



Model Answers — Monash Practice SAQ Trial 2024.1

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Question 1 (18 marks)

A 70 year old male is brought into your tertiary Emergency Department after pre-hospital notification of a suicide attempt by jumping in front of a passenger train with resultant complete amputation at the level of his right upper arm.

Emergency services have retrieved the patient's limb and are transporting this with the patient.

On arrival the patient's vital signs are:

PR	118 bpm
BP	98/50 mmHg
RR	26 /min

Surprisingly the patient is alert and oriented, however he is screaming out in pain. You task one of your senior nursing colleagues to specifically manage the amputated limb whilst you concurrently attend to resuscitating your patient.

Part a (4 marks)

State four (4) steps in caring for the amputated limb

Model answer

- Remove gross contamination
- Irrigate with saline or sterile water
- Wrap in moistened sterile gauze
- Seal in water-tight container
- Place container on ice water bath (slurry) or medical refrigerator

Part b (4 marks)

Outline four (4) steps in caring for the stump (site of amputation)

Model answer

- Elevate the limb
- Irrigate with saline
- Cover with damp gauze
- Splint obvious/unstable fractures (keep as near anatomic position as possible)
- Control haemorrhage with pressure bandage
- Accept use of tourniquet if explains only for uncontrollable bleeding

Part c (6 marks)

The patient is clearly distressed and you decide to prioritise analgesia.

Complete the table below with an appropriate analgesic option FOR THIS SCENARIO as well as indicating one potential negative in its use IN THIS PATIENT.

You must give a DIFFERENT potential negative for each option.

Model answer

- Ketamine - salivation / spasm in a currently patent airway

- Morphine or Fentanyl - risk of elderly patient and trauma rapid respiratory depression
- with even small doses (note fentanyl appears to be better tolerated in trauma)
- Intubation - loss of sympathetic tone in borderline BP elderly
- BZD - not truly analgesic and may inhibit useful cues in Ax (pain!)
- Nerve blocks - difficult in amputation if this is source (anatomy distorted)
- Penthrane - requires patient cooperation and may induce emesis
- Splinting - loss of visualisation of site (e.g. blood loss)

Part d (4 marks)

List four (4) acute complications of traumatic amputation you will specifically address during resuscitation

Model answer

- Rhabdomyolysis (crush usually predominates - guillotine military)
- Coagulopathy (most patients coagulopathic pre hospital)
- Compartment syndrome
- Infection control (particularly long bones)
- Fat embolism
- ARDS (fluid Mx)
- Joint dislocations (nerve and vascular ongoing damage)

Question 2 (12 marks)

A young female presents to your Emergency Department with hypotension and collapse

Part a (3 marks)

Other than a massive PE, list three (3) possible differential diagnosis for this presentation with the specific Ultrasound exam type to identify them

Model answer

- Ruptured ectopic FAST
- Pneumothorax Lung
- Pericardial effusion, tamponade ECHO
- AAA EFAST
- Bleed/hypovolaemia EFAST

Part b (3 marks)

Describe three (3) POCUS findings typical of a massive PE and the view required to obtain it

Model answer

- Increased RV size Apical 4, PSLAX
- Decreased RV function Apical 4
- Tricuspid regurgitation Apical 4
- Abnormal septal wall motion (D septum) PSSAX
- McConnell sign Apical 4
- Decreased tricuspid annular plane systolic excursion (TAPSE) Apical 4
- Dilated non collapsible IVC Subcostal view.
- Increased Pulmonary Arterial Pressure Apical 4
- Hyperdynamic LV systolic function PSLAX, Apical 4

Part c (3 marks)

The patient's transthoracic echo confirms a large pulmonary embolus and so you proceed to look for a lower limb DVT.

List the three-points on PoCUS you would assess to exclude a DVT

Model answer

- Point one CFV
- Point two FV Accept CFV-GSV. Mid and distal FV
- Point three PV

Part d (3 marks)

List three (3) expected US findings for an acute proximal DVT

Model answer

- Non compressible vein "non winking"
- No colour flow Doppler identified
- No or reduced Doppler flow
- Clot seen in the vein (echogenic)

Question 3 (12 marks)

An infant male is brought to your ED by ambulance following a Brief Resolved Unexplained Event (BRUE).

Part a (4 marks)

List four (4) criteria that must be met to diagnose this event as a BRUE

Model answer

- Infant less than 12 months
- Sudden onset
- Not explained by identifiable medical conditions
- Characterised by at least one of cyanosis/pallor; abnormal breathing; change in tone; altered level of responsiveness

Return to baseline not accepted (it's in the definition)

Part b (6 marks)

List six (6) specific and contrasting differential diagnoses that should be considered when assessing this infant

Model answer

- Airway: obstruction, inhaled foreign body, laryngospasm, congenital abnormalities, infection
- Cardiac: congenital heart disease, vascular ring, arrhythmias, prolonged QT
- Abdominal: intussusception, strangulated hernia, testicular torsion
- Infection: pertussis, sepsis, pneumonia, meningitis
- Metabolic: hypoglycaemia, hypocalcaemia, hypokalaemia, other inborn errors of metabolism
- Toxins/Drugs/Ingestions: accidental or non-accidental
- Inflicted injury

Part c (2 marks)

There are no concerning features found on history and examination. You believe that this is a low risk event and plan to discharge the infant home.

List two (2) additional criteria which must be met to consider this presentation a low-risk BRUE

Model answer

- age >60 days
- born ≥32 weeks gestation and corrected gestational age ≥45 weeks
- no CPR by trained healthcare professional
- first event
- event lasted <1 minute

Question 4 (12 marks)

A 47 year old male presents to your ED complaining of a change in his skin colour. He has no known past medical history and no relevant family history of note. He is clinically stable, and his initial blood tests are as follows:

Hb	65 g/L	(normal 130-180 g/L)
WCC	8 x10 ⁹ /L	(normal 4-11 x10 ⁹ /L)
Platelets	230 x10 ⁹ /L	(normal 150-450 x10 ⁹ /L)
AST	18 units/L	(normal <35 units/L)
ALT	15 units/L	(normal <35 units/L)
ALP	106 units/L	(normal 30-110 units/L)
GGT	25 units/L	(normal <40 units/L)
Bilirubin	60 micromol/L	(normal <20 micromol/L)

Part a (4 marks)

Complete the following table by giving two (2) possible causes for each category.

Model answer

CONJUGATED HYPERBILIRUBINAEMIA	UNCONJUGATED HYPERBILIRUBINAEMIA
Infections: Hepatitis, Leptospirosis, EBV, sepsis	Haemolysis
Extrahepatic obstruction: calculi, tumours	Congenital: Gilbert disease, Crigler-Najjar syndrome
Drugs: halothane, paracetamol, methyldopa, phenytoin, barbiturates, MAOI, sulphonamides, indomethacin, erythromycin, chlorpromazine, isoniazid, flucloxacillin, OCP	Drugs: chloramphenicol, gentamicin
Congenital: Dubin–Johnson syndrome, Rotor syndrome	
Other: cirrhosis, sarcoidosis	

Part b (1 mark)

You ask the pathology laboratory to provide a bilirubin differential. His result are as follows:

Conjugated bilirubin 5 micromol/L
Unconjugated bilirubin 55 micromol/L

On further questioning, you discover that the patient was recently commenced on an antimalarial medication as prophylaxis ahead of his upcoming trip to Vanuatu.

What is the most likely diagnosis?

Model answer

Haemolytic anaemia

Part c (3 marks)

List three (3) other possible drugs that can cause this scenario.

Model answer

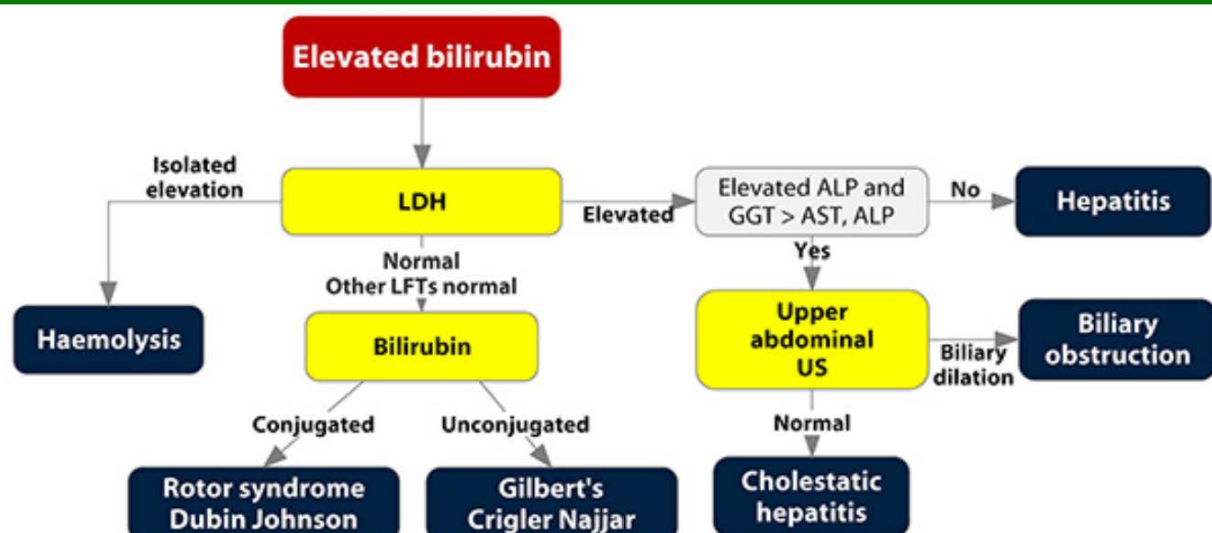
Dapsone, local anaesthetics (lignocaine, benzocaine), nitrates/nitrites, sulfonamides, penicillin, cephalosporins, erythromycin, paracetamol, NSAID's, quinidine, levodopa/methyldopa, rifampicin, probenecid, quinidine, chemotherapy agents.

Part d (4 marks)

List and provide a justification for four (4) further blood tests that you will now order

Model answer

Image 1: Diagnosis of elevated bilirubin



Question 5 (12 marks)

A 60 year old female, with known hypothyroidism, presents with acute confusion. There is no history of trauma, she is on thyroxine but no other medications.

Vital signs:

Temp 36.0 °C
HR 40 bpm
BP 60/40 mmHg
O₂ Sats 86% on RA
GCS 13

An ABG is taken shortly after with FiO₂ = 0.4

pH 7.20
pO₂ 55 mmHg
pCO₂ 60 mmHg
HCO₃⁻ 10 mmol/L
Na 130 mmol/L
K 6.0 mmol/L
Cl 100 mmol/L
Glucose 2.2 mmol/L

Part a (4 marks)

Complete the table below regarding the two (2) main acid base abnormalities in this ABG. Include your calculations

Model answer

	Abnormality	Calculation
1	Metabolic acidosis	AG = 130-10-100 = 20 = RAGMA Delta = 20-12/24-10 = 8/14 = 0.6 = Mixed RAGMA and NAGMA
2	Respiratory acidosis	Expected pCO ₂ = 1.5*10 +8 = 23 expected HCO ₃ = acute 26 and chronic 32

ABG- hypoxaemia, hypoNa, hypoglycaemia metabolic acidosis, resp acidosis

Part b (4 marks)

List two (2) other abnormalities and one (1) likely cause for each in this patient

Model answer

	Abnormality	Cause
1	HypoNa	Increased ADH secretion Impaired free water clearance
2	Hypoglycaemia	Impaired gluconeogenesis Adrenal insufficiency, decreased insulin clearance, GH deficiency
3	Widened Aa gradient, hypoxaemia $A-a \text{ gradient} = 300 - 1.25 \times 60 - 55 = 170$	Respiratory sepsis/pneumonia, hypoventilation from muscle weakness

HyperK- 6.0. Cause- expected shift in K for metabolic acidosis

Part c (1 mark)

List your most likely diagnosis.

Model answer

Myxoedema Crisis

Part d (3 marks)

Supportive treatment has been started– supplemental O₂, IV fluids and ionotropes.

List three (3) other specific treatments that should be given

Model answer

- IV levothyroxine
- IV IV tri-iodothyronine
- IV hydrocortisone
- Broad spectrum AB – normal temp in myxoedema is likely sepsis

Question 6 (12 marks)

A 70 year-old male presents with 24 hours of painful acute urinary retention.

Part a (8 marks)

Complete the table by listing five (5) obstructive and three (3) non-obstructive potential causes

Model answer

Obstructive	Non obstructive
• Intrinsic to urinary tract - o Urethritis - o Urethral stricture - o Cystitis - o Urethral stone - o Blood clots - o Foley catheter malfunction • Extrinsic to urinary tract - o BPH - o Prostatitis - o Prostatic abscess - o Fecal impaction - o Balanitis or posthitis - o Phimosis or paraphimosis - o Abscess around urethral meatus - o Pelvic mass - o Aortic aneurysm	• Disruption of the urinary tract - o Urethral or penile trauma - o Bladder injury • Problems with bladder emptying - o Neurogenic ▪ Spinal cord trauma ▪ Spinal cord compression ▪ Multiple sclerosis ▪ Guillain-Barré - o Pharmacologic ▪ Anticholinergics ▪ Histamine (H1) receptor antagonists ▪ Antipsychotics ▪ Anticholinergics for chronic obstructive pulmonary disease ▪ Tricyclic antidepressants ▪ Opioids • Psychogenic - o Anxiety - o Fear of painful urination

Part b (1 mark)

The patient returns three days later with a paraphimosis from a failure to retract the foreskin during IDC insertion. The IDC remains in-situ.

Left untreated, what is the primary complication of paraphimosis for this patient?

Model answer

Glans Necrosis

Nb: Urinary obstruction/retention not applicable given IDC insitu

Part c (3 marks)

List three (3) management steps to treat the paraphimosis.

Model answer

- Manual compression and reduction
- Application of granulated sugar, dextrose or ice
- Urology referral for dorsal slit reduction if above measures fail

Question 7 (12 marks)

A 35-year-old woman, 30 weeks gestation, presents with shortness of breath and chest pain for the last 2 days.

On examination, she is afebrile and orthopnoeic with mild pallor while coughing up pink frothy sputum.

RR	34 /min
Sats	90% on RA
BP	100/60 mmHg
HR	120 bpm

Her ECG showed chronic LBBB. Chest X-ray shows features of cardiomegaly and pulmonary oedema.

Part a (4 marks)

Other than peripartum cardiomyopathy, list four (4) conditions, specific to pregnancy, which may result in right or left heart failure or both.

Model answer

- Massive Pulmonary Embolism
- Pre-eclampsia
- Myocarditis
- Sepsis
- Worsening of Pre-existing rheumatic heart disease
- Pituitary apoplexy
- Tocolytic pulmonary oedema
- Myocardial infarction
- Pre-existing Cardiomyopathy

Part b (2 marks)

List two (2) points in the criteria that form the definition of peripartum cardiomyopathy.

Model answer

Echo evidence of idiopathic cardiomyopathy +

1. that occurs during a 6 month period peripartum (1 month pre and 5 months postpartum)
2. other identifiable causes excluded

Part c (2 marks)

This patient has a cardiac arrest.

List the two (2) criteria for a Resuscitative Hysterotomy

Model answer

- Maternal arrest within 4 minutes AND
- >24/40 gestation (Alternatively use fundal height above umbilicus)

Part d (4 marks)

List four (4) adjustments you would make to ALS in a pregnant cardiac arrest patient

Model answer

- CPR in left lateral position (15-30 deg tilt).
- Manual uterine displacement to relieve aortocaval compression.

Have to mention one of above and then others below may be accepted as well.

- Hands slightly higher on sternum for chest compressions (also accepted)
- IV access above diaphragm
- Early intubation

Prepare for perimortem c-section

Question 8 (12 marks)

A 28 year old man presents following a suspected gammahydroxybutyrate (GHB) overdose. His GCS is 7 (E1V1M5)

Part a (2 marks)

Other than reduced conscious state, list two (2) clinical signs you would seek on physical examination that are associated with GHB toxicity.

Model answer

1. Myoclonus
2. Bradycardia

Other: Excessive salivation, miosis

Part b (4 marks)

List two (2) pros and two (2) cons regarding the utility of intubation in the management of this patient.

Model answer

Pros

1. Secures airway if inadequate
2. Provide higher FiO₂ if hypoxic

Other: less risk aspiration if vomits

Cons

1. Risk if complications e.g. failed airway,
2. Requires increased staff resources during intubation, plus 1:1 nursing after

Other: Increased length of stay

Part c (6 marks)

List three (3) important non-toxicological differential diagnoses for altered conscious state that would require specific treatment (other than supportive care), and for each give your method of confirming the diagnosis if suspected.

Model answer

	DDx	Diagnostic method
1.	hypoglycaemia	Bedside glucose
2.	Head injury/SDH/ICH	CTB
3.	CNS infection	Seek history of headache, vomiting, fever.

Other: hypoNa, ETOH withdrawal, hepatic encephalopathy, uraemic encephalopathy, post-ictal, heat stroke.

Question 9 (18 marks)

A 27-year-old female has collapsed at home. She develops a narrow complex PEA arrest enroute to hospital. The Paramedics are performing CPR as the patient arrives in the ED.

Your team will utilize ultrasound, during CPR and the rhythm check, to determine possible causes of the cardiac arrest. What is the name of the graph?

Part a (15 marks)

List five (5) potentially reversible causes of a PEA cardiac arrest for this patient that could be identified by an ultrasound. For each of your causes, list two (2) ultrasound findings (without repetition) that could be seen.

Model answer

- Cardiac tamponade
 - o Significant pericardial effusion
 - o Dilated IVC
 - o Compressed right atrium and/or ventricle
- Massive PE
 - o RV dilation, RV:LV > 1:1 (early in arrest as RV dilation occurs with prolonged CPR)
 - o D shaped RV on PSAX
 - o Right heart thrombus
 - o Deep vein thrombosis
 - o Clot in pulmonary artery / bifurcation / saddle
- Tension pneumothorax
 - o Absent lung sliding (during ventilation)
 - o Linear/linear (Stratosphere/barcode) finding on M mode scanning during assisted ventilation
 - o Collapsed / Underfilled ventricles
 - o Dilated IVC
- Hypovolaemia/trauma/ectopic/sepsis

(These could be counted separately provided the ultrasound features are not repeated).

- o Underfilled ventricles
- o Unable to visualise the IVC / Collapse of IVC
- o Pleural effusion
- o Free peritoneal fluid
- o Empty uterine cavity (if known positive pregnancy test)
- o Presence of adnexal mass

Part b (3 marks)

List three (3) ways that Pseudo-PEA can be detected in the absence of a palpable pulse

Model answer

- arterial line placement during cardiac arrest (identified by the presence of a blood pressure)
- high ETCO₂ readings in intubated patients
- echocardiography or Doppler ultrasound demonstrating cardiac pulsatility

Question 10 (18 marks)

You are working in a major trauma centre when you receive a call that there has been a chemical spill in a pesticide factory. 30 people have been found unconscious

Part a (8 marks)

Complete the table by listing the categories and then describing the criteria used for disaster triage

Model answer

- Red – first priority – life threatening shock or hypoxia is present or imminent, but the patient can likely be stabilised and, if given immediate care will probably survive
- Yellow/amber – second priority – the injuries have systemic implications or effects, but patients are not yet in life-threatening shock or hypoxia, although systemic decline may ensue, given appropriate care, can likely withstand a 45-60 minute wait without immediate risk
- Green – third priority – injuries are localised without immediate systemic implications, with a minimum of care, these patients generally are unlikely to deteriorate for several hours if at all
- Black – dead – no distinction can be made between clinical and biological death in a mass casualty incident, and any unresponsive patient who has no spontaneous ventilation or circulation is classified as dead. Some place catastrophically injured patients who have a slim chance for survival regardless of care in this triage category

Part b (6 marks)

List six (6) steps in preparing your emergency department of the incoming patients

Model answer

- Activate a code brown – hospital disaster code
- Set up decontamination area ensuring access to decontamination showers
- Ensure all staff in the warm zone in appropriate PPE
- Set up external triage
- Decant patient from the emergency department – admitted patients to ward, discharge those that can be discharged
- Prepare equipment – intubating drugs and equipment, ventilators
- Call in staff – set up rosters, allocate roles
- Ensure security – walk ins need to be directed to decontamination before entering the cold zone

Part c (1 mark)

The first patient arrives in your resus bay after decontamination, she is a 34 year old female, HR 34 bpm with sats of 80% on Room Air, chest sounds wet, she has a GCS of 11/15 with active vomiting. The patient appears diaphoretic.

What is your key differential diagnosis?

Model answer

Organophosphate poisoning

Part d (3 marks)

List three (3) management priorities for this patient

Model answer

- Decontamination – wash with soap and water and remove clothing
- Atropine 1mg IV repeat every 5 minutes until secretions dry
- Pralidoxime 1-2 grams
- Admit to ICU for monitoring

Question 11 (12 marks)

An 85 year old woman with a past hx of IHD and a DDD pacemaker presents with palpitations and syncope.

This is her ECG.



Part a (5 marks)

List five (5) abnormalities on her ECG

Model answer

1. Atrial Flutter with variable block (Atrial fib flutter also accepted)
2. No atrial spike seen as inhibited by the flutter waves
3. Ventricular pacer failure to sense leading to
 - Ventricular pacing inappropriately, Last ventricular spike pacing during the T wave, thus causing R on T phenomenon triggering ventricular arrhythmias
4. RBBB
5. Right Axis deviation
6. Widespread secondary ST depression changes

Part b (3 marks)

She has runs of stable non sustained VT with a cardiac output. List three (3) medication treatment options include dosages

Model answer

- i) Amiodarone 15mg/kg or 300mg LD
- ii) Sotalol 1.5mg/kg
- ii) Lignocaine 1-1.5 mg/kg or 100mg LLD
- iv) Procainamide 20-50mg/min until arrhythmia terminated
- v) Magnesium 10mmol or 2.5

Part c (4 marks)

Give four (4) possible causes of the patient's pacemaker malfunction.

Model answer

- Lead migration or fracture
- Fibrosis or ischaemia
- Hyperkalaemia
- Undersensing: improperly programmed sensing threshold (high sensing threshold), insufficient myocardial voltage signal, lead displacement, or pacemaker failure

Question 12 (12 marks)

A 22 year old male is brought to ED by police after his family have become increasingly concerned about his behaviour. He has no personal or family history of prior mental health issues. You suspect the patient is exhibiting signs of a psychotic illness.

Part a (4 marks)

Other than medications or drugs, list four (4) medical causes of acute psychosis

Model answer

- Epilepsy
- Hypo- or hyperthyroidism
- Huntington disease
- Wilson disease
- Porphyria
- B12 deficiency
- Cerebral neoplasm
- Stroke
- Viral or autoimmune encephalitis
- Neurosyphilis
- Human Immunodeficiency Virus (HIV)-associated neurocognitive disorders

Part b (5 marks)

List five (5) features on either history or Mental State Examination that make a primary psychiatric illness more likely than an organic cause in this patient

Model answer

- Fully orientated
- Clear sensorium
- Intact cognition
- Slow onset
- Premorbid slow deterioration in employment/family/socially
- Recent significant life event
- Auditory hallucinations
- Structured delusions
- Somatic passivity experiences
- Thought withdrawal/insertion/broadcasting

Part c (3 marks)

After assessment, you have informed the patient that he is to be admitted for psychiatric care. The patient states he wishes to leave.

State three (3) general criteria that must be met before Mental Health legislation can be used to detain a patient

Model answer

- A psychiatric disorder must be present/suspected
- The patient is at acute risk to themselves/others
- There is no less restrictive way to manage this risk

Question 13 (12 marks)

A 65 year old male presents to a rural Emergency Department with chest pain for 70 minutes and is diagnosed with an anterior STEMI on ECG.

His observations are:

HR	72 bpm
BP	105/68 mmHg
RR	20 /min
SpO ₂	95% on Room Air
Temp	37.0 °C

Part a (2 marks)

For this patient, list two (2) criteria for fibrinolysis over PCI

Model answer

1. Time to PCI from first medical contact >90 minutes
2. Chest pain onset < 12 hours

Part b (2 marks)

List two (2) factors that would reduce the urgency of retrieval for rescue PCI post fibrinolysis

Model answer

1. Resolution of pain
2. >50% reduction in STE

Part c (5 marks)

The patient has been given Aspirin 300mg, Ticagrelor 180mg and 5000 IU Heparin.

State five (5) steps that should be taken to prepare the patient while waiting for the retrieval teams arrival.

Model answer

1. Secure IV access - ensure 2 working well
2. Print documentation
3. Prepare infusions - heparin
4. Update family/patient regarding destination
5. Pads on

Other reasonable answers accepted

Part d (3 marks)

State the circumstances in which each of the below platforms would be the quickest to transfer a patient to definitive care

Model answer

Platform	Circumstances
Rotary Wing	Medium distance 50-200km, helipad available at both sites
Fixed Wing	Medium distance & no helipad available, Long distance (>200km)
Road Ambulance	Short distance (<50km)

Question 14 (12 marks)

A 24 year old man presents to your tertiary ED after a motorbike accident. Primary survey and eFAST reveal fluid in the LUQ and the patient proceeds to CT scan where a splenic laceration is revealed.

Part a (5 marks)

Utilising the AAST grading system, provide a definition for the possible grades of injury for a splenic laceration

Model answer

Grade	Injury description	
I	Laceration	Capsular tear, < 1 cm parenchymal depth
II	Laceration	Intraparenchymal, < 5 cm diameter
	Laceration	1–3 cm parenchymal depth not involving a parenchymal vessel
III	Laceration	> 3 cm parenchymal depth or involving trabecular vessels
IV	Laceration	Laceration of segmental or hilar vessels producing major devascularization (> 25% of spleen)
V	Laceration	Completely shatters spleen

Part b (4 marks)

The patient has an isolated grade 3 splenic laceration confirmed. Vital signs are:

HR	90 bpm
BP	100/60 mmHg
GCS	15/15
RR	14 /min
SpO ₂	98% on room air

List and justify two (2) potential management options for this patient.

Model answer

Management Option	Indication
Conservative	Haemodynamically stable, aim to preserve spleen Grade I-III
IR	Amenable to embolization, contrast blush on CT, moderate haemoperitoneum, ongoing bleeding, AAST > III
Surgery (Splenectomy)	Grade IV/V injury at the hilum or avulsion, haemodynamic instability

Part c (3 marks)

List three (3) vaccinations that patients with functional asplenism require

Model answer

Immunisation (boosted every 5 years)

- Pneumococcal
- HiB
- Meningococcal C
- Influenza

Question 15 (12 marks)

A 65 year old man is brought in by ambulance following a motor vehicle accident where he drove over the edge of a cliff. He was the sole occupant, self extricated and was found by a passerby on the side of the road.

He has obvious signs of a head injury, clinical rib fractures, mild abdominal pain and multiple abrasions.

About an hour post presentation, the patient states he wants to leave. He has had a plain CXR and pelvis Xray which do not show any life threatening injuries.

His vital signs have been within the normal range throughout.

Part a (2 marks)

The patient needs to have capacity to make this decision. State two (2) requirements that demonstrate capacity.

Model answer

- comprehend and retain the information needed to make the decision, including the consequences of the decision.
- use and weigh that information as part of their decision-making process.

Part b (4 marks)

If you were concerned that this was an attempt at deliberate self harm, state four (4) criteria that must be fulfilled to hold him under a treatment order (via the mental health act).

Model answer

1. The person has a mental illness and,
2. Because the person has a mental illness, the patient needs immediate treatment to prevent
 - a. Serious deterioration in mental or physical health, or;
 - b. Serious harm to the person or to another person and,
3. If the person is made subject to a temporary treatment order or a Treatment order, the immediate treatment will be provided to the person and,
4. There are no less restrictive means reasonably available to enable the person to receive the immediate treatment.

Part c (3 marks)

List three (3) decision making principles, outlined in the Mental Health Act, that would guide you in potentially restraining this patient for ongoing investigation and management.

Model answer

- Care and transition to less restrictive support principle
- Consequences of compulsory assessment and treatment and restrictive interventions principle
- No therapeutic benefit to restrictive interventions principle

- Balancing of harm principle
- Autonomy principle

Part d (3 marks)

List three (3) steps you could take to safely discharge this patient if they have capacity and do not fulfil the criteria for a Treatment order.

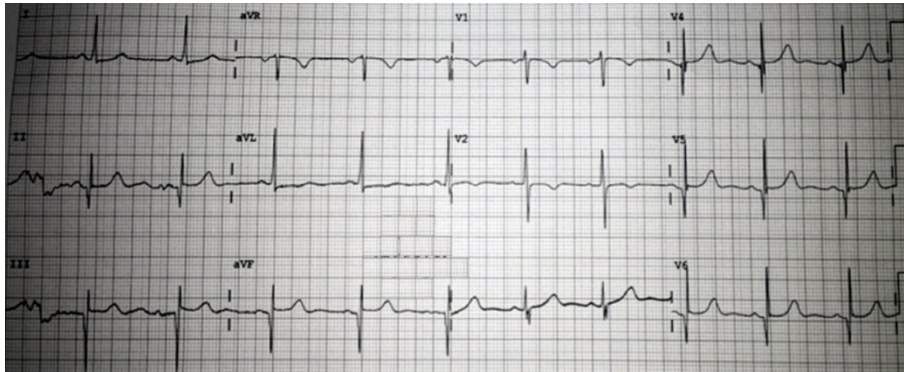
Model answer

- Contact the GP ASAP to arrange for them to be involved in follow up.
- Call the patient the next day to assess for any worsening of condition.
- Involve NOK to either help patient stay in or to follow up.
- Try and negotiate with patient the minimum requirements to be able to leave e.g. CT to exclude serious issues, then leave.
- Provide a list of symptoms to watch for which should encourage return.

Question 16 (12 marks)

Your registrar has seen a 31 year old female who has presented to the Emergency Department with daily palpitations over the preceding 2 weeks and a syncopal episode while exercising today.

Her initial vital signs are within the normal limits and her ECG is shown below:



Part a (4 marks)

List four (4) diagnostic abnormal findings in her ECG

Model answer

- Dagger Q
- LVH pattern
- Short PR
- Delta wave

Part b (5 marks)

List five (5) typical characteristics of a murmur you may auscultate on examination of this patient

Model answer

- High Pitch
- Cres-decres
- Mid sys
- Best at LSB
- Ends before 2nd HS
- Increase with Valsalva

Part c (2 marks)

You request a test knowing it's characteristics (sensitivity 85%, specificity 100%) to confirm your diagnosis.

Calculate the Negative Likelihood ratio for the mentioned test showing your formula.

Model answer

$$LR- = FN/TN = 1-SN/SP = 0.15$$

Part d (1 mark)

What other parameter do you need to know for calculating the 'accuracy' of the mentioned test?

Model answer

Prevalence

$$Accuracy = SN \times Prevalence + SP \times (1 - Prevalence)$$

Question 17 (12 marks)

You are looking after a 58 year old man who has an AICD. He has presented due to the device discharging 5 times during the previous 2 hours. Whilst you are assessing him, he has another episode with a wide complex regular tachycardia on the monitor. He is cardioverted successfully by his AICD. You determine that he is in an electrical storm.

Part a (3 marks)

Apart from myocardial ischaemia/infarction, list three (3) causes of structural heart disease that predispose a patient to electrical storm

Model answer

Non-ischaemic cardiomyopathy (1/2 mark for “cardiomyopathy” and nil marks for dilated cardiomyopathy as mostly ischaemic), arrhythmogenic right ventricular dysplasia, sarcoidosis, amyloidosis, Chagas disease, post-surgical resection

Nil for valvular disease or rheumatic disease unless states scarring

Part b (5 marks)

List five (5) reversible causes of electrical storm in susceptible patients.

Model answer

- Drug toxicity- Class 1A anti-arrhythmics/Amphetamines or other stimulants, heart failure exacerbation, acute myocardial ischaemia (inc ACS, AMI), thyrotoxicosis, hypokalaemia, hypomagnesaemia, infection/sepsis, fever, binge alcohol, and QT prolongation (inc drug toxicity)

Nil mark for “electrolyte abnormality” unless state which one.

Only one mark total for more than one electrolyte, same class drug or more than one QT prolonging drug

Nil marks for anything to do with the AICD malfunctioning as this is not electrical storm

Part c (4 marks)

If the patient is stable, apart from treating reversible causes, list two (2) drugs with justification that you would use to treat his electrical storm.

Model answer

- Amiodarone- first line therapy for VT with class 1,2,3&4 action
- Lignocaine/Lidocaine- Class 1B anti-arrhythmic, especially useful in ischaemic VT. 2nd line agent.
- Beta blocker- Decreased catechols that drive ES
- Isoprenaline- acts on cardiac calcium channels to decrease VT, esp in setting of Brugada, short PR or long QT
- Sedation e.g. propofol or benzos OR thoracic epidural. Decrease sympathetic drive to heart
- Magnesium- Useful in case of TdP, long QTc

To get the mark for justification had to give mechanism or use case

Procainamide not available in Australia and did not score.

Question 18 (18 marks)

A 2 week old male infant has presented to a regional mixed ED with three episodes of vomiting over the past 24 hours and the child has become sluggish with poor feeding for the past 6 hours. A further vomit occurs in the department and is noted to be green.

Bedside blood glucose level is 3.6 mmol/L

Weight is 3.0 kg

Part a (4 marks)

List four (4) key differentials for any child presenting with green vomiting

Model answer

- Sepsis
- Malrotation with Volvulus
- Hirschsprungs disease
- Bowel Obstruction
- atresias
- NOT: pyloric stenosis

Part b (2 marks)

An abdominal X-Ray has been performed:



List two (2) relevant x-ray findings.

Model answer

- Paucity of small bowel gas
- Normal calibre of large bowel – not in keeping with hirsprungs
- May also answer – aerated rectum – makes atresia less likely

Part c (8 marks)

Complete the table by listing four (4) further investigations required with a justification for each.

Model answer

Investigation	Justification
Upper GI contrast study	Investigation of malrotation & volvulus; other modalities insufficient to exclude
Blood Culture	Possibility early sepsis
Blood gas	Seeking lactate in setting either sepsis or ischaemic gut / seeking alkalosis in vomiting
UEC / electrolytes	In setting of vomiting seeking disorder
Other reasonable options include metabolic investigations for hypoglycaemia screen; urine culture; CSF culture	Nb must have upper GI study, gas, and blood culture

Part d (4 marks)

The infant will need to be transferred to another centre approximately an hour away by road.

Axillary temperature is currently 35.2 °C

Complete the table by listing two (2) possible contributing factors to the low temperature and for each, a step which can be taken to mitigate their impact

Model answer

- Contributing factors: radiant loss of heat when left exposed/open trolley/cold ED
- Shock or septic shock or sepsis
- Cold fluids being given as treatment
- Hypovolemic shock also possible but cant give full marks just for 2 different types of shock.
- Steps to address: radiant heater/resuscitaire OR humidicrib for transport. Fluid warmer. Antibiotics, correction of hypovolemic shock.

Question 19 (18 marks)

A 19-year-old woman has been brought to ED after having a seizure at a music festival.

On arrival she is agitated, and her vital signs are as follow:

GCS	10 (E3 V3 M4)
HR	125 bpm
BP	130/80 mmHg
RR	28 /min
Temp	41.0 °C

Part a (4 marks)

It is deemed most likely that the presentation is due to a sympathomimetic toxicity.

Apart from agitated delirium and seizure, list four (4) other complications that this patient is at risk of?

Model answer

Hyperthermia is the most important feature of this presentation and is an immediate life threat.

Therefore, MUST mention the complications of hyperthermia - ie: brain injury, rhabdomyolysis, and disseminated intravascular coagulation, liver failure / injury (at least 2 of these 4)

The other 2 can be more general sympathomimetic toxicity complications

- Cardiovascular:
 - Chest pain, MI.
 - Aortic dissection.
 - Cardiomyopathy: takotsubo cardiomyopathy (acute), non ischemic cardiomyopathy (chronic sympathomimetic use).
 - Arrhythmias (e.g., atrial fibrillation, ventricular tachycardia).
- Pulmonary:
 - Aspiration pneumonia.
 - Pulmonary oedema (cardiogenic or noncardiogenic).
- Gastrointestinal:
 - Ischaemia: Colonic ischemia, acute mesenteric ischemia.
 - Fulminant liver failure (especially following hyperthermia or MDMA use).
- Renal:
 - Rhabdomyolysis (especially following hyperthermia, overexertion, or seizures).
 - Renal infarction can occur.
- Neurologic:
 - Agitated delirium.
 - Seizures.
 - CVA (ischemic stroke, intraparenchymal hemorrhage, subarachnoid hemorrhage).
 - Acute angle-closure glaucoma may result from aggressive pupil dilation

Part b (6 marks)

Excluding sympathomimetics, list three (3) other possible toxicological and three (3) possible non-toxicological causes for her presentation.

Model answer

bold is mandatory

Non-Toxicological Toxicological	Non-Toxicological Toxicological
Heat Stroke Serotonin Toxicity	Heat Stroke Serotonin Toxicity
Hyponatraemia Anticholinergic	2 Hyponatraemia Anticholinergic
Thyrotoxicosis / thyroid storm Dinitrophenol	3 Thyrotoxicosis / thyroid storm Dinitrophenol
CNS infection /	CNS infection /
	Malignant hyperthermia. Neuroleptic malignant Syndrome
No marks for trauma / head injury - does not explain temperature	Hyponatraemia can be listed in tox if attributed to water intoxication from MDMA / ecstasy but need to specify

Part c (8 marks)

The patient is becoming increasingly agitated and her vitals otherwise remain unchanged from presentation.

Outline four (4) management priorities in this patient and briefly describe of how each will be achieved, including end points and doses for any interventions provided.

Model answer

I think intubation for agitation control + cooling + airway protection needs to be undertaken in this patient.

Could justify initially aiming for agitation control but would need to articulate that this needs to be achieved immediately (utilising reasonable, titrated IV doses of benzos +/- antipsychotics (olanzapine or droperidol) - ketamine and propofol also reasonable choices) with mention of proceeding to intubation if not immediately achieving control of agitation and/or there is ongoing hyperthermia.

Better answers will include avoidance of physical restraints as may promote hyperthermia + rhabdo

Clear temperature goals & methods for active cooling needs to be outlined with urgency
temperature goals :

(#1) Initially, drop the core temperature to 38C (100.4F) as rapidly as possible

(#2) Stop active cooling when the temperature reaches 38-39C (100.4-102F) to prevent overshoot.

(#3) Continue monitoring for ongoing thermal instability (ideally at least for 6 hours).

Cooling methods - need to mention multimodal cooling techniques - must include surface cooling (removing clothes and immersive or evaporative techniques) plus one other method (cold IV fluid or resp cooling technique etc)

There is no role for paracetamol or other antipyretic medications

Mark for mentioning possible complications and supportive management of these but need to be specific

Sympathomimetic seizures should be managed with benzodiazepines rather than anticonvulsants

Question 20 (12 marks)

You are the duty consultant covering an urban district emergency department on a hot summer day. Several patients have been brought in by ambulance from a fun-run marathon event near to the hospital. A 41-year-old male participant has collapsed on the scene and was witnessed to have a brief tonic-clonic seizure. On arrival his vital signs are as follows:

GCS	10 (E3 V3 M4)
Temp	41.0 °C
RR	30 /min
SaO ₂	98% on 6L O ₂
HR	140 bpm
BP	70/40 mmHg

Part a (4 marks)

Other than 'heat stroke', list four (4) specific likely differential causes for the patient's collapse.

Model answer

- Intracerebral haemorrhage
- Hypoglycaemic seizure
- Hyponatraemic seizure
- Acute coronary syndrome
- Malignant arrhythmia
- Exercise associated collapse (EAC) / exercised induced syncope
- Sympathomimetic toxicity
- Hypovolaemia
- Other appropriate: CNS, cardiovascular, toxicological causes given.
- CNS infection / sepsis not given as patient running a marathon.

Part b (3 marks)

A VBG is obtained, which demonstrates a serum Na level of 118 mmol/L.

List three (3) specific risk factors for developing exercise induced hyponatraemia.

Model answer

- Exercise > 4 hours
- Female sex
- Low BMI
- Excessive drinking (eg >500ml/hr)
- NSAID use
- High environmental heat or extreme cold
- Event inexperience

Part c (5 marks)

State five (5) key management priorities for this patient.

Model answer

- Key choices from amongst the following:
- Intubation to facilitate airway protection and paralysis.
- Active cooling via ice packs, fans, misting aiming core temp $<38^{\circ}\text{C}$.
- Haemodynamic support: cool IVF, titrated NA aiming MAP $>70\text{mmHg}$.
- Correct hyponatraemia with 3ml/kg 3% hypertonic saline aiming $\text{Na} > 120\text{mmol/L}$ acutely.
- Titrated midazolam infusion to achieve deep sedation / sympatholysis.
- Optimise oxygenation aiming for $\text{SaO}_2 > 98\%$.
- Achieve euglycaemia with titrated Glucose 50%.
- Cooled IVF to maintain $\text{UO} > 0.5\text{ml/kg/hr}$.
- ICU admission for supportive care and cooling

Question 21 (12 marks)

A 32 yr old female, who is currently 32/40 gestation, presents to your Emergency Department with chest pain and shortness of breath over the past 2 days.

Her observations are:

HR	115 bpm and regular
BP	105/70 mmHg
SaO ₂	93% on RA
Temp	37.4 °C
GCS	15/15

Part a (4 marks)

Apart from chest pain and shortness of breath, list four (4) features on clinical history which may support a diagnosis of pulmonary embolism?

Model answer

- Calf pain/tenderness suggestive of DVT
- Haemoptysis
- Syncope
- Previous DVT/PE
- Surgery or lower limb fracture in past 4 weeks
- Palpitations
- Other high risk factors- thrombophilia, family hx, malignancy, smoking etc

Part b (8 marks)

Complete the table regarding investigations that may be useful in this patient. State one (1) advantage and one (1) disadvantage for each of the investigations listed.

Model answer

Investigation	Advantage	Disadvantage
D Dimer	In conjunction with YEARS criteria can exclude DVT in pregnancy in 39% of patients without the need for thoracic imaging	Elevated in pregnancy- rises in 1st trimester and remains elevated until 4-6 weeks post partum
V/Q Scan	Reduced risk of radiation to mother especially breast tissue	Increased risk of radiation to foetus (can be overcome with hydration +/- IDC insertion), if inconclusive CTPA may still be required
CTPA	Gold standard for diagnosis of PE, reduced risk of radiation to foetus	Increased risk of radiation to breast tissue which may increase risk of breast cancer
Lower Limb Doppler Ultrasound	If DVT diagnosed can avoid the need for thoracic imaging	Proximal DVTs (in iliac veins) more common (>60%) in pregnancy which may not be diagnosed with lower limb doppler

Question 22 (12 marks)

A 24-year-old male has been brought to your tertiary emergency department after being found unresponsive, hypoxic and hypotensive in a nightclub. Collateral history is limited, however revellers on the scene suggest alcohol and drugs were consumed. The ambulance crew have administered 15L of O₂ via Hudson mask and 2L of crystalloid on route.

Vitals signs on arrival:

GCS	10/15
RR	22 /min
SaO ₂	88% on 15L O ₂ via Hudson Mask
HR	130 bpm
BP	110/70 mmHg
Temp	37.0 °C

On arrival the following VBG is obtained:

pH	7.40
PaCO ₂	38
PaO ₂	300
HCO ₃	20
BE	-4.0
Hb	131
FiO ₂	1.0
FMethHb	45%
FCOHb	0%
Na	139
K	4.1
Cl	110
Glu	8.3
Lactate	3.2

Part a (3 marks)

Showing your calculations, state three (3) points about your interpretation of the KEY finding from this VBG result

Model answer

- Anion gap with calc.
- Expected CO₂ with calc.
- AA gradient with calc.
- Pathological level of methemoglobinemia at 45%.

Part b (5 marks)

List five (5) possible toxicological causes for this pathology.

Model answer

- MANDATORY ANSWER: Recreational amyl nitrate toxicity
- Sodium nitrite/nitrate
- Other nitrite/nitrate agents (sodium nitroprusside, nitroglycerin, etc.)
- Chloroquine
- Dapsone
- Aniline derivatives
- High doses metoclopramide
- Benzene derivatives
- Prilocaine (also lignocaine, benzocaine)

Part c (4 marks)

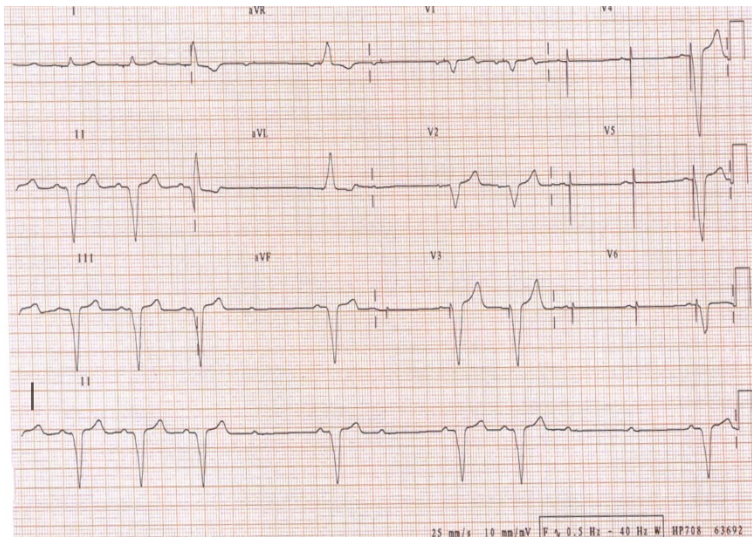
State four (4) management steps including key endpoints

Model answer

- Maximise oxygen delivery FiO₂ 1.0 via high flow Hudson or HFNP O₂.
- Administer methylene blue 1mg/kg IV every 30-60min until MetHb <1.5% or resolution of symptoms.
- HDU / ICU admission for close monitoring and supportive care.
- Support haemodynamics – IVF 1L, titrated noradrenaline aiming for MAP >70mmHg.
- Avoid / remove provoking agent.
- Other appropriate supportive care measures may be accepted.

Question 23 (12 marks)

A 78 year old man is brought to your emergency department after an unconscious collapse. He is now alert and well. His vital signs are normal. His ECG is shown.



Part a (2 marks)

List two (2) key features of the ECG

Model answer

- Failure of ventricular capture (4th beat, 6th, 9th, 10th beats)
- Native Atrial activity (P waves)
- Ventricular pacing with LBBB morphology

Part b (4 marks)

List four (4) potential causes of this ECG

Model answer

- Lead dislodgement or malposition (most common cause)
- Programming errors with suboptimal output
- Battery failure
- Exit block - failure of capture when falls outside of refractory period
- Electrolyte abN esp hyperK and acidosis
- Cardiac fibrosis/inflammation at site of ventricular wire tip
- Ischaemia
- Medications eg flecainide, sotalol

Don't accept lead fracture since good pacing spikes.

Part c (5 marks)

List five (5) key steps in performing transcutaneous pacing.

Model answer

- Sedation/analgesia
- Connect 3 leads

- Connect pads(AP better)
- Turn pacing setting on defib
- Select pacing mode(fixed/demand),
- Set rate 50-70bpm,
- Increase output to 70mAmps to achieve electrical and mechanical capture then increase 5-10 mAmps
- Trouble Shooting if not captured at current of 120-130mA - resite electrodes and repeat above.

Part d (1 mark)

Explain the difference between electrical and mechanical capture

Model answer

Electrical capture = ECG showing widened QRS following each pacer spike.

Mechanical capture = palpable pulse with each pacing spike and QRS and other signs of increased circulation – increased blood pressure, improvements in skin color and warmth, and improved level of consciousness.

Question 24 (12 marks)

Part a (12 marks)

Complete the table by listing examples of four (4) performance metrics or indicators used to assess and monitor the quality of care in the Emergency Department.

For each metric, list two (2) strategies to improve the quality of care.

Model answer

Door-to-Doctor Time:	• More doctors, better CDM,
Patient Arrival-to-Triage Time:	• Increase triage staff, better trained staff, mobile data entry devices
Ambulance off load times	• Reduce ED crowding, off load staff
Time to Treatment:	• Improve ED throughput, upfront treatment
Left Without Treatment (LWOT) Rate:	• Improve wait times, triage times, improve waiting room comfort
Diagnostic Imaging Turnaround Time:	• Orderly to take pt to xray, redesign to have in ED xray. • Reduce unnecessary xrays
Missed xray rates	• Train staff, SMS supervision, in house radiol reg
Transfer Time to Inpatient Unit:	• Improve CDM, radiol and path times
Medication Error Rates:.	• Education, processes for checking, typed scripts
Patient Satisfaction Scores:	• Reduce waiting times, play therapist
Readmission Rates:	• Improve care coordination, clear discharge advice
Compliance with Protocols:	• Education about protocols, easy access of protocols

Question 25 (12 marks)

A 57 year old patient, with a past medical hx of alcoholic liver cirrhosis, presents to the ED with abdominal pain.

Examination reveals tense ascites and generalised tenderness.

Vital signs are as follows:

HR	120 bpm
BP	100/60 mmHg
Sats	97% on air
Temp	39 °C

Part a (4 marks)

List four (4) differential diagnoses for this presentation.

Model answer

Must include **spontaneous bacterial peritonitis** to pass this section

Other reasonable answers include

Appendicitis, pancreatitis, perforated viscus, cholecystitis

Part b (4 marks)

Other than patient consent, state four (4) key steps in performing an ascitic tap on this patient

Model answer

Positioning- head of bed elevated to 30-45degrees, abdomen exposed

- Preparation- skin prep, local anaesthetic
- Anatomy/landmarks- ideally LLQ, avoiding scars, US to identify deepest pocket & inf epigastric artery
- Procedure: 22G needle & 20ml Syringe- stretch skin "z track" technique to avoid leak
- Post procedure: dressing, send sample for analysis

Pass criteria: Answer must include the following

- safe approach using USS or a clear description of landmark technique
- Mention of avoidance of inferior epigastric artery or knowledge of its location

Part c (4 marks)

After the procedure, the patient complains of worsening abdominal pain.

Their vital signs are

HR 120 bpm, BP 80/60 mmHg, Sats 97% on air, Temp 39°C.

State four (4) steps in your immediate management priorities.

Model answer

Answers must identify haemorrhage as a potential complication & cause for the patients deterioration.

- Resuscitate: IV fluids- crystalloid initially reasonable 500ml-1L with sensible endpoint

- Specific: concern about haemorrhage/complication of ascitic tap- check site of procedure for
- signs of bleeding/haematoma.
- urgent CT abdo once stabilised with view to embolisation if significant haemorrhage
- Empiric abx not unreasonable given likely diagnosis of SBP & signs of sepsis.
- Supportive: analgesia
- Other: check coagulation & give products as required e.g. platelets/FFP

Question 26 (12 marks)

Our practise of clinical medicine is ideally guided by evidence based medicine and hence the emphasis on the awareness of research.

Part a (2 marks)

Provide a description of a meta-analysis study. State two (2) points in your answer

Model answer

A quantitative, formal, epidemiological study design to systematically examine data from a number of independent studies of the same subject, in order to determine overall trends, effectiveness or risk factors

Part b (4 marks)

Apart from meta-analysis, list four (4) other research methodologies

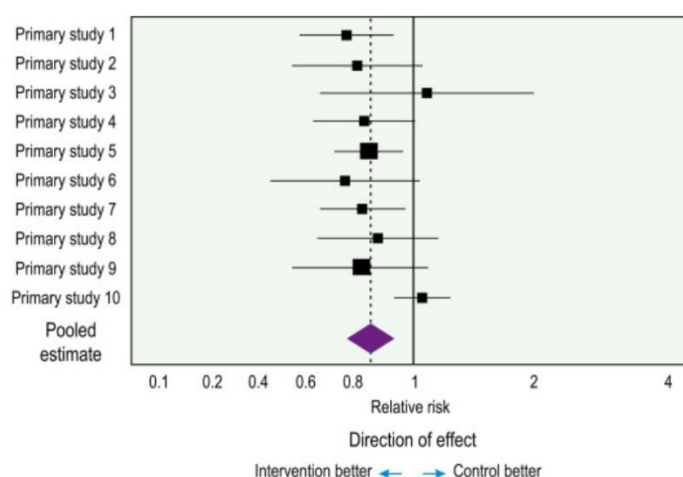
Model answer

- Experimental
- Observational
- Case report
- Case series
- Multi centre Clinical trials
- Quantitative
- Qualitative
- Quasi-qualitative

REF:acem.org.au/getmedia/9af41df8-677f-44ed-b245-440164155f56/FACEM-Curriculum-2021

Part c (1 mark)

When you were reading the most recent meta-analysis, you came across this graph:



What is the name of the graph?

Model answer

Forest graph

Part d (1 mark)

State a definition of relative risk.

Model answer

Relative risk is the ratio of the risks for an event for the exposure group to the risks for the non-exposure group

Part e (1 mark)

Only using this graph, out of the 10 included studies, how many studies showed a significant benefit toward the intervention?

Model answer

3 (will accept 4 as one of the study just touch the line)

Part f (3 mark)

Only using this graph, would you conclude that the intervention was significant overall? State two (2) points to give explain your answer.

Model answer

Yes, because the overall diamond is at the left side of the RR line showing benefit toward the invention with $RR < 1$ (0.8 in this graph)

Question 27 (18 marks)

A 64 year old woman presents to the ED with severe right eye pain which occurred suddenly while she was reading in bed. She has associated vomiting.

Part a (15 marks)

Fill in the following table with the expected physical examination findings for the listed conditions.

Model answer

	Acute angle closure glaucoma	Anterior uveitis/iritis	Conjunctivitis
Visual acuity	Reduced	May be reduced	Normal
Pupils	Semi-dilated, non-reactive	Irregular (if synechiae), constricted/miotic, sluggish, direct + consensual photophobia (accept any of above)	Normal
Conjunctiva and sclera	Injection	Injection, especially perilimbal injection	Injection, chemosis, follicles, subconj. Haemorrhage, pseudomembrane (Accept any of above)
Anterior chamber	Shallow AC May have cells/flare	Cells/flare/hypopyon	Normal
Intraocular pressure	>30mmHg	Normal initially May increase with synechiae development	Normal (unless complicated)

Part b (3 marks)

Based on your physical examination, you suspect acute angle closure glaucoma. List three (3) specific treatments for this condition

Model answer

1. Acetazolamide 500mg IV stat
2. Pilocarpine 2% drops q5min for 1 hr
3. Timolol 0.5% drops q30min (+/- brimonidine – Combigan)
4. Latanoprost drops
5. Prednisolone acetate drops
6. Mannitol 1g/kg if not improving with acetazolamide
7. Laser iridotomy
8. Peripheral iridectomy

For eye drops, drug name sufficient (dosing/concentration not required)

Do not accept supportive care (e.g head up, analgesia, anti emetics)