

## BOOK 2 ANSWERS

### QUESTION 11 (13 marks)

A 23 year old lady presents to your ED following an episode of 'feeling faint' with subsequent collapse and brief loss of conscious with spontaneous recovery. Her observations at triage are normal, she is afebrile and alert. An ECG is performed

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

i. What is your ECG diagnosis? (2 marks)

Long QT (concerning for an arrhythmia syncope cause)

ii. Outline 5 questions on history that you would like to ask (5 marks)

- History of prior syncope or pre-syncope
- Syncope in the setting of inciting event such as exercise. Swimming, emotional event etc
- Hx of palpitations/chest pain
- Family hx of sudden death esp. age under 30
- Confirmed relative with congenital Long QT.
  - Personal or family hx of deafness (Jervell, Lang-Nielson)
  - Medication use/substance ingestion (e.g. Thiazides, Opiates, (Quinidine, Quinolone) Risperidone, Sotalol, Antihistamine, ant-Depressants TCA, Erythromycin (macrolides) SSRI)
  - Anything sensible affecting electrolytes (eating disorder, vomiting illness etc.)

iii. List and justify initial bedside ED investigations (5marks)

Bloods – including EUC, CMP, May do VBG (hypoK/Ca/Mg as cause) LFT renal/hepatic impairment as risks for long QT

- (TSH, BSL, BHCG) - alternative cause
- Serial ECG (?dynamic changes) and continuous monitoring (monitor for arrhythmia)
- Postural BP
- Consider bedside Echo ?alternate cause (PE, effusion, etc although clinically unlikely)

iv. What is your disposition plan for this lady? (1 mark)

Admit to monitored bed under cardiology

## QUESTION 12 (16 marks)

A 35 year old woman presents diplopia. She has binocular double vision on both horizontal and vertical gaze. You suspect she has a third cranial nerve palsy.

- i. Describe the typical examination findings of a third nerve palsy (3 marks)
  - Binocular horizontal, vertical or oblique diplopia
  - Paralysis of adduction, elevation & depression → eye looks “down & out”
  - Ptosis
  - Pupil dilation (may or may not be present)
- ii. The location of the site of a third nerve lesion can be predicted by the presence of other symptoms and examination findings (6 marks)

| Location of lesion  | Associated symptoms/signs   |
|---|---|
| Brainstem/midbrain (e.g. around oculomotor nuclei)                | Dizziness, vertigo, ataxia, aphasia<br>“Crossed signs” - contralateral cerebellar deficits or contralateral hemiparesis |
| Intra-cranial course (e.g. along lateral wall of cavernous sinus) | Involvement of other CN - 4 <sup>th</sup> , 5 <sup>th</sup> , 6 <sup>th</sup>   |
| Orbital (superior orbital fissure, orbital apex)                  | Orbital signs – chemosis, conjunctival injection, proptosis, visual loss, 4 <sup>th</sup> , 6 <sup>th</sup>             |

- iii. In the setting of a 3<sup>rd</sup> nerve palsy, the presence or absence of ipsilateral pupil dilation helps to distinguish between a compressive aetiology (eg. expanding aneurysm) and a microvascular/ischaemic aetiology. Explain. (2 marks)

Pupil constriction is mediated by parasympathetic fibres that accompany CN III – they travel peripherally & are more susceptible to compression resulting in pupil dilation (from unopposed sympathetic supply)

- iv. List 5 causes of anisocoria (other than 3<sup>rd</sup> nerve palsy) (5 marks)
  - Physiologic
  - Structural defects of iris – congenital iritis, traumatic, surgical
  - Acute angle closure glaucoma
  - Horner’s syndrome
  - Pharmacologic – cycloplegics (atropine, tropicamide, cyclopentolate), aerosolized anticholinergic (ipratropium), plants
  - Traumatic
  - Adie’s pupil

## QUESTION 13 (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 <sup>9</sup> /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 – MgSO<sub>4</sub> 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 14 (14 marks)

The time to transfer of care (TOC) from ambulance stretcher to your ED (“off-stretcher” time) deteriorated recently.

- i. What are the adverse effects of prolonged TOC times? (4 marks)

Delayed access to definitive assessment and care in the acute hospital setting<sup>1</sup>, with these delays likely to be associated with the same poor outcomes already known to be associated with delayed emergency department care<sup>2</sup>.

☐ Effects on the timeliness of ambulance responses, as there are fewer crews available to cover the same geographic areas<sup>1</sup>. This is reflected in deteriorating response times for critical and emergent patients.

☐ Lost ambulance and personnel time for ambulance services, which either reduces ability and flexibility, or increases ambulance service and community costs due to additional overtime or the need for additional crews and ambulances<sup>1</sup>.

☐ Potential impacts on funding and resultant financial penalties for ambulances and hospitals, as ramping affects key performance measures for ambulance services and EDs.

☐ Prolonged poor publicity for health systems, ambulance services, hospitals and EDs, leading to poor staff morale and poor public perceptions of key areas of the health system and personnel within that system.

☐ Increased stress and interpersonal conflict between patients, paramedics and ED staff<sup>1</sup>.

To address this problem an increasing number of patients have been sent directly from the ambulance bay to the Emergency Medicine Unit (EMU). Unfortunately, there have been a number of incidents in your EMU where patients have unexpectedly deteriorated during their stay.

- ii. What is the role of an EMU or ED Short Stay Unit? (2 Marks)

*To manage Emergency Medicine patients who would benefit from extended treatment and observation but have an expected length of stay of less than 24 hours.*

*Taken from Cameron Textbook of Adult Emergency Medicine 3rd Edition Section 27.2*

- iii. How would you develop a solution to the increased number of patients deteriorating in EMU? (4 Marks)

*Gather information - 1 Mark*

*Develop solution plan - 1 Mark*

*Implement plan - 1 Mark*

*Audit / Re-collect data - 1 Mark*

*Note exact wording not essential but plan must include aspects of each of these domains to score maximum marks*

- iv. You have been asked to develop a set of exclusion criteria for your Short Stay Unit. Please list your exclusion criteria ? (4 Marks)

*Patients who should be admitted to in-patient wards - complex medical or surgical problems*

*Multiple problems*

*Elderly patient ?*

*Paediatric patients*

*Patients without clear management plan / diagnosis*

*Patients with intensive nursing requirements*

*Risk to staff patients - psychotic, violent, forensic history*

## QUESTION 15 (17 marks)

A 23 year-old female is brought to your ED following a high speed motor vehicle accident. She has normal vital signs but has tenderness in her right upper abdomen with no peritoneal signs. Secondary survey reveals no other injuries.

- i. Outline the role of the abdominal FAST scan in haemodynamically *stable* blunt trauma patients (3 marks)
  - Clear role for FAST in *unstable* blunt trauma (guides decisions about going to OT...)
  - In stable patients, sensitivity of FAST in detecting significant injury is poor (< 50% - i.e. lots of false negatives – doesn't "rule out" the disease)
  - In particular misses hollow viscus & retroperitoneal injury and doesn't assess solid organ injury (with view to non-operative Mx)
  - There is no evidence base to recommend FAST in this context. Decisions about CT scan/laparotomy/observation need to be based on other patient findings
  - May be useful for clinician practice and possibly a role for serial FAST in a stable patient admitted for observation
- ii. Describe the findings in the right upper quadrant on this FAST scan image (2 marks)

Possible hypoechoic stripe adjacent to kidney – wedge-shaped and bounded by echoic lines – likely represents perinephric fat rather than free fluid. (1 mark for adequate description, 1 mark for correct interpretation)

- iii. What are the pitfalls and limitations of FAST ultrasound scanning in trauma (4 marks)
  - Operator dependent
  - Technical difficulties – obesity, subcutaneous air
  - Requires > 250 mL blood to collect to become positive
  - Doesn't look at retroperitoneal space, hollow viscera or solid organs
  - Role in pelvic trauma unclear
  - Doesn't identify source of bleeding
  - Doesn't distinguish other sources of IP fluid (peritoneal dialysis, ascites, ruptured ovarian cyst etc)
  - False positive → unnecessary further imaging/operation
  - Opportunity cost, in terms of staffing resources and time for other procedures ie. People dicking around with the probe instead of getting on with definitive care
  - Trauma patients non-fasted and limitations with bowel gas
  - Evidence for use in Paediatric population limited and due to primarily conservative approach in kids for blunt trauma - limited utility in decision making.

- iv. Discuss the advantages and disadvantages of whole body CT scanning (“pan scan”) versus selective imaging in trauma (4 marks)

Controversial area. Biggest study is REACT-2 which found

- No mortality benefit in WBCT
- Time to identifying injuries shorter (50 minutes versus 58 min)
- No difference in total radiation dose (both groups ~ 20mSv) – though the range of dose in the selective group 9-22 mSv

- v. Complete the following table relating to ionising radiation arising from CT imaging (4 marks)

|                   | Dose (mSv) | Equivalent number of chest X-rays | Equivalent period of natural background radiation (years) |
|-------------------|------------|-----------------------------------|---|
| Head CT           | 2          | 100                               | 1   |
| CT abdomen/pelvis | 15         | 700                               | 5   |



## QUESTION 16 (16 marks)

A 25 year old man presents 6 hours after a SCUBA dive with a possible decompression sickness (DCS)

- i. List 6 questions specific to diving that you should ask in your history (6 marks)
- Dive profile (ideally from log book or computer) – depth, times, ascent rates, surface intervals, safety/decompression stops
  - Dives in excess of tables?
  - Multiple dives in one day?
  - Altitude/flight since dive
  - Any problems during descent/ascent – problems equalising? Equipment issues? Incidents?
  - Delay to symptom onset after leaving water
  - Previous dive experience
  - Previous dive-related illness

- ii. Complete the table listing 3 symptoms or signs of DCS in each category (6 marks)

| Category     | Symptom/Sign  |
|--------------|---|
| Neurological | Weakness, headache, paralysis, dizziness, visual disturbance, vertigo, altered LOC, paraesthesia, urinary retention |
| Other        | SOB, rash, itching, joint/muscle aches, chest pain  |

- iii. Complete the table contrasting DCS and Arterial Gas Embolism (AGE) (4 marks)

|                 | DCS   | AGE   |
|-----------------|---|---|
| Pathophysiology | Nitrogen bubbles forming in tissues (pressure effects) and vessels (flow effects) & activation of inflammatory cascade  | Barotrauma – rapid expansion/tear of pulmonary tissue – direct entry of bubbles into arterial circulation |
| Time of onset   | Gradual onset of neuro, MSK and/or skin symptoms – often within 30-60 minutes of surfacing – nearly all within 24 hours | Usually occurs on ascent or immediately upon surfacing  |

QUESTION 17 (14 marks)

A five-year old boy has been kicked in the face by a horse and has been brought to your rural base hospital by ambulance. He is unconscious, has extensive facial injuries and partial airway obstruction.

Vital signs:

HR 140

SBP 80

GCS 3

Sats 85%

At laryngoscopy the view is obscured by anatomical derangement, massive tongue swelling, blood and debris and he cannot be oro-tracheally intubated.

- i. Explain why partial/complete upper airway obstruction is a relative contraindication to percutaneous transtracheal ventilation (3 marks)

In routine use of percutaneous transtracheal ventilation (PTV) through a catheter, much of the expired air comes out of the mouth and nose. Thus, with complete upper airway obstruction, egress of expired air is difficult. Initial studies in animals suggested that PTV in the setting of complete upper airway obstruction led to development of massive distension of lungs, severe barotrauma, and death. Subsequent studies have shown successful use of PTV in settings of complete upper airway obstruction using modified techniques that consist of prolonged expiratory time, larger internal diameter catheters, and lower oxygen flow rates.

PTV may be used successfully in partial laryngeal obstruction as the "ball-valve" effect, while constraining natural inspiration, adequately permits exhalation. For infants and young children with complete upper airway obstruction and where other methods have been unsuccessful, it is reasonable to use PTV. Ventilatory methods should use a longer expiratory time (eg, I:E ratio of 1:8 to 1:10), lower oxygen delivery pressure and flow rate, and as large a catheter as possible. In addition, the clinician should carefully monitor for chest rise and fall with inspiration and expiration. Diminished chest fall with expiration should lead to further reduction in respiratory rate, longer expiratory time, and emergent chest radiography to look for signs of pulmonary barotrauma.

- ii. Describe a method for connecting a bag-valve device to a 16-gauge catheter that has been inserted successfully through the cricothyroid membrane (3 marks)

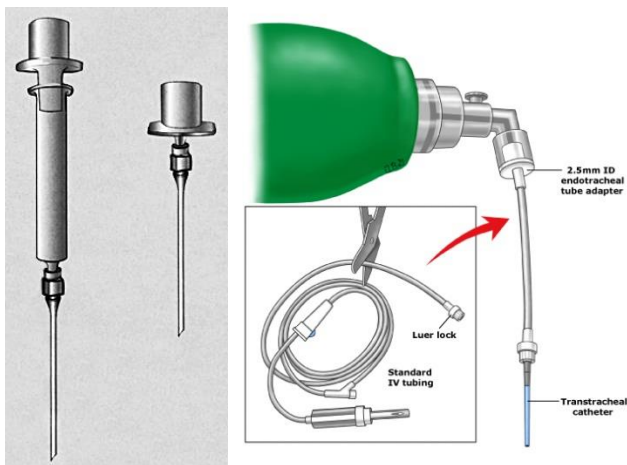
**Bag-valve-mask connector options** — If a bag-valve-mask will be used for patient ventilation, then it should connect to the catheter using one of the following improvised adapters:

10ml syringe with plunger removed – insert small ETT and inflate cuff

Three mL Luer lock syringe with plunger removed with 7.5 mm ID endotracheal tube connector (bag-valve-mask connector)

3.0 mm ID endotracheal tube connector attached directly to the catheter (bag-valve-mask connector)

2.5 mm ID endotracheal tube connector attached to cut off IV tubing with Luer lock end connected directly to the catheter



- iii. Outline the ventilation parameters you would use if a commercially available jet ventilation device with variable-flow oxygen is available (3 marks)

Begin regular ventilation by intermittently opening and closing the in-line valve; by intermittently occluding the side port, y-connector, or stopcock; or by ventilations with the self-inflating resuscitation bag, depending on the system in use.

●Use I:E ratio of 1:4 to 1:5, with a breath rate of 10 to 12/minute for most children. Change the ratio to 1:2 to 1:3 with a breath rate of 15 to 20/minute in the setting of increased intracranial pressure to improve CO<sub>2</sub> elimination. With partial or complete upper airway obstruction, use the ratio of 1:8 to 1:10 with a breath rate of 5 to 6/minute to reduce the risk of pulmonary barotrauma. Adjust these ratios based on clinical monitoring, blood gas measurements, and chest radiography.

iv. List 5 complications of percutaneous transtracheal ventilation (5 marks)

| Category  | Complication  |
|---|---|
| Unsuccessful catheter placement <b>OR</b> Successful catheter placement with subsequent obstruction, kinking, or dislodgement | Inability to ventilate  |
|   | Subcutaneous emphysema  |
| Barotrauma  | Subcutaneous emphysema  |
|   | Pneumomediastinum   |
|   | Pneumothorax  |
|   | Pneumatocele of the larynx  |
| Damage to adjacent structures   | Posterior tracheal laceration or perforation                                    |
|   | Esophageal perforation  |
|   | Mediastinitis   |
|   | Vocal cord injury   |
|   | Laryngeal injury and/or laryngospasm  |
| Excessive bleeding  | Hematoma (cutaneous and/or airway) with extrinsic or intrinsic airway narrowing |
| Infection   | Cellulitis and abscess (cutaneous and/or prevertebral)                          |
|   | Tracheitis  |
|   | Osteomyelitis of the cervical spine   |

QUESTION 18 (15 marks)

A 52 year old man presents with back pain.

- i. List six (6) clinical features associated with serious underlying causes (“Red Flags”) (6 marks)
  - Age of onset < 20 and > 55 years
  - Constant, progressive pain not relieved with bed rest
  - Past history of malignancy
  - History of osteoporosis or prolonged corticosteroid use
  - Risk factors for infection – immunosuppression, recent spinal surgery
  - Systemically unwell and/or fever
  - Unexplained weight loss
  - Significant neurological symptoms or signs
  - Structural deformity
- ii. Recovery from non-specific mechanical back pain is influenced by various psychosocial factors (“Yellow Flags”). List 5 of these (5 marks)
  - Inappropriate attitudes/beliefs about back pain – belief that pain & activity are harmful
  - Abnormal pain behaviour with an inappropriate reduction in activity levels
  - Past/recurring history of back pain
  - Work-related problems/worker’s compensation implications
  - Previous psychological or stress problems
  - Poor coping skills
  - Lack of social support
- iii. The infection causing spinal epidural abscess can arise from many sources. List 4. (4 marks)

Source of infection

often unknown

haematogenous spread

skin/ soft tissue infections

infected prostheses e.g. IV catheters

bacterial endocarditis

pneumonia

UTI

contiguous spread

Vertebral osteomyelitis

Retropharyngeal abscess

Overlying skin infections or pressure sores

Psoas abscess

Penetrating injury

Epidural injections or catheters

Spinal stimulators

QUESTION 19 (16 marks) A 53 year old man injured his posterior lower leg on sharp steel at a worksite and presents with a 5cm laceration 6 hours later.

- i. Wound irrigation is an effective way to remove debris and contaminants and to decrease bacterial counts in traumatic wounds. Describe the usual method of conducting wound irrigation (3 marks)
- ii. Anaesthesia (local, block etc) normally used as wound cleaning is painful. Classically irrigation is with 0.9% saline (though tap water considered OK) with device delivering sufficient pressure (7-10 psi in ED context – operating theatre pulsed jet lavage delivers 50-70 psi). Typically a 20 mL syringe and 19 g catheter. Need sufficient volume – typically 100-300 mL (more for larger and/or visibly contaminated wounds)
- iii. Which wounds are typically considered candidates for Delayed Primary Closure? (2 marks)
- iv. Bite wounds, heavily contaminated wounds, wounds with extensive tissue damage, wounds presenting late (controversial – duration of concern is anything from 4-12 hours)
- v. Describe the technique for Delayed Primary Closure (2 marks)

At initial encounter, wound cleaned, irrigated, debrided as needed. Pack with saline-soaked gauze or equivalent, cover with dressing. Return at about 4-5 days. If wound appears clean, uninfected → closure

- vi. In what circumstances is antibiotic prophylaxis appropriate in traumatic wounds? (5 marks)

Bites, clenched fist injuries, heavily contaminated wounds (soil, faeces etc), wounds with significant tissue injury (e.g. crushed, macerated, devitalised tissues), stab/penetrating injuries, wounds involving deeper structures (e.g. tendon, joint), wound in a limb with lymphoedema, delayed presentation (> 8-12h), situations where cleaning/irrigation/debridement is difficult

- vii. What are the key points in the wound care instructions that you will give this patient? (4 marks)
  - Advice on expected course – there will be a scar, fades over 6-12 months
  - Advice on return precautions – e.g. signs of infection – expect 2-5% of wounds to become infected
  - Advice about pain management
  - Keep dressing in situ, clean & dry for 48 hours – can then remove to look for infection
  - Daily gentle washing with mild soap & water
  - Can continue to dress if makes more comfortable
  - Advice about timing of ROS (about 7 days for the wound in stem)

## QUESTION 20 (15 marks)

A 40 year old developmentally delayed patient is brought to your ED with vomiting. She had PEG inserted 4 weeks ago for feeding. On arrival her GCS is 13 (E4 V3 M6) which is normal for her according to the carers. Sats 95%, RR 13, P 90 BP 140/70, she weighs approximately 40kg. She is on no regular medications.

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

- i. Please describe the ECG and provide 3 possible diagnoses (5 marks)

SR rate approx 80

Diffuse ST depression (all chest leads, inferior and lateral) with T wave inversion

Prominent U waves

(psuedo) Prolonged QT 480 uncorrected, 550 corrected (do not need values)

Differential:

Hypokalaemia – pathognomic

Ischaemia (but unusual as widespread ST depression)

Any cause of long QT – drugs (artis) for example. Should name a drug

- ii. Her clinical exam is unremarkable other than dry mucus membranes, bloods including a VBG are taken. The ambulance crew have NOT placed an IVC. Describe and interpret the VBG and provide a likely differential (5 marks)

pH 7.44 (7.35 – 7.45)

pCO<sub>2</sub> 47 mmHg (35 – 45)

HCO<sub>3</sub> 42 mmol/L (22 – 28)

BE xxxx (-3 - + 3)

K 2.0 mmol/L (3.4 – 5)

Na 155 mmol/L (134 – 146)

Cl 129 mmol/L (98 – 106)

Glu 7.4 mmol/L 3.5 – 5.5)

Severe / moderate respiratory acidosis and severe metabolic alkalosis with normal pH. (alkalosis likely pathological process as much more severe)

Severe hypernatraemia

Severe hypokalaemia – life threatening

Differential:

Conns / hyperaldosteronism

Cushings

PEG feed error

Dehydration (severe)

(Note: administration of chloride or sampling error unlikely given NO ivc present)

iii. Outline your immediate management of this case (5 marks)

Ensure patient monitored – risk of VT / VF

Potassium replacement – likely need CVC – 10mmol /hr periph, higher if central access

Check urinary Cl – high in mineralocorticoid excess, low in dehydration (former resistant to saline, latter saline is treatment)

Check Mg –often severely deplete with hypokalaemia

Check serum Cl – high in mineralocorticoid excess

Monitor EUC – 4 hrly

High risk for deterioration – discussion with family / next of kin regards treatment limitations

Disposition – monitored bed, likely HDU / ICU