

Candidate number _____

BOOK TWO

QUESTION 10 (20 marks) – DOUBLE QUESTION

You are the consultant in a regional Emergency Department. A 5 year old girl re-presents having been discharged 7 hours ago. She was assessed during the previous presentation for a head injury, sustained after a fall from a slide at preschool. No investigations were performed.

i. List 6 indications for CT scan of brain for this child (6 marks)

- Definite indications: GCS <15 or other signs of AMS; focal neurology; seizures: signs of basilar skull #: penetrating skull injury.
- Consider if: persistent vomiting; ongoing persistent moderate/severe headache; delayed seizure; history of LOC; Post traumatic amnesia; clinical deterioration; parental concern;
- CHALICE/PECARN/CATCH criteria
- Decision rules exclude patients with bleeding disorder, pre-existing neuro disorder/tumour/shunt

ii. Give 3 positive findings from the axial CT Image below (3 marks)

A CT BRAIN IS SHOWN IN THE PROPS BOOKLET, PAGE 5

- Left frontal **extradural haematoma**/left anterior cranial fossa, approximately 1.5 x 4cm
- Left frontal lobe compressed slightly
- Fluid in left frontal sinus
- Air bubble
- External soft tissue swelling
- Debatable presence of midline shift

iii. The child deteriorates to GCS 5. List your top 5 management priorities (5 marks)

- Resuscitate: Move to RR/Team Leader. Delegate Roles. Resus Equipment/Monitoring RSI: ETT 5.5 (1 up and down).
- RSI/Ventilation. Maintain BP/avoid Hypotension and hypoxia. Appropriate drugs- ketamine. Ongoing sedation and paralysis.
- CPP: Avoid Hypotension/hypoxia. Aim PaO₂ 100mmHg or more, low normal CO₂. Head up. Avoid tight tapes. Mannitol/Hypertonic saline
- Mobilise Surgeon (Burr holes/EVACUATION)/Retrieval team. Tertiary referral centre and Neurosurgery.
- Inform parents/NOK/SW

iv. Concerns about the management of the initial presentation are brought to your attention. Give 3 potential issues and action required (6 marks)

Expected Response	Details & Comments	
Review of clinical case	Explore circumstances in detail: clinical, staffing, resources, other Was alternative management appropriate at presentation	
Review of staff resources	Systems: roster adequacy, sufficient senior support Individual: Clinician competence. Previous clinical issues, recurrent problem? Impaired physician?	
Review of systems / processes	Review by senior Dr? Education / competence of personnel Workload. ?Poor access to radiology and/or IP services Discharge processes / ?applicable guidelines	
Risk management	Highlight in morbidity / mortality meetings; also for educational purposes Notifications: Risk Man, hospital legal counsel	
Implement required changes	Targeted at systems: education, guidelines, accreditation, triage, rostering At individual practitioners IF indicated: eg counseling	
Quality feedback loop	Review after defined period to ensure loop closed and desired effect achieved.	
Liaison with parents / NOK	Open disclosure. Full explanation, apology. Inform them of findings, and actions.	

QUESTION 11 (16 marks)

You are the overnight registrar in your tertiary hospital ED. You receive an ambulance pre-arrival call at 2am for a 25 year old male, stabbed multiple times in the chest. ETA is 10 min.

Vital signs: HR 150 bpm
 BP 72/41 mmHg
 SaO2 90% on 15L
 RR 30 bpm
 GCS 12

i. List 6 potential life threatening injuries in this patient (6 marks)

- Cardiac- rupture, tamponade, damage to coronary arteries/ STEMI, contusion
- Lung- haemothorax, pneumothorax, pulm laceration, hilar injury, bronchial/ trachea
- Vessels- aorta, coronary, intercostals, pulmonary artery/ vein etc...
- Abdominal organs/ diaphragm/ oesophagus
- Others- Neck/Head

ii. Briefly describe how you would prepare to receive this patient (5 marks)

- Team- trauma team- allocate roles, ED reg, juniors, nurses, +/- anaesthetics, surgical reg, radiology- x-ray, brief them with plan, anticipate deterioration, PPE
- Equipment- for intubation, thoracostomies/chest drain, thoracotomy, rapid transfusion, USS
- Packed cells, TXA
- Rest of Department- NUM, make sure other sick patients cared for, clear resus bay,
- Rest of hospital-
 - ED physician on call
 - Cardiothoracics/ surgeons
 - Theatres
 - Anaesthetist
 - ICU
 - Blood bank- MTP
 - Security/ police
 - Social work/ media

iii. What are the indications for ED thoracotomy in trauma (3 marks)

- Widely accepted
 - Penetrating chest injury with cardiac arrest/ peri-arrest non-responsive to resus measures and signs of life within previous 10 (? 15) minutes
- Controversial
 - Penetrating non-thoracic trauma (e.g. abdominal, peripheral) with traumatic arrest and witnessed signs of life/cardiac activity
 - Blunt trauma- with exsanguination from chest drain or pericardial tamponade seen on FAST or who lose signs of life/cardiac activity on arrival

iv. Provide an estimate of survival rates following ED thoracotomy for traumatic arrest (2 marks)

In penetrating chest trauma	15% (some studies as high as twice that)
In blunt trauma	1-2%

QUESTION 12 (14 marks)

A 68 year old female presents to your tertiary emergency department intoxicated, 2 hours after deliberately ingesting 120 x 600mg tablets of slow release potassium. She has been vomiting and has a GCS of 14 (confused). An initial VBG is performed.

pH	7.32	(7.35-7.45)
pCO ₂	35 mmHg	(35-38)
Lactate	5 mmol/L	(0.6-1.5)
Creat	110 mcml/L	(45-90)
BSL	6.3 mmol/L	(3.9-5.8)
Na	133 mmol/L	(136-146)
K	6.1 mmol/L	(3.9-5.2)
HCO ₃	18 mmol/L	(21-28)
BE	-4 mmol/L	(-1.5-3.0)

- i. Outline your risk assessment with regard to her ingestion (4 marks)

- Agent - Potassium potentially lethal OD
- Dose - 120 x 600mg - large ingestion
- Time - >1/24 post ingestion - absorption in progress ++
- Patient factors - GCS 14 and vomiting ?toxicity ?co-ingestion/alcohol etc
- Clinical - Potassium already elevated on VBG

- ii. List and briefly describe 2 specific toxicological interventions that may be used to manage her potassium ingestion (2 marks)

- GI decontamination – Whole bowel irrigation (Picoprep/PEGELS)
- Increase clearance – Dialysis, via vascath in ICU

iii. List an advantage and disadvantage for each of the methods listed above (4 marks)

- GI decontamination
 - decrease potassium load and often negates dialysis requirement in the setting of normal renal function
 - compliance - intubate pt for WBI - resources/staff/gastric tube placement/aspiration etc
- Dialysis
 - definitive therapy
 - invasive via vascath/central line, not in ED

iv. List 4 other management priorities (4 marks)

- IDC - urine output and strict fluid balance
- Check BSL/temp/ECG/blds- para/ETOH
- Xray ?confirm ingestion
- Consult with poisons/tox
- Specific to K
 - Elevated K+, ?ECG changes - fluids/renal excretion with e.g. u/o >1ml/kg/hr, insulin/dextrose/Ca²⁺
 - Serial K measure

QUESTION 13 (20 marks)

A 35 year old female presents to your Emergency Department with an acute asthma attack. She is highly distressed and only speaking single words despite continuous salbutamol nebs.

i. List 4 markers of severe asthma (4 marks)

- Inability to talk in full sentences
- O₂ saturations < 90-92% PaO₂ < 60mmHg
- PaCO₂ > 45
- Use of accessory muscles, tracheal tugging
- Pulsus paradoxus > 15mmHg
- Quiet chest
- Unable to lie supine
- Cyanosis, sweating
- Confusion, decreased LOC
- Bradycardia, hypotension

ii. Complete the table below regarding the use of intravenous salbutamol and magnesium sulfate in asthma (8 marks)

	Indication and rationale	Adverse Effects
Intravenous salbutamol	<p>Critical/severe asthma where inhaled B agonists cannot be effectively delivered (e.g. ventilated patients)</p> <p>IV salbutamol in addition to (or as replacement for) inhaled B agonists – <i>no evidence</i> to support</p> <p>Efficacy in paedics unclear (too few paediatric trials)</p>	<p>(Compared to inhaled salbutamol)</p> <p>Increase in autonomic adverse effects</p> <p>Increase in heart rate</p> <p>Hypokalaemia</p> <p>Lactic acidosis</p>

Magnesium	<p>Main indication: severe asthma. No benefit in mild/mod asthma</p> <p>Reduces need for admission & improves some lung function parameters in patients with severe asthma who have not responded sufficiently to usual treatments</p> <p>Paeds studies – small numbers so evidence weak. May reduce need for admission in moderate-severe asthma</p>	<p>Hypotension</p> <p>Depressed tendon reflexes</p> <p>Muscle weakness</p> <p>Flushing</p> <p>Depressed cardiac function</p> <p>CNS depression</p> <p>Respiratory depression</p>
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Despite intensive therapy, and a period of non-invasive ventilation, the patient continues to deteriorate, appears exhausted and begins to tire rapidly. You decide intubation is required.

iii. Outline what your initial ventilator settings (4 marks)

- Needs a safe approach. Mention permissive hypercapnia & lung protective strategy
- Tidal volume - low side - maximum of 8ml/kg (5-8)
- RR – may need to be low – 6-8 breaths/min start at 10 bpm, but be prepared to titrate down
- I:E ratio – > 1:2, may need to be 1:5. May need to adjust inspiratory time to achieve
- FiO2 titrated to keep SpO2 > 92-94%
- PEEP – controversial 0 – 5 mmHg (may have autopeep)
- Limits – Peak insp < 40, target plateau pressure < 20 cmH2O

iv. List likely causes of climbing airway pressures in a ventilated asthmatic (4 marks)

- Progression of disease – worsening bronchospasm
- Pneumothorax
- Air trapping/dynamic hyperinflation
- Mucous plugging (bronchial, endotracheal tube)
- Ventilator malfunction, inappropriate settings
- Patient-ventilator dyssynchrony

QUESTION 14 (13 marks)

This is the ear of a 40-year-old male who has developmental delay with autism.

A CLINICAL IMAGE IS SHOWN IN THE PROPS BOOKLET, PAGE 6

i. Describe and interpret the image (2 marks)

- Extensive redness and swelling of the pinna/external ear. Some extension onto neck
- Perichondritis or cellulitis of the external ear

ii. List two possible predisposing conditions (2 marks)

- Otitis externa
- Tick or insect bite
- High ear piercing, other local trauma

iii. List two complications (2 marks)

- Cartilage necrosis/cauliflower ear
- Local abscess
- Deep extension eg cerebral abscess, mastoiditis

iv. Name the three bacteria typically involved (3 marks)

- **Pseudomonas**
- Staph aureus
- Strep pyogenes

v. Name one suitable antibiotic choice for this condition (1 mark)

- Must include Pseudomonas cover or no marks
- Quinolone eg ciprofloxacin PO or IV
- Gentamicin IV and a penicillin IV
- Anti-pseudomonas cephalosporin eg ceftazidime IV

This developmentally delayed man is distressed about being in hospital. He is currently pacing and will not come into the assessment room.

vi. List 3 non-pharmacological strategies or techniques you can use to manage his agitation (3 marks)

- Familiar people and objects. Involve his carer, favourite soft toy
- Distraction. eg screentime, music via headphones
- Low stimulus environment, minimise distractions, noise and lights
- Explain procedure in simple language and diagrams
- Minimise staff involved to build relationships

QUESTION 15 (15 marks)

A 74 year old man presents after a fall the night before. He is now complaining of reduced mobility. Past medical history includes atrial fibrillation and hypertension. His medications are dabigatran, metoprolol and aspirin. GCS is 15.

- i. Outline the findings on the CT image (4 marks)

A CT BRAIN IS SHOWN IN THE PROPS BOOKLET, PAGE 7

- Acute on chronic left subdural haemorrhage overlying the left cerebral convexity, tentorium and parafalcine location. Maximal thickness of this SDH is 23mm
- Mass effect with 5mm shift of midline structures to the right and early hydrocephalus

- ii. List 4 possible treatments you would consider using and your rationale for each (8marks)

- Blood products if required – Packed RBC, Platelets
 - PRBC for severe anaemia/ongoing blood loss
 - Platelet transfusion for thrombocytopenia and/or severe platelet dysfunction
- Tranexamic Acid (antifibrinolytic agent)
 - Low cost and risk (of thrombosis, adverse reaction), therefore should be considered
- Desmopressin
 - Low cost and risk as above
- Idarucizumab – only specific reversal agent available for DOACs at present
 - Currently the only FDA approved agent for reversal of DOACs; only works for dabigatran. Shown to reverse the anticoagulant effect in lab testing and within minutes. Haemostasis without significant thrombosis risk
- Prothrombin Complex Concentrates (PCC) :
 - Three Factor PCCs (factors II, IX, X) - prothrombinex
 - Four Factor PCCs (II, VII, IX, X) – which can be inactive (octaplex) or active (FEIBA (Factor Eight Inhibitor Bypassing Activity))
 - Generally would not give if Idarucizumab has been given. Would consult Haematology.
 - Controversial results in in vitro and animal studies. I would discuss with Haematology before prescribing – need to balance risk of thrombosis.

Other points:

- Recombinant Factor VIIa (Novoseven) - Not recommended in treatment of DOACs due to high doses required and therefore concern for possibility of thrombotic sequelae.
- FFP is not recommended for reversal of DOACs unless no other agent is available

iii. List 2 important additional features on assessment that are required to assist your treatment decision (2 marks)

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- Time of ingestion of last DOAC dose
 - Assessment of renal and hepatic function

iv. List one other option for the management of NOAC associated bleeding (1 mark)

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- Haemodialysis – Dabigatran is 80-85% renally excreted. (Not useful in Direct Factor Xa oral Inhibitors eg rivaroxaban, apixaban as only 25-35% renal excretion; they are mostly protein bound)
 - Charcoal if ingested <2hrs prior – reduces absorption

QUESTION 16 (15 marks)

A 12 year old girl was brought to ED via ambulance following a syncopal episode.

i. What is the definition of syncope (3 marks)

- Abrupt loss of consciousness and postural tone resulting from transient global cerebral hypoperfusion followed by spontaneous complete recovery

ii. What is the most common cause of syncope in children (1 mark)

- Neuro-cardiogenic syncope OR vasovagal syncope

iii. Name a form of syncope unique to the preschool population (1 mark)

- Breath holding spells

iv. List 5 red flags in this girl's history that would prompt further investigation (5 marks)

- Syncope during exercise/supine
- Chest pain prior
- Palpitations prior
- Known structural heart disease
- Family Hx dysrhythmias, sudden death

v. List 5 conditions you would look for in this girl's ECG (5 marks)

- Pre-excitation/WPW
- Long QT
- Short QT
- Brugada
- HOCM
- AV nodal block
- ARVD

QUESTION 17 (14 marks)

A 26 year old primigravida presents at 36 weeks gestation with jaundice, blurred vision and hypertension (180/100 mmHg). The antenatal period was otherwise unremarkable. The following are her blood results:

Hb	80g/L	(115 – 160)
Platelets	52 x 10 ⁹ /L	(140 – 400)
INR	1.8	(0.9 – 1.3)
APTT	55 seconds	(25 – 38)
LDH	654 U/L	(110 – 250)
Fibrinogen	1.0 G/L	(1.5 – 4.0)
Total bilirubin	51 micromol/L	(< 20)

- i. List the four most likely diagnoses for this clinical presentation (4 marks)

- **Pre-eclampsia**
- **HELLP Syndrome**
- HUS – TTP
- Biliary disease
- Acute fatty liver of pregnancy

- ii. Outline 4 priorities in your management (4 marks)

- IV access and resus
- Contact O&G, anaesthetics, paediatrics – may require immediate delivery of baby
- Treat hypertension – IV hydralazine 5mg every 5 - 10 minutes, aim SBP <150, DBP <105
- Prevention of seizures – MgSO4 4g IV
- Consider correction coagulopathy

iii. She starts to have a generalised seizure. List 2 medications with doses that you might administer (2 marks)

- 4g Magnesium followed by 1g/hour magnesium infusion, Mg can be repeated every 5 minutes 2g
- BZD – midazolam 5mg IV, not first line

iv. List the findings on a cardiotocograph (CTG) trace that would indicate foetal distress (4 marks)

CTG Feature	Non-reassuring or Abnormal values
Baseline rate	
Decelerations	

- Normal baseline is 100-160. 161-180 is “non-reassuring” Above 180 or below 100 is bad
- Normal trace has no decelerations or only early decelerations. Abnormal decelerations are variable or late (after contractions) and take longer to recover

QUESTION 18 (16 marks)

A 72 year old male presents via ambulance short of breath. He is sweaty and looks unwell but is conscious. He has a history of IHD and has an AICD in situ.

Vital signs P 150 bpm
 BP 75/- mmHg
 RR 30 bpm
 SaO₂ 96% 15LNRB

- i. What rhythm is shown (1 mark)

A 12 LEAD ECG IS SHOWN IN THE PROPS BOOKLET, PAGE 8

- VT

You decide to perform DC cardioversion to treat the rhythm noted above. A VBG done after a cannula is placed shows the following.

pH	7.35	(7.35-7.45)
pCO ₂	57 mmHg	(32-45)
Lactate	3.3 mmol/L	(0.5-1.6)
K	6.1 mmol/L	(3.5-5.2)
Cr	160 mcmmol/L	(60-110)

- ii. What other treatment is required while cardioversion is being arranged (2 marks)
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- Urgent treatment of hyperkalaemia. **CaCl for hyperkalaemia** and malignant rhythm 10ml 10% repeated if no change to ECG. Consideration of insulin/dextrose/and IV NaHCO₃

- iii. Outline 2 pharmacologic agents you could use for sedation in this patient with initial doses and indicating advantages/disadvantages for each (8 marks)

Drug	Dose	Advantages	Disadvantages
Fentanyl	25-50mcg	CVS stable/analgesia	Resp depression
Midazolam	1-2mg	CVS stable/anxiolytic/amnesic	Resp depression/no analgesia
Ketamine	10-20mg	CVS stable/analgesia	Resp depression Apnoea Tachycardia

Morphine – not ideal given renal function/age, Propofol – not ideal given hypotension

- iv. Describe what settings you would set on the defibrillator and the positioning of the pads on the patient (2 marks)

- Synchronised 200 J, pads standard or AP with 10cm clearance of AICD box

- v. After cardioversion with sedation his rhythm is as follows. Describe the rhythm (1 mark)

A RHYTHM STRIP IS SHOWN IN THE PROPS BOOKLET, PAGE 8

- AF with VEB

- vi. Despite the ECG change the patient remains hypotensive, P 100bpm, SBP 80mmHg. Give 2 differential diagnoses for this (2 marks)

- Drug effect of sedation/stunned myocardium/NSTEMI/sepsis