**BLOOD TEST QUESTIONS FOR STUDENTS**

**Question 1**

82 yo female presented with two episodes of malaena. She had been commenced on clopidogrel by her cardiologist three days prior. She was afebrile, BP 70/50, HR 123, Sats 93% RA. Bloods were as follows:

| | 0700am | 0900am |
|---|---|---|
| Hb | 85 | 79 |
| WCC | 24.5 | 13.8 |
| Plat | 238 | 149 |
| K | 5.3 | 5.1 |
| Urea | 10.5 | 9.7 |

Interpret these blood tests. Is there any benefit in giving platelets, given the drop in number?

- Active bleeding – Hb dropping
- WCC likely due to active bleeding rather than infective process
- Plat count dropping due to being used up. * platelets less useful than normal, too, because of clopidogrel. Will take 9 days for turnover of platelets.
- K elevated due to digestion of blood
- Urea elevated for same reason

Pt taken for endoscopy, which showed a bleeding ulcer.

**Question 2**

38 yo male presented with acute confusion and drowsiness. Bloods were as follows:

| | | | |
|---|---|---|---|
| Hb 123 | Na 142 | Bili 145 | BAL 0.12 |
| WCC 4.2 | K 2.5 | ALP 64 | |
| Plat 71 | Urea 1.1 | GGT 163 | INR 2.2 |
| MCH 37.4 | Creat 50 | ALT 63 | |
| MCV 106 | Mg 0.52 | AST 139 | Ammonia 69 |
| | | Albumin 24 | |

What is the likely underlying cause of his confusion?

- Alcoholic encephalopathy
- Hb low with macrocytic picture
- Plats low (typical in alcoholism, and the platelets don't work normally neither)
- K low – probably due to use of lactulose/laxatives
- Creat normal – so no hepatorenal syndrome
- Mg low – needs correction
- LFTs deranged with "alcohol picture" on top of hepatitis
- Albumin low – chronic malnutrition
- BAL high – patient said he only had one can of beer = do we believe him?
- INR elevated – liver dysfunction
- Ammonia high – encephalopathy

**Question 3**

38 female presents with fever, dysuria, and malaise. Temp 37.9 C. Chemotherapy 7 days ago for breast cancer. What are you concerned about in this woman? Blood results show:

Hb 97

WCC 1.9 (neutrophils 0.34)
Plat 170

- Diagnosis: febrile neutropenia, which commonly occurs on day 10 post-chemo but can occur earlier. Septic screen needed, febrile neutropenia protocol, antibiotics early.

**Question 4**

81 female with type 1 diabetes presented with 18 hours of nausea, vomiting, and confusion. She was hypotensive with elevated BGLs and ketones in blood and urine. History of aortic stenosis and high cholesterol.

Blood gas:

| | | |
|---|---|---|
| pH 7.25 | HCO3 15 (formal HCO3 11) | Na 140 |
| PCO2 36 | BGL 34.4 | Cl 111 |
| PO2 61 (V) | K 4.3 | Lactate 3.1 |

Interpret this blood gas.

- Metabolic acidosis, severe. HAGMA. Compensation of respiratory alkalosis and NAGMA.

Other blood test results: Ketones: Acetoacetate 3.2 (<0.2), BOH butyrate 6.81 (<0.3).

What is the underlying problem, and how should this be managed?

- DKA, severe. Patient needs DKA protocol – IVT, insulin infusion, monitoring, ICU review.
- Whole body potassium is likely to be low because of intracellular shift – so will need potassium replacement sooner rather than later

Half an hour later, the patient complains of dyspnoea and chest pain. The following results are obtained:

Troponin 402
CK 266
CKMB 20.7

A CXR is also requested. What are the findings on the CXR and bloods above, and how does this relate to the presenting problem?

- DKA – severe fluid deficit – myocardial strain with fixed output (Ao stenosis) – NSTEMI – APO.
- Reinforces the importance of reducing myocardial strain in elderly patients with poor myocardial function

**Question 5**

72 yo male presented to ED in rapid AF. He had developed chest pain that woke him from sleep, associated with nausea and dyspnoea. He had seen his GP, who diagnosed AF and sent him to hospital. Hx of HTN, smoking, and FMHx heart disease.

Blood test results:

| | | |
|---|---|---|
| FT3 18 | Hb 133 | Troponin 35 |
| TSH 0.01 | WCC 11.6 | Lipids normal |
| FT4 60 | | |

Explain these results. What are the treatment options?

- Hyperthyroidism (Grave's disease)

- Mild WCC elevation – likely stress response
- AF secondary to thyrotoxicosis
- NSTEMI secondary to thyrotoxicosis
- Treatment options: carbimazole or PTU for thyroid. BB and/or digoxin for AF. Anticoagulation.

**Question 6**

13 day old baby referred in by GP with ongoing jaundice. Blood tests show:

Bili 323 (<225)
Conjugated bili 20 (<11)

What sort of jaundice is this?

- Neonatal jaundice – conj bili elevated, so liver working. Not more than 15% of total bili which is reassuring.

How does neonatal jaundice occur?

- Excessive breakdown of RBC when neonate and immature removal systems

How is it treated? What is the process behind this?

- Sunlight/UV therapy. Changes bilirubin into water soluble forms, which is more easily removed.

**Question 7**

22 female 34/40 with first pregnancy. Presents with pleuritic chest pain and dyspnoea for several hours. On arrival, BP 140/105, HR 118, Sats 88% RA, afebrile. What blood tests do you need?

Blood test results:

| | 0915am | 1150am |
|---|---|---|
| Bili | 19 | 19 |
| GGT | 61 | 69 |
| ALP | 303 | 329 |
| ALT | 84 | 118 |
| AST | 136 | 195 |

| | | |
|---|---|---|
| Hb 153 | Coags normal | ABG on air |
| WCC 13.4 | D dimer 3.6 | pH 7.46 |
| Plat 104 | Fibrinogen 6.6 | PCO2 34 |
| Trop neg | | PO2 84 |

Urine protein: 4059
Protein/creatinine ration: 572 (<18)

Based on these results, what are your diagnoses?

- PE – increased risk in pregnancy, sats low, tachycardia, pleuritic chest pain
- HELLP syndrome/pre-eclampsia

How is pre-eclampsia managed acutely in ED? Long term?

- Nifedipine or hydralazine to drop BP
- ACEi contraindicated in pregnancy

- Delivery of baby is only real solution.

**Question 8**

54 ATSIC female presents with malaise and generally feeling unwell, with back pain. Found to have sacral pressure ulcer which has not been treated. ABGs taken on presentation:

| | 0435am | 0450am | 0511am |
|---|---|---|---|
| O2 | 100 | 61 | 137 |
| CO2 | 40 | 46 | 37 |
| pH | 6.61 | 6.58 | 6.79 |
| HCO3 | 4 | 4 | 5 |
| Na | 137 | 132 | 136 |
| K | 6.4 | 6.3 | 6.0 |
| Glu | 2.4 | 22.2 | 13.7 |
| Anion Gap | 23 | 23 | 23 |
| Cl | 116 | 111 | 114 |
| Lac | 9.3 | 9.2 | 9.5 |

What do these blood gases show?

Severe metabolic acidosis with high anion gap (HAGMA), likely secondary to severe lactaemia. No appreciable respiratory compensation. Hyperkalaemia and labile BGL are also noted.

- What is the likely cause of this?

  Sepsis of unknown origin, but in this case, the cause was most likely related to the sacral pressure ulcer. The patient had an infection in her spinal column that had arisen from her sacral ulcer (local spread) and literally had pus in her spinal canal.

- How should this patient be managed?

  In ICU, with input from neurosurgery. Patient was started on high dose antibiotics and taken to theatre where a significant amount of frank pus was drained

**Question 9**

51 yo female BIBA after collapse at gym. Under CPR on presentation. What blood test(s) do you order?

- Blood gas is "the only blood test you need" in emergency situation.

  pH 6.97
  CO2 83
  O2 26
  Na 139
  K 3.7
  Cl 104
  Lac 9.3
  HCO3 19.3

Interpret this result. What should you do next?

- Acute, severe respiratory acidosis
- Low O2
- Lactate very high

- Patient unlikely to survive – pt declared dead based on non-contractile myocardium on ultrasound despite full IVC, and ABG. ET CO2 only 10 – very poor sign. Usually increases if ROSC.
- Discussion points: mortality rate of OOHA is very low. Blood gas can help determine whether to cease CPR. After 20mins good CPR with no response, unlikely to have good outcome (exception: hypothermia). Ultrasound can be useful as an adjunct.

**Question 10**

51 yo female from MINDA choked, then went into PEA arrest. SAAS called, CPR commenced, ROSC. Detritus in throat. Possibly 20mins down time.

What are the causes of PEA arrest?

- 4H 4T. Physiology is a marked reduction in cardiac output due to either profound myocardial depression or mechanical factors that reduce venous return or impede flow of blood thru CVS.
- Organised rhythm without detectable pulse in person clinically in cardiac arrest.

ABG shows:

pH 6.96
CO2 74
O2 419
Na 145
K 3.5
Cl 116
Lac 5.8
HCO3 17

Interpret this result.

- Severe acute respiratory acidosis.
- Too much oxygen – overventilation, risk of secondary brain damage. Likely tubed.
- Elevated lactate

What should you do next?

- Seek reversible causes and reverse if appropriate
- Patient likely to be tubed already – see high oxygen level, suggests intubation/ventilation
- CT to assess degree of brain damage
- Resuscitation status/contact relatives/ICU admit pending this.
- CTB in ICU showed brain death secondary to hypoxic injury.

**Question 11**

94 yo female referred to ED by GP with "deranged electrolytes". History of ischaemic colon, for which she had total colectomy and stoma, HTN, slow growing breast cancer. Meds: trandalopril, omeprazole, amlodipine, tamoxifem. Bloods show:

Na 122
K 5.0
Cl 97
HCO3 14
AG 16
Glu 9.7

Urea 14.7
Creat 104
LFT normal
Mg 0.77
Hb 98 (chronic)
WCC/platelet/CRP/Troponin normal.

Describe and interpret these results. How is hyponatremia classified?

- Hypertonic, isotonic (pseudohyponatremia), hypotonic (most common)
- Hypotonic can be classified into hypovolaemia, hypervolaemic, euvolemic.

What are the risks of hyponatremia?

- Confusion, nausea, malaise, coma or seizures (particularly if Na < 115)

What other blood test do you want at this point? Why?

- Blood gas. Whenever bicarb is out of whack, it is useful to get a blood gas (arterial if respiratory problem or you want CO2, venous if you just want everything but CO2).

pH 7.28
CO2 37
O2 27
Na 125
K 5.0
Cl 104
Lac 0.6
HCO3 17

Describe and interpret this blood gas.

- Acidosis – primarily metabolic, with secondary respiratory acidosis (based on Winter's formula).

**Question 12**

92 yo male last seen 24 hours ago. Found on floor. Hypothermic 28 C. BP 80/P. HR 36. Sats 90%. GCS 4-1-3 EVM. History of CABG and ?seizures.

What is your initial management of hypothermia? What management options are there for re-warming?

- Re-warming – active or passive. BAIR hugger, gastric or bladder lavage, warmed fluids, blankets.

What are the ECG changes of hypothermia?

- Bradycardia
- Prolonged QRS
- Long QT interval – risk of arrhythmia
- J (Osborne) waves – deflection after the R wave
- Shivering artefact

What does this ECG show?

- All of the above except shivering – which is concerning in itself, as patient should be shivering at this point!

Blood tests show:

| | | |
|---|---|---|
| Na 141 | Bili 9 | Hb 133 |
| K 4.3 | GGT 282 | WCC 10.5 |
| HCO3 21 | ALP 244 | Plat 125 |
| Urea 13.8 | ALT 25 | CRP normal |
| Creat 109 | AST 44 | |
| Trop T 105 | | ABG normal |
| | CK 308 | INR normal |

What do these bloods show? Describe and explain.

- Mild troponin elevation – likely secondary to heart strain from hypothermia/hypovolaemia. Note that troponin needs to be repeated – trend is important.
- Urea elevation – chronic in this man, likely dehydration/chronic GI bleed?

- Mild derangement of liver enzymes, secondary to ischaemic/hypothermic damage
- CK mildly elevated – but remember that this man is elderly and has little muscle to form CK from. Rhabdomyolysis can be diagnosed if CK >5x normal.
- FBE and CRP normal – infection is unlikely cause of collapse.
- INR normal – although liver has had insult, it is still producing coagulation factors.

**Question 13**

54 female. Recently admitted to FMC with atraumatic splenic laceration with haemorrhage and pseudoaneurysm formation. Received embolization and prophylactic antibiotics. Discharged one week ago. Returns today with constant LUQ pain. Blood tests:

Hb 119
WCC 21.8
Plat 1033

CRP 120

Biochem unremarkable.

What are you concerned about given this history? What imaging would you like?

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Bloods: Considering clinical context (splenic trauma, collection and now admission
      with complete splenic infarct), findings are likely reactive.
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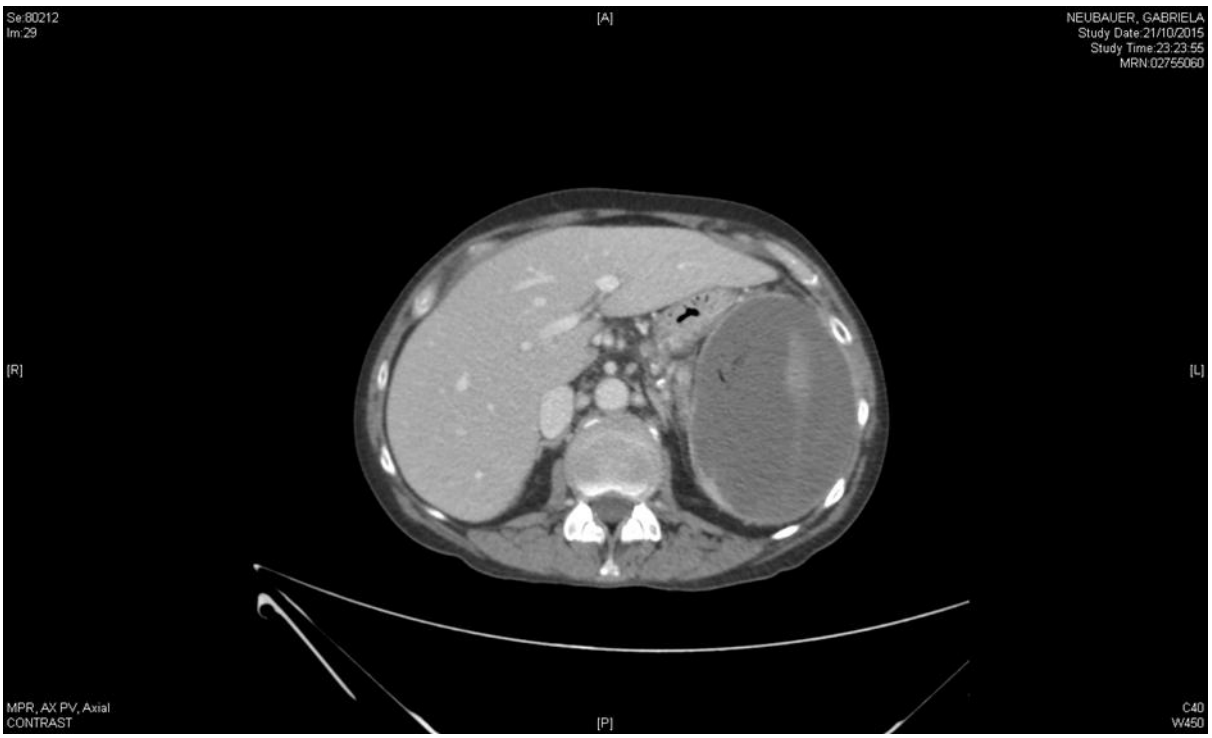
CT shown: what does this show?




**Complete splenic infarction with large left upper quadrant collection. This is slightly increased in size and presumably the cause of the patients LUQ symptoms.**

**Question 13**

84 yo male presents with abdominal pain and tachycardia. No peritonism, no bowel symptoms. CT abdo showed:


What is the abnormality shown? Can you see any other abnormalities? How is this managed?

- **There is aneurysmal dilatation of the abdominal aorta with maximum dimensions of 65 x 71 mm in the axial plane. There is thick crescentic soft plaque arising from the right lumen.**