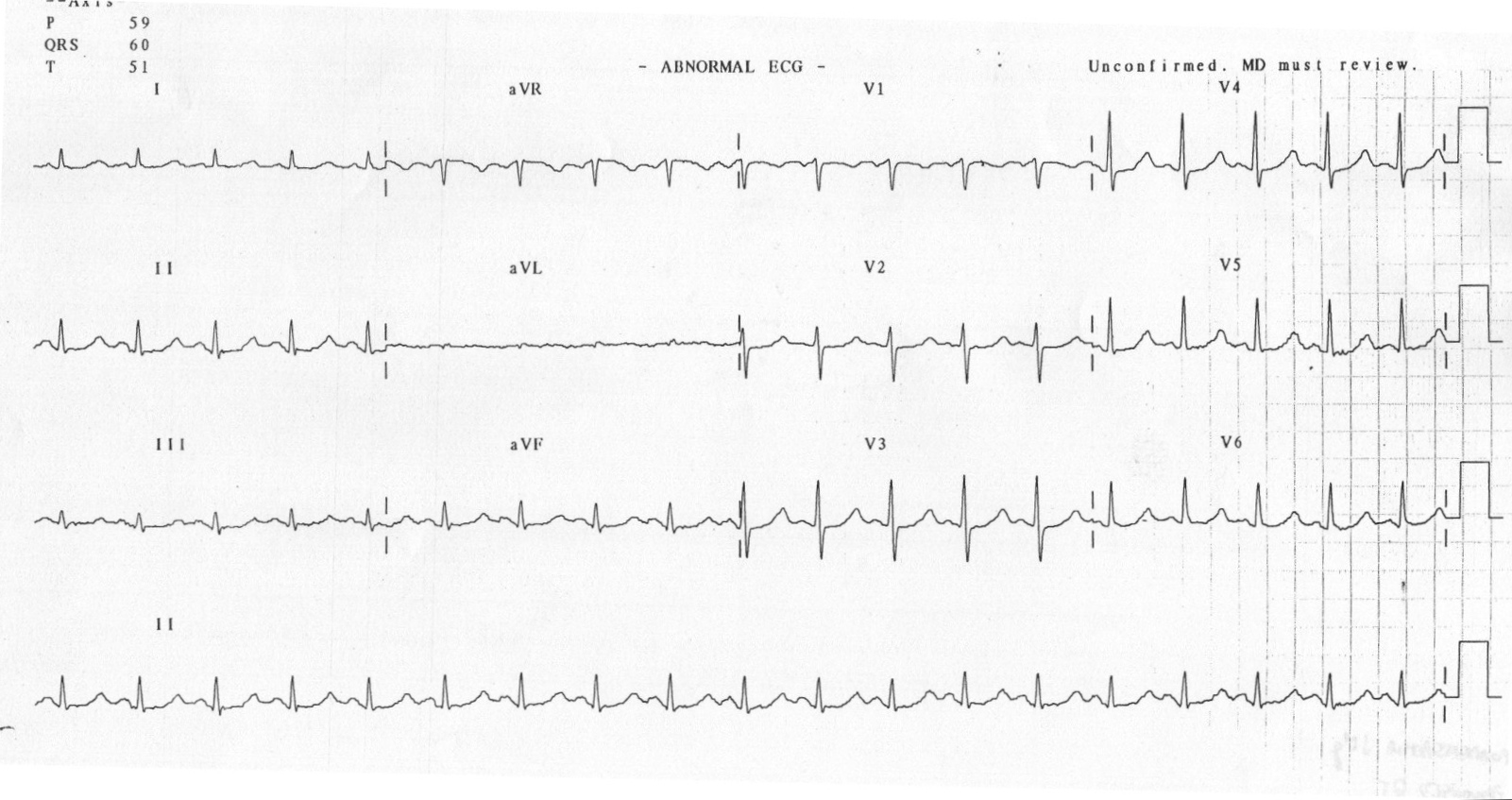
Feed if able to eat otherwise 50mls 50% dextrose for hypoglycaemia

d) What test will be most valuable in determining the underlying cause (1 mark)

Cortisol (random)

**Question 4**

**A 65 year old alcoholic male presents after a syncope. He has had a recent chest infection and is on a course of antibiotics. His ECG is shown below.**



a) List the most abnormal finding on this ECG (1 mark)

Long QTc

b) What are 5 likely causes of this abnormality in this man, with justification for each (5 marks)

Hypomagnaesaemia

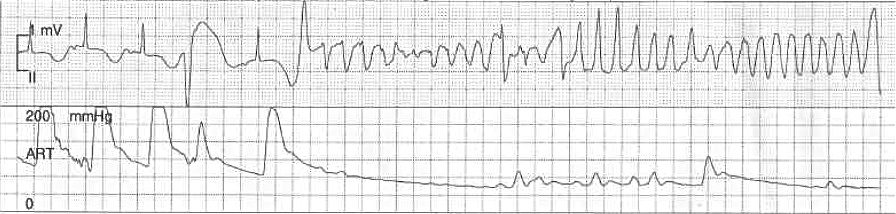
Hypocalcamia

Hypokalaemia –electrolytes often abnormal in hazardous drinking

Cardiac causes – e.g alcoholic cardiomyopathy

Drug induced e.g macrolide antibiotics for chest infection

**As you gathering the canulation trolley the cardiac arrest buzzer is pushed, when you arrive at the bedside the patient has no signs of life and the nurse shows you this.**



c) In the table below list the 4 most important actions you will direct your team to take in the first 2 minutes, with details of each (8 marks)

|  |  |
| --- | --- |
| **Action** | **Details** |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

|  |  |
| --- | --- |
| **Action** | **Details** |
| Commence CPR | 30:2 Compressions to ventilations via BVM, 2 min cycles between pulse checks |
| Defibrillate as soon as pads attached | AP paddle position, shock at 200J, stacked shocks as a witnessed arrest |
| IV access | Check VBG for K/Ca, send blood for CMP |
| Replace electrolytes as guided by VBG - | 10mmol MgSO4 prior to result as likely to be low, 10mls 10% CaGluc, 10mmol KCl |

Adrenaline is incorrect as is only administered after the 2nd shock

**Question 5**

**A 54 year old man presents post ictal after a witnessed seizure. He has the following VBG**

**pH 7.2**

**pCO2 76**

**HCO3 18**

**Lactate 10**

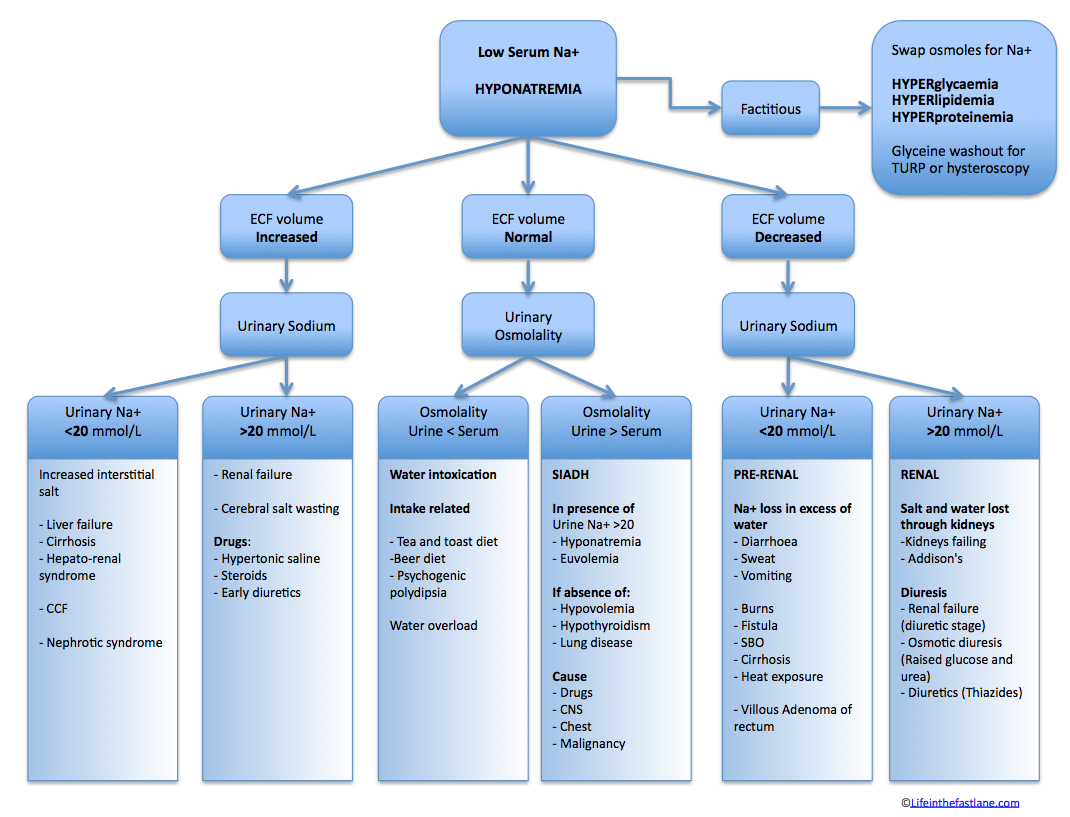
**K 5.4**

**Na 110**

**Cl 109**

a) List some possible causes for his hyponatraemia, classified by fluid status, in the table below (9 marks)

|  |  |  |
| --- | --- | --- |
| **Euvolaemic** | **Hypovolaemic** | **Hypervolaemic** |
|  |  |  |
|  |  |  |
|  |  |  |



**The patient has a further tonic clonic seizure**

b) How will you raise the Na and by how much will you aim to increase (2 marks)

3% NaCl (hypertonic) 1-2mls/kg over 20 mins

Aim to increase by 5-7mmol

Total increase over 24 hrs of no more than 10mmol – risk of osmotic demyelination

DUNN

**3% Saline**

•100 mL = 50 mmol

•3 x normal osmolality

•must be given via a central line

**Indications**

•only for therapy of severe hyponatraemia with acute cerebral symptoms

•50 mmol/hour = (1-2 mL/kg/hour) until Na+ 125 -130 then maintained for 48 hours

•adult starting dose of 150mL (2mL/kg) 3% saline over 20 min

-repeat as required to raise [Na+] 5mmol/L by one hour

-remeasure [Na+] after the first 20min infusion has finished to monitor progress and adjust second infusion dose if required

-250 mmol over 10 min if seizures present (raises [Na+] 7 mmol/L)

c) List 10 investigations you will order with justification (20 marks)

Plasma and Urine Osm – helps to delineate cause e.g. SIADH

Formal EUC – formal Na level and other electrolytes

CMP – Potential for other elec abn, paraneoplastic phenomena

LFT - ?malignancy

FBC - ?infective causes

CTB – mass lesions as cause for

ECG – evidence of other electrolyte abnormalities/rhythm disturbances

TSH – hypothyroidism as a cause of hyponatraemia

Cortisol - ?addisions

CXR - ?pancoast tumour leading to SIADH

Glucose – possible cause for seizure