



Model Answers — Monash Practice SAQ Trial 2023.1

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Question 1 (18 marks)

A 44 yr old is transferred to your Emergency Department from his supported accommodation following a fall which has resulted in an altered conscious state. His past medical history includes schizophrenia, alcohol abuse, anxiety/depression, insomnia and COPD.

His regular medications are: escitalopram, risperidone, diazepam and temazepam.

On arrival his vital signs are:

SpO ₂	94% on 6L O ₂ via Hudson mask
HR	115 bpm
BP	140/90 mmHg
GCS	13 (E3, V4, M6)
Temp	37° C

Physical examination reveals a small abrasion to the skin over his right temporal region

Part a (6 marks)

List six (6) differential diagnosis for the altered conscious state of this patient.

Model Answer

1. Trauma – SDH, SAH, EDH
2. Drugs in OD – BZD overdose ,alcohol, amphetamines, any sodium channel blocker.
3. Fluid & electrolyte imbalance – hyponatremia, hypoCa, mg.
4. Sepsis – CNS meningitis / encephalitis / abcess or others organs– eg pneumonia with hypoxia, empyema pyelonephritis. Any acute illness causing delirium acceptable answer.
5. Drugs in withdrawal – alcohol, bzd
6. Metabolic – hypoglycaemia, cirrhosis , acute renal impairment with uraemia, hepatorenal syndrome.
7. Tumors / SOL – intracranial glioblastoma, metastatic lesions.

Part b (6 marks)

A VBG is performed and show below:

pH	7.23	(7.35 - 7.45)
pCO ₂	70 mmHg	(35 - 45 mmHg)
HCO ₃	23 mmol/L	(22 - 26 mmol/L)
Na ⁺	100 mmol/L	(135 - 145 (mmol/L)
K ⁺	3.7 mmol/ L	(3.5 - 4.5mmol/L)
Cl ⁻	67 mmol/L	(98 - 106 mmol/L)
Ionised Ca ²⁺	1.00 mmol/L	(1.05 - 1.3 mmol/L)
Lactate	2.5 mmol/L	(< 2 mmol/L)
Hb	29 g/L	(120 - 160g/L)
Glucose	10	(3.9 - 5.5 mmol/L)

List four (4) abnormalities seen on the VBG and provide an interpretation of your findings in the context of this patient's presentation. State two (2) points in your interpretation.

Model Answer

1. Critical life-threatening hyponatremia Na – 100
2. Mixed normal anion gap metabolic and respiratory acidosis with Type 2 respiratory failure.

3. Expected $\text{PaCO}_2 = (1.5 \times \text{HCO}_3) + 8 \pm 2 = (1.5 \times 23) + 8 \pm 2 = 42.5 \pm 2$
4. Expected HCO_3 - Chronic COPD - HCO_3 incr 4 from 24 per 10 change in CO_2 from 40 = 36
5. Mild Lactic acidosis - (0.5 marks only maximum)
6. Anion gap $\text{AG} = \text{Na} - \text{Cl} - \text{HCO}_3 = 100 - 67 - 23 = 10$
7. Can comment on hypocalcaemia- (0.5 marks only maximum)

(cannot score full marks without points 1-2 for this section)

Patient with life threatening hyponatremia with mixed respiratory and metabolic acidosis, possibly post ictal

Part c (6 marks)

Complete the table by listing three (3) immediate management priorities for this patient and give a details for each

Model Answer

1. Urgent correction of sodium to raise it by 5 -6 mmol / l by using 3% saline 100ml x 2, (maximum 300ml)then correct slowly aim < 7-8 mmol inc in 24 hrs.
2. Improve oxygenation – escalate to HFNP / BIPAP / CPAP with the intent to electively intubate.
3. Seek and treat underlying cause of hyponatremia – eg -chest sepsis – bloods including FBE< UEC< CRP, 2 sets culture, urine MCS, urine osmolality/ na level, POCUS- lung/ abdomen, CXR, CT brain, Rx with IV abs -ceftriaxone 2g.
4. Modified RSI intubation – ketamine/ preoxygenate- HFNP/ apnoeic O2. (1 mark)
5. Discussion with ICU for ongoing hyponatremia management & disposition. (1 mark)

(cannot score full marks without points 1-3 for this section)

Question 2 (12 marks)

You are about to review a 26 yr old female who has presented with a sudden onset of right lower quadrant abdominal pain.

Her vital signs at triage were:

HR	98 bpm
BP	110/70 mmHg
Temp	37° C
RR	22 /min

Part a (6 marks)

List six (6) features on clinical history that would assist your differential diagnosis

Model Answer

1. Pregnancy related:
 - Ectopic Pregnancy – confirmed pregnancy of unknown location, previous ectopic, known IUD insertion with pregnancy, known tubal pathology.
 - Threatened, incomplete miscarriage -pregnant with abdominal pain & associated PV bleeding and previous miscarriages.
 - Septic abortion - known miscarriage with RPOC
2. Other Gynaecological :
 - ovarian torsion – PMH- PCOS / ovarian torsion
 - mittelschmerz – midcycle pain and bleeding
 - Ovarian cyst rupture - past medical history of ovarian cysts, PCOS
 - Dysmenorrhoea – known history of adenomyosis/ endometriosis
 - PID – high risk behaviours(multiple partners, unprotected sexual intercourse), recent instrumentation , fever with pv discharge
3. Surgical causes :
 - Appendicitis – Mcburney sign, psoas sign, anorexia, rosvings sign,
 - Ascending colon diverticulitis - diarrhoea, altered bowel habits, fever.
4. Medical :
 - Renal colic - loin to groin pain and haematuria
 - Pyelonephritis / cystitis - urinary symptoms , pyuria
 - Colitis - associated bloody, mucous diarrhoea , IBD, family history of IBD.

Part b (6 marks)

Complete the table by listing two (2) points about the role of each type of ultrasound in the assessment of this patient

Model Answer

POCUS	• early diagnosis of free fluid in ruptured ectopic: facilitating early exploration and management of ectopic • operator dependant with false -ve as need 250-500ml of free fluid • unable to visualise appendix/ovaries unless pathology/operator dependant • time of day: able to used out of hrs/rural hospitals
Transvaginal U/S	• for any of ruptured tubal/ectopic/free fluid • location of gestation/ectopic • appendicitis: false negative rate 30-40% • ovarian torsion • cyst rupture • PID for tube-ovarian abscess • RPOC • assess for hydronephrosis (ureteric calculi in prox or distal ends)
Transabdominal U/S	• lower b-hcg discriminatory zone so higher specificity for ectopic • patient tolerance and operator dependant

Question 3 (12 marks)

A 65 year old male presented to your Emergency Department on Sunday evening with acute atraumatic hip pain. He was assessed as a triage category 3. After waiting for four hours he collapsed in the waiting room. Resuscitation efforts were unsuccessful and he died.

You are the ED consultant involved in the root cause analysis

Part a (2 marks)

Define root cause cause analysis. State two (2) points in your answer

Model Answer

Root Cause Analysis (RCA) is a method or methodology used to investigate an incident in order to assist in the identification of health system failures that may not be immediately apparent at initial review. The purpose of an RCA is to identify system issues that contributed to or resulted in the incident occurring and to provide recommendations on actions to be taken to prevent or minimise a recurrence of a similar incident. It is interdisciplinary in nature and uses a structured process which endeavours to answer three questions:

- What happened?
- Why did it happen?
- How can it be prevented from occurring again?

An RCA is not used to apportion blame to staff; it is designed for learning and improving the quality of the health system

Part b (6 marks)

List three (3) systems issues that could lead to an adverse event in the ED and how each would contribute

Model Answer

Systems Issue	How this contributes
ED overcrowding due to access block (boarding of admitted patients)	• Patient unable to get into a nursed area to have obs/initial investigations/medical review • Potentially unwell/unstable patients become "lost" in the long list of patients waiting to be seen and are not recognised as being unwell • Admitted patients are de-prioritised by ED staff due to the need to see new patients, therefore deterioration in this group can go unchecked.
Inadequate staffing	• Not enough people to efficiently see patients when they arrive • No one physically available to carry out initial investigations/brief assessment
Inexperienced staff	• Lack of availability of senior staff or combination of junior staff leads to lack of expertise/prioritisation/decision making therefore having the potential for important signs to be missed and treatment to be delayed
Teamwork and communication issues	• Conflict between staff can lead to lack of communication about relevant issues or can lead to no communication due to fear or

	reprisal. Therefore can miss information that is required for adequate treatment
Lack of equipment or equipment failures	Can impact directly on ability to provide treatment or pick up diagnosis eg CT scan broken down, Lack of available pumps to administer fluids/drugs
Reliability of consultation services or inadequate consultation services	Lack of regular inpatient service provision, lack of on call service can mean specialist advice is not available when needed urgently
Lack of education/training	- Lack of recognition of potentially life threatening conditions - Lack of knowledge around correct management and urgency of management - Lack of insight around when to escalate to senior members of staff
Lack of complete medical records	- Staff reliant on verbal handovers which can lead to missed important information - Lack of documentation of important information such as allergies can lead to drug errors
Difficulty using electronic health record or order entry system	Can mean documentation is limited and therefore important information is missed
Insufficient processes for surge/high demand	- Unable to identify potentially unwell patients and re-prioritise their care as the triage system cannot adequately identify the priorities in the lesser acuity patients - Inability to access treatment spaces for new patients

Part c (4 marks)

State four (4) aspects the open disclosure process must include.

Model Answer

At a minimum, an open disclosure process must include:

- an apology or expression of regret
- a factual explanation of what occurred, including actual consequences
- an opportunity for the affected patient to relate their experience
- the steps taken to manage the event and prevent its recurrence

Question 4 (12 marks)

You are retrieving a previously healthy 43 yo male from a regional hospital. They have been diagnosed with a subarachnoid haemorrhage. Their current observations are:

GCS 14 (E4,V4,M6)
HR 72 bpm
BP 138/74 mmHg
RR 16 /min
SpO₂ 98% (RA)

Part a (4 marks)

State four (4) assessment features that would make you more likely to intubate the patient for transport

Model Answer

History

- Rapidity of onset
- Anticoagulation

Exam

- GCS/Pupils
- Agitation

Radiology

- Grade
- IVE
- Hydrocephalus
- Uncal herniation

Logistic

- Platform
- Distance to definitive care
- Plan on arrival

Part b (6 marks)

Prior to loading, the patient's GCS dropped to 9/15 and was intubated.

List three (3) complications related to the stated pathology that could occur in transport. For each one, briefly state your management in transit

Model Answer

Cause of deterioration	Steps taken to manage
Raised ICP/Blown Pupil	3% Saline 3ml/kg or Mannitol 0.5-1g/kg
Hypertension	Deepen sedation, commence antihypertensive need dosing
Seizure	Bolus benzo/propofol, load Keppra 60mg/kg

Part c (2 marks)

In general, state two (2) benefits of utilising a fixed wing platform over a rotary wing platform

Model Answer

- Ability to pressurise cabin
- Increased speed
- Greater range
- Greater comfort

Question 5 (12 marks)

A 27 yo female has been brought to your tertiary ED via ambulance with a penetrating wound to her neck. She reported being assaulted by her partner with a kitchen knife.

She is speaking with a hoarse voice and appears confused. There is no visible blood in the oropharynx.

Her vital signs are:

GCS	13
HR	100 bpm
BP	95/60 mmHg
SaO ₂	95% on RA

Part a (6 marks)

State six (6) points about your initial management of this patient

Model Answer

- Early airway management is crucial as injuries can lead to dynamic airway obstruction, be prepared for a surgical airway with anticipation of difficult airway with Anaes/ ENT presence – ideally awake fiberoptic
- Breathing – high flow O₂; examination for haemopneumothorax (usually only zone I injury) and urgent mobile CXR +/- decompression
- Haemodynamic stability – Attempt to control vascular injuries with direct pressure and consider balloon tamponade with a foley catheter
- appropriate IV access (large bore, femoral central line) judicious fluid resus, activation of MTP/ early blood Tx. Mention of relevant pathology tests
- (Wound assessment to be done in theatre without delay for investigations if platysma breached).
- Do not probe wounds

urgent vascular / surgical consult for operative exploration/Mx

*Examine for other injuries/ neuro deficits/ other Ix / in-line C spine mobilisation (only if trajectory suggests cord injury or neurological sx)

Part b (1 marks)

The patient complains of visual disturbance in her left eye with paraesthesia and weakness in her right arm. Injury to which structure is most likely?

Model Answer

- Left common carotid artery

Part c (3 marks)

List three (3) other signs that would indicate urgent operative intervention

Model Answer

Hard signs of aerodigestive / vascular injury:

*would accept stridor

*accept breach of platysma (although outdated)

* do not accept signs already mentioned in stem

- active bleeding,
- large/expanding haematoma
- bruit/thrill
- reduced GCS
- shock
- haemoptysis
- haematemesis
- air/bubbles in the wound

Part d (1 marks)

The patient's airway has been secured and remains stable with your initial resuscitation. A decision has been made for the patient to undergo further investigation while preparing for operative intervention. What is your imaging of choice?

Model Answer

- CT angiogram of neck (carotid angio) + /e extending to chest

Part e (1 marks)

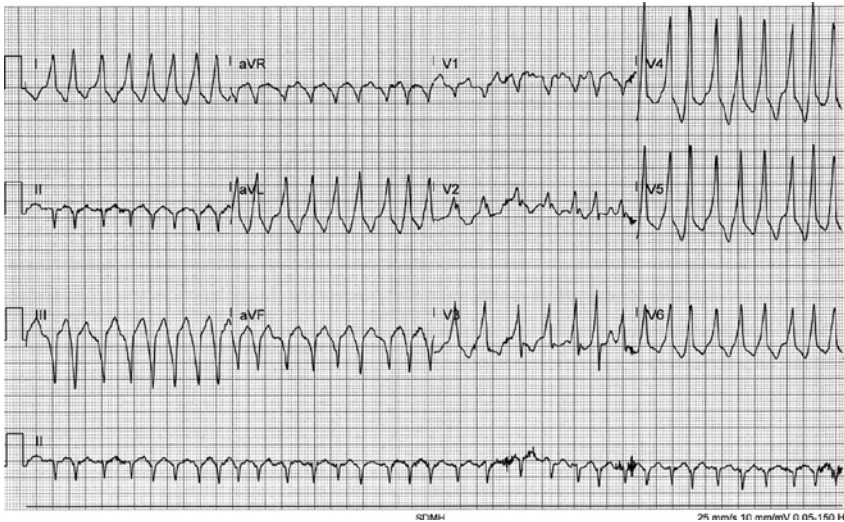
Injury to which structure is the leading cause of delayed mortality in patients with penetrating neck injury?

Model Answer

- Oesophageal injuries – missed on CT angio (sensitivity ~50%), difficult to diagnose

Question 6 (12 marks)

A 36yo man presents to the ED with palpitations. He has a past history of recurrent syncope. His initial ECG is shown below



Part a (4 marks)

List four abnormalities seen on this ECG

Model Answer

1. Irregularly irregular
2. Wide complex tachycardia – rate 180 -200
3. Left axis deviation
4. no p waves

Also: variable QRS morphologies

Part b (4 marks)

List four (4) clinical findings that would support your decision to urgently treat this patient.

Model Answer

- a. chest pain
- b. confusion
- c. hypotension
- d. signs of heart failure

Part c (2 marks)

What is the most appropriate medication and dose for pharmacological treatment of this patient

Model Answer

Medication	Dose
Flecainide	150mg or 2mg/kg IV over 30 minutes

Zero point rule if answer amiodarone/verapamil/adenosine/dig

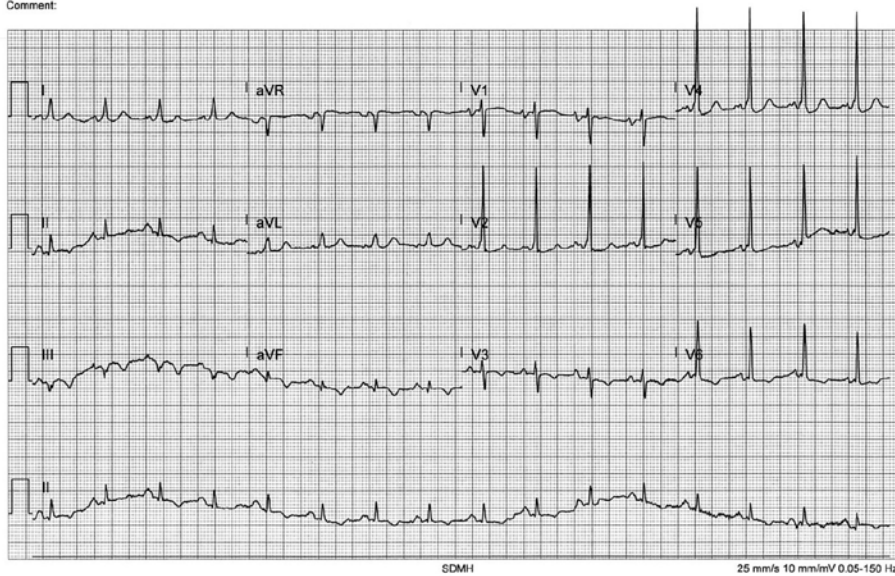
Procainamide: not accepted. Not widely available It's not actually listed on the TGA's register of therapeutic goods for Australia so it's technically not allowed to be used.

Part d (2 marks)

Following a successful response to treatment, another ECG is taken as below.

List 2 (two) significant findings on this patient's ECG.

Comment:

**Model Answer**

- Delta waves laterally
- Short pr interval

Question 7 (12 marks)

A 14 year old girl presents to your ED following a syncopal episode.

Part a (6 marks)

List three (3) key questions to ask when taking a history from this patient, and state the relevance for each question.

Model Answer

1. any prodromal symptoms: differentiate vasovagal versus cardiac versus neuro
2. associated activity and timing of activity in relation to the event: determine likelihood of cardiac cause
3. any seizure-like activity including tongue biting, incontinence, post-ictal period: differentiate syncope versus seizure as different follow-up and implications
4. relevant PMHx including previous similar episodes, medication hx, LMP/sexual activity, drug and alcohol use: recurrent episodes needing investigation, medication use or misuse, risk of ectopic pregnancy, intoxication as possible causes
5. relevant FHx including sudden unexplained death or death at young age: risk of congenital arrhythmic cause

Part b (3 marks)

List three (3) specific features to look for on this patient's ECG.

Model Answer

1. ischaemia
2. arrhythmia
3. major conduction defect
4. ventricular pre-excitation
5. HOCM
6. LV strain (due to aortic valve disease)
7. prolonged QTc
8. Brugada syndrome
9. RV dysplasia

Part c (3 marks)

List three (3) indications for referral and further outpatient investigations for a child with syncope

Model Answer

1. atypical history
2. abnormal cardiovascular or central nervous system examination
3. suspect cardiovascular cause
4. suspect seizure
5. suspect eating disorder
6. recurrent or problematic vasovagal syncope

Question 8 (12 marks)

You are asked to see an 8 year old boy who has had a low level fall from play equipment and been brought into your emergency department. He has sustained an isolated right elbow injury with no evidence of any other injuries. You suspect a supracondylar injury.

Part a (3 marks)

Complete the table by listing an important detail for each category of the Gartland classification of supracondylar fractures.

Model Answer

- Gartland 1, undisplaced fracture of distal humerus, conservative Mx only, treated with simple backslab
- Gartland 2, displaced fracture of distal humerus, commonly posterior, posterior cortex intact, will need some form of reduction and plaster
- Gartland 3, displaced fracture of distal humerus, no cortex intact, will require urgent surgical repair

Part b (6 marks)

You are concerned that this child has sustained a significant injury. Fill in the box below with the nerve you want to immediately assess, and how you would perform each motor assessment.

Model Answer

Nerve	Expected normal motor physical examination finding
AIN Anterior Interosseous Nerve	A-OK sign flex the interphalangeal joint of the thumb and the distal interphalangeal joint of the index finger
Radial Nerve	Thumbs up Extend thumb interphalangeal joint Wrist extension
Ulnar Nerve	Make a star Abduct all fingers
Median Nerve	Make a fist All finger flexion

Part c (3 marks)

Your physical findings are consistent with a serious supracondylar injury. Please detail three (3) immediate management steps for this child.

Model Answer

- Analgesia (plus details)
- Plaster in position of comfort, **no marks** if reduction in ED
- Urgent Orthopaedic referral
- NBM
- ANGEL for IV access

Question 9 (18 marks)

You are the Emergency Physician working in a regional centre when you receive an ambulance notification of a 25 yo male with extensive burns sustained from throwing an aerosol can into a bonfire. The time of the incident was 60 minutes ago and appropriate first aid was carried out at the scene. The patient weighs 80kg. The ambulance crew estimate the TBSA burnt is 30%.

Current vital signs are as follows;

HR	120 bpm
RR	24 /min
SpO ₂	98% RA
BP	105/75 mmHg
Temp	36.5° C
GCS	15

The patient will arrive in 10 minutes.

Part a (4 marks)

List four (4) key steps in your preparation for the arrival of this patient

Model Answer

- Warming equipment (Bair hugger/space blanket ready)
- Analgesia prepared
- Burns/dressing trolley
- Prepare IV fluid
- Prepare difficult airway trolley

Part b (2 marks)

State two (2) points on why it is important to obtain a measurement of total burn surface area during the initial management of people with burns?

Model Answer

- Estimating fluid requirements
- Determining need for transfer to a burns service

Part c (2 marks)

List two (2) methods for estimating the total body surface area affected by a burn

Model Answer

- The Wallace Rule of Nines
- The Lund-Browder chart
- Palmar Method

Part d (2 marks)

List two (2) criteria that definitely warrants URGENT transfer to a specialist burns facility

Model Answer

- All burn inhalation injuries
- Burns to > 20% TBSA
- High-voltage electrical burns, including lightning injury

Part e (6 marks)

List six (6) criteria that may warrant transfer of a patient with burns to a specialist burns facility following consultation

Model Answer

Consultation about transferring should take place when;

- Burns greater than 10% TBSA.
- Burns to special areas and full-thickness burns involving the face, eyes, ears, hands, feet, major joints or genitalia.
- Full-thickness burns greater than 5% TBSA.
- Electrical burns.
- Chemical burns.
- Circumferential burns of the limbs or chest.
- Burns with associated trauma.
- Burns in the very young or older people.
- Burn injury in patients with a pre-existing illness or disability that could adversely affect patient care and outcomes.
- Suspected non-accidental injury in children.
- Small area burns in patients with social problems, including children at risk.
- Burns occurring in pregnant women.
- Burn injuries that the referring unit is concerned about or are slow to heal.

Part f (2 marks)

State two (2) steps in how you would calculate the volume of fluid required to resuscitate this patient over the next 24 hours?

Model Answer

- Modified Parkland formula ($3-4 \text{ mls} \times \text{kg} \times \% \text{TBSA}$)
- Half in first 8 hours from time of injury, half in the next 16 hours

Question 10 (18 marks)

A 38 year old female presents to your regional emergency department. You establish she has been in labour for 10 hrs. She is clearly in pain and states that she feels like she needs to push.

The nearest obstetric service is 90 minutes away by road.

Part a (4 marks)

List four (4) important details you need to obtain from the patient's obstetric history.

Model Answer

- Est. Delivery Date / Gestational Age- Minimum criteria
- Any gestational complications, conditions (with example)
- Fetal lie e.g. breech
- Previous pregnancies, deliveries and/or complications
- Antenatal Care received 0.5 mark if no detail
- Timing of rupture of membranes
- Twin/ Multiple Pregnancies
- No mark for: rhesus status, frequency of contractions, allergies and medications

Part b (1 marks)

After delivery of the head, the woman has two (2) further contractions without progression. The baby's head appears to progress slightly before retracting.

Name this condition.

Model Answer

- Shoulder dystocia

Part c (4 marks)

Outline the next four (4) important steps in your treatment

Model Answer

- Declare emergency / get help (other staff, obstetric, paediatric, anaesthetist)
- Insert IDC
- Extreme lithotomy position (or knees to nipples) McRoberts maneuver
- Then McRoberts with moderate supra-pubic pressure while downward traction on the foetal head
- Delivery of posterior arm
- Posterior arm axillary traction
- Place patient on all fours (Gaskin)
- Episiotomy – controversial, HELPER mnemonic only states 'evaluate for', RANZCOG guidelines state 'An episiotomy is not always necessary'. Episiotomy is not for relief of shoulder obstruction but for the entry of attendants hands to perform internal maneuvers. Must have reasons for episiotomy to have full mark. No mark for episiotomy only.
- Rubin II / Woods screw / Clavicular fracture – late stage options if others fail to work
- Push head back into vagina and immediate Caesarian section (last option if surgeon available)

Part d (6 marks)

You successfully deliver a healthy baby. Shortly after the delivery of the placenta, the woman begins to bleed heavily.

For each of the three (3) phases of delivery, state two (2) risk factors for a postpartum haemorrhage. (answers cannot be repeated)

Model Answer

Antepartum (2 marks)	• Maternal Age (>35), • Obesity • Grand Multi • Uterine abnormalities • Previous PPH • Hx of APH in current pregnancy, • Macrosomia • Foetal death • Anticoagulation • Maternal bleeding disorders • Polyhydramnios • Preelampsia • Previous LUSCS • Transverse lie • Placenta Praevia
Intrapartum (2 marks)	• Prolonged labor • Arrest of descent • Uterine infection • induction of labor • Instrumental birth • intrapartum hemorrhage • amniotic fluid embolism • DIC
Postpartum (2 marks)	• Bladder distention, • retained placenta, • manual removal, uterine inversion, • LSCS • AFE/DIC • cervical, uterine or perineal lacerations. • Uterine atony

Part e (1 marks)

You decide that poor uterine tone is the most likely cause for this patient's ongoing bleeding. This is despite 10 units IM of oxytocin being given with delivery, and an oxytocin infusion being commenced.

List one (1) non-pharmacological treatment option.

Model Answer

- Fundal massage/rub
- Insert urinary catheter
- Bimanual compression
- External aortic compression
- Bakri Balloon 0.5

Part f (1 marks)

List two (2) pharmacological treatment options.

Model Answer

- ergometrine 250mcg Slow IV or IM. Q5min to max 1mg.
- misoprostol (1mg PR)
- prostaglandin (GF2alpha, carboprost, prostinfenem) IM 250mcg, q15min to max 2.0mg
- Tranexemic acid 1g IV
- *(IV oxytocin not accepted as already given in question)*

Question 11 (12 marks)

A patient presents to the emergency department with acute otitis media.

Part a (6 marks)

List three (3) serious complications of acute otitis media that would require a hospital admission with an examination finding for each that would assist in the diagnosis

Model Answer

Complication	Examination Finding
Mastoiditis	Otorrhoea Displacement of the ear downward, outward, and forward in advanced cases Mastoid erythema and fluctuance
Intracranial Abscess	Purulent otorrhoea Localising neurological signs Features of meningitis Temporal lobe abscess – aphasia, visual field defects, other focal neurological signs Petrus apicitis – purulent otorrhoea, retro-orbital pain, abducens nerve palsy
Meningitis	Features of meningitis
Lateral sinus thrombosis	Intermittent fevers Palpable IJV Cranial nerve palsies of IX, X, XI
Sepsis	Fevers, hypotension, tachycardia, altered conscious state etc.

Other complications that would not usually require an admission

- Facial nerve paralysis
- Bullous myringitis
- Middle Ear Effusion
- Suppurative otitis Media

Part b (6 marks)

You ascertain that the patient does not require admission and is safe for discharge from the ED. List six (6) situations where oral antibiotics would be indicated as part of your ongoing management

Model Answer

- Australian indigenous
- immunosuppression
- where follow up is difficult
- in children < 6 months of age
- in children 6-24 months of age who do not improve within 24 hours
- systemic features of infection
- tympanic membrane perforation
- Cochlear implant
- Affecting the only hearing ear

Question 12 (12 marks)

You are managing a 5 year old girl with fevers, her mother has been reading about Kawasaki's disease and is concerned she may have it. Below is a photo of her hand.



Part a (3 marks)

Other than Kawasaki's Disease, list three (3) diagnoses for this rash

Model Answer

- Staph scalded skin syndrome or toxic shock, can be strep
- Drug induced – Stevens-Johnson's or similar
- Consider traumatic burn, neglect, (?NAI), although stem not suggestive
- Gonococcal/syphilis
- other reasonable answers

Part b (6 marks)

List six (6) diagnostic criteria for Kawasaki's Disease

Model Answer

- Conjunctivitis
- Rash
- Adenopathy
- Strawberry tongue
- Hands and feet
- And Burn fever > 5/7

Part c (3 marks)

Describe three (3) specific treatments for Kawasaki's Disease

Model Answer

INTRAVENOUS IMMUNOGLOBULIN (IVIg): 2g/kg as a single IV infusion on diagnosis.

- given within the first 10 days of the illness

- second dose of 2g/kg IVIg should be given to patients who do not respond to the first dose

Don't require dose for full mark

- CORTICOSTEROIDS: use controversial. Consider for high risk patients in discussion with local paediatric team. High risk as suggested by: 0.5 marks for steroids, 0.5 marks for drug name and dose or 'for high risk'

- Signs of shock.
- Patients < 12 months of age.
- Asian ethnicity.
- ALT > 100 IU/L
- Albumin < 30 g/L
- Any patient with evidence of cardiac involvement on echocardiography at time of presentation.

Prednisolone 2mg/kg (max 60mg) orally daily for a minimum of 5 days and until CRP normalises. (Evidence for optimal dose/duration is limited)

A steroid course of >10 days will require weaning and consideration of concurrent proton pump inhibitor or H2 receptor blocker.

-ASPIRIN: 3-5mg/kg as a daily dose until normal echo on follow up (minimum 6 weeks).

The association of Reye syndrome with aspirin remains a consideration, thus risks must be balanced against clinical benefit.

Question 13 (12 marks)

Cognitive biases can negatively affect clinical care provided to patients in several ways.

Part a (10 marks)

In the table below, list and outline five (5) types of cognitive biases that can impact clinical care.

Model Answer

Type	Explanation
Stereotyping	Tendency to associate certain attributes, characteristics, and behaviours with members of a particular group of people
Hindsight bias	Tendency to believe past events were predictable at the time when they happened
Outcome bias	Tendency to evaluate a decision based on its outcome rather than the factors that contributed to the decision at the time it was made
Saliency	Prominent items of information are more likely to receive attention and are given more weight
Confirmation bias	We tend to more easily accept and look for information that confirms existing beliefs
Primacy and recency effect	We tend to best remember the first and last piece of information
Groupthink	The desire for harmony or conformity in a group leads to irrational decision-making outcomes
Fundamental attribution error	When someone else does something, we emphasise character or intention rather than external factors to explain behaviour (and the opposite when we do something)
Availability heuristic	Reliance on examples that come to mind easily when evaluating a situation and giving undue weight to this

Part b (2 marks)

State two (2) points about an approach that can be used to achieve cognitive debiasing in clinical medicine.

Model Answer

Table 1 Educational and workplace strategies for cognitive debiasing

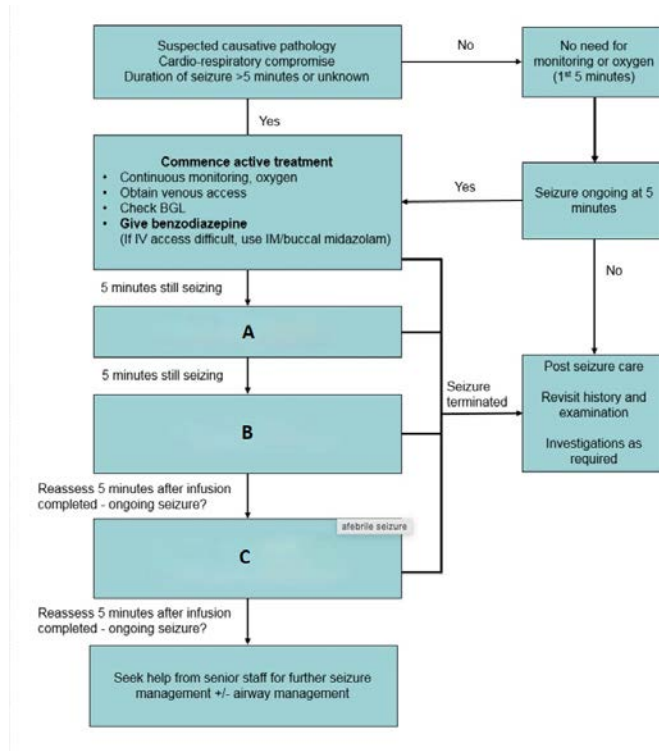
Strategy	Comment	Examples
Educational		
training on theories of reasoning and medical decision making	Achieving improved diagnostic reasoning requires an understanding of cognitive theories about decision making and the impact of cognitive biases ¹⁵⁻¹⁸	► Educational curricula covering theories of decision making, major cognitive and affective biases and their application to diagnostic reasoning ¹⁹⁻²¹
Bias inoculation	A key recommendation is to teach about cognitive and affective biases and develop specific tools to test for them ²²⁻²⁴ and for debiasing	► A 'consider-the-opposite' procedure marginally reduced anchoring in judgements of personality traits ²⁵ ► Cognitive forcing strategies to counteract cognitive bias showed minor effects ²⁶
Specific educational interventions	Teaching specific skills may mitigate particular biases by providing basic knowledge leading to greater insight	► People trained in inferential rules committed fewer base rate errors ^{27, 28} ► Combining a non-analytical with an analytical approach in reading ECGs improved diagnostic accuracy ²⁹
Cognitive tutoring systems	Computer-based systems can be used to construct a learner's profile of decision making and provide feedback on specific biases and strategies to mitigate them	► Decision monitoring software of virtual slide cases detected cognitive biases according to preset criteria ³⁰
Simulation training	Simulation may be a venue for teaching about, identifying and remediating cognitive errors ³¹	► Residents experienced a simulation involving a difficult diagnosis with a cognitive error trap ³²
Workplace		
Get more information	Heuristics and biases often arise in the context of insufficient information. Diagnostic accuracy is related to thoroughness of cue acquisition ³³	► The greater the number of attributes of a problem that can be identified, the greater the likelihood of selecting the best alternative ³⁴
Structured data acquisition	Forcing deliberate data acquisition may avoid 'spot diagnoses' ^{35, 36} by ensuring that less obvious symptoms are considered	► Traditionally, data acquisition has been pursued by establishing a differential diagnosis list, and more recently by employing a differential diagnosis checklist tool ³⁷
Affective debiasing	Virtually all decision making involves some degree of affective influence. Many affective biases are hard-wired. Decision makers often are unaware of the affective influences on decision making ^{38, 39}	► Overview of affective biases and recommendations for debiasing are available ²⁰
Metacognition, decoupling, reflection, mindfulness	A deliberate disengagement or decoupling from intuitive judgements and engagement in analytical processes to verify initial impressions ¹	► Deliberately reflecting upon initial diagnoses led to better diagnoses in difficult cases ⁴⁰ and counteracted availability bias ⁴¹
Slowing down strategies	Accuracy suffers when diagnoses are made too early and improves with slowing down	► A planned time-out in the operating room ^{42, 43}
Be more sceptical	A tendency in human thinking is to believe rather than disbelieve. Type 1 processing occurs by viewing something as more predictable and coherent than is really the case ^{10, 44}	► No published examples
Recalibration	When the decision maker anticipates additional risks, recalibration may reduce error	► When bias is anticipated, (eg, medical comorbidities in psychiatric patients), ⁴⁵ the decision maker may recalibrate
Group decision strategy	Seeking others' opinions in complex situations may be of value. Crowd wisdom, at times, is greater than an individual decision maker ⁴⁶	► Group rationality exceeded individual rationality in studies with experimental games in other domains ⁴⁷
Personal accountability	When people know their decisions will be scrutinised and they are accountable, their performance may improve	► Participants who knew they would be justifying their responses performed better than participants who thought that their responses were anonymous ⁴⁸

Question 14 (12 marks)

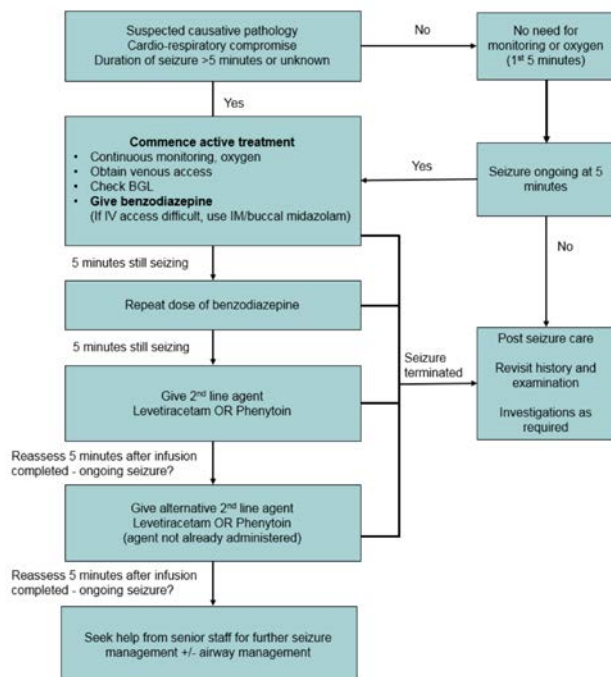
A two year old child presents to your Emergency Dept. with a generalised tonic-clonic seizure.

Part a (3 marks)

Complete the the following table for A, B and C regarding seizure care.



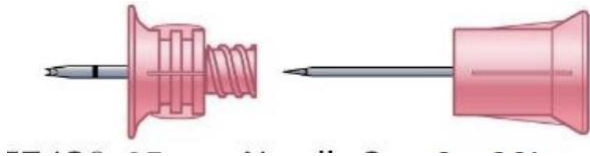
Model Answer



Part b (1 marks)

The IVC dislodged and during resuscitative care an intraosseous needle was placed.

What is the significance of the black line on the EZ-IO intraosseous needle?

**Model Answer**

- This line gives confirmation of the needle length being long enough to reach the medullary space. Distance marker

Part c (1 marks)

After needle insertion when should the black line be visible?

Model Answer

- When the tip of the needle touches bone you need the black line visible – this is 5mm from the hub – before you drill into the bone. (if not visible = change needle size)

Part d (6 marks)

Complete the following table regarding ongoing airway and resuscitative management for this patient.

Model Answer

Formula to assist estimating patient weight	$(\text{Age} + 4) \times 2 = 12\text{kg}$
Size for uncuffed ETT	$\text{Age}/4 + 4 = 4.5$ uncuffed
Expected (approximate) depth for ETT insertion	3 x ETT size = 12cm at the lips litfl: $\text{Age}/2 + 12 = 13\text{cm}$ at the lips, $\text{Age}/2 + 15 = 16\text{cm}$ at the nose
Size LMA	1.5 or 2
Normal/expected lung tidal volume	6mls/kg as a minimum = 72mls, up to 8mls/kg = 96mls
Maximum Peak Inspiratory Pressure	25-30 cm H ₂ O

Part e (1 marks)

After the ETT is placed, there are no breath sounds heard on the left side of the chest. A chest x-ray is obtained (below).

Outline your next step in management

**Model Answer**

- Using the laryngoscope and with cuff (if present) deflated: withdraw the ETT out of the right main bronchus back to just above the carina (likely approx. 4cm).

Question 15 (12 marks)

Capnography is a vital form of monitoring in the Emergency Department

Part a (3 marks)

State three (3) of the most important common uses of ED capnography.

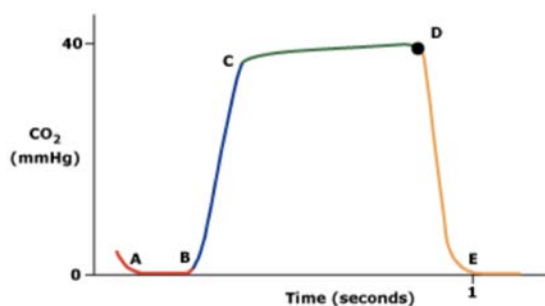
Model Answer

- Confirmation of ETT placement
- Monitoring of ventilation/ongoing confirmation of tracheal location
- Cardiac arrest-Monitor for ROSC in CPR/ Assess adequacy of compressions/Assess need for perfusion support e.g. fluids or pressors/Prognosis
- Procedural sedation- monitor for hypoventilation/respiratory depression in sedated patient.
- Other- prognosis in sepsis/trauma, detecting metabolic acidosis, monitoring ventilation in patient with altered mental state

NB accept any appropriate answer from each topic (dot point). More than one answer from the same topic will not score extra.

Part b (1 marks)

Normal CO₂ waveform



On the normal waveform above which interval (e.g. A-B, B-C, C-D or D-E) contains the period of dead space ventilation?

Model Answer

- A-B

Part c (8 marks)

In the table below, state conditions that can cause abnormal EtCO₂ values. Only one unique example should be given for each box.

Model Answer

Aetiology	Low EtCO ₂ (4 marks)	High EtCO ₂ (4 marks)
Metabolic	Hypothermia Metabolic acidosis DKA	Malignant hyperthermia Neuroleptic malignant syndrome

		Thyroid storm Sepsis Recovery from anaesthesia Hyperthermia Excited delirium
Respiratory	Pulmonary oedema Intrapulmonary shunt Hyperventilation – any appropriate cause including hypoxia/pain etc PE Air embolism Apnoea	Hypoventilation -any appropriate cause e.g. sedation, etoh, raised ICP COPD Asthma
Circulation	Anaesthesia induction PE/ air embolism Hypovolemia/haemorrhagic shock Cardiogenic shock/ cardiac arrest Intracardiac shunt	Release of tourniquet Laparoscopy with CO2 insufflation Acidosis/acidemia treatment e.g. bicarbonate infusion Improved circulation / perfusion e.g. secondary to pressors/fluids
Equipment	Equipment/tubing disconnection Oesophageal intubation Equipment malfunction/over ventilation Tubing blockage/kink	CO2 absorber dysfunction Monitor contamination Equipment malfunction e.g ventilator failure/ underventilation Partial obstruction Inadequate fresh gas flows

Question 16 (12 marks)

A 45 year old man is brought to the Emergency Department with a suspected snake bite.

Part a (5 marks)

List five (5) features on initial assessment that would be raise your concern for envenomation

Model Answer

- Non-specific:
 - o Headache, nausea, vomiting, abdominal pain, collapse, cardiac arrest
- Neurotoxicity
 - o Ptosis, diplopia, ophthalmoplegia, respiratory paralysis, distal limb paralysis, seizures.
- Coagulopathy
 - o Bleeding from bite site, venipuncture, gums, epistaxis, intracranial bleed

Part b (4 marks)

List four (4) time points when investigations are required for the management of suspected snake bite?

Model Answer

- At presentation
- 1 hour after removal of Pressure Immobilisation Bandage
- 6 hours after suspected snake bite
- 12 hours after suspected snake bite

Part c (3 marks)

List three (3) pre-requisites that need to be satisfied prior to the discharge of a snake bite victim from the Short Stay Unit.

Model Answer

- Normal neurological examination at 12 hours post snake bite
- Normal bloods (INR, APTT, Fibrinogen, CK, FBE and film, UEC, Quantitative D-dimer) at 12 hours post snake bite
- Daylight hours

Question 17 (12 marks)

A 40-year-old male is brought to your Emergency Department, having been found on a park bench in an altered conscious state. His medical history is unknown. His vital signs are as follows:

HR	36 bpm
BP	70/30 mmHg
RR	6 breaths/min
O ² Sats	92 % (via 10L NRB mask)
Temp	27.5 °C
GCS	3 E1V1M1

Part a (6 marks)

Complete the following table regarding treatment options for rewarming of this patient.

Model Answer

Active External Rewarming	Active Core/Internal Rewarming
Forced air blanket (Bair Hugger/Warm Touch)	Warmed, humidified inhalation
Warm IV fluids (I disagree with this as an "external" option, but it is listed in Cameron)	Left pleural cavity lavage/Thoracic lavage
Warm blanket	ECMO
• Radiant heat via light source • Hot bath immersion • Heat packs (*body-to-body contact not accepted in ED environment)	• Warm IV fluids • Abdominal lavage • Haemodialysis • IDC warmed fluid lavage

Part b (3 marks)

The patient becomes pulseless during your initial assessment.

List three (3) contraindications to cardiopulmonary resuscitation (CPR) in this patient.

Model Answer

not for resuscitation status is verified
any signs of life are present: • Regular respirations • Responsiveness • Pulsatile arterial activity on bedside ultrasound
chest wall depression is impossible (e.g. rigor mortis)
• Obvious lethal injuries are evident • Regular spontaneous respiration present

*** dilated pupils have a variety of causes and should not be considered as a sign of death in hypothermia**

Part c (3 marks)

State three (3) alterations you would make to standard Advanced Life Support (ALS) in this patient.

Model Answer

1.	assess for breathing then pulse for up to 60 seconds to confirm respiratory arrest, pulseless cardiac arrest, or bradycardia that is profound enough to require CPR
2.	withhold or limit drug use in severe hypothermia
3.	if temperature is 30- 34°C, double the normal dosing intervals of ALS drugs
	• VF: reasonable to attempt defibrillation at temperatures < 30°C, but if no response to standard ALS, defer further attempts at defibrillation until core temperature rises above 30°C do not commence BLS if regular spontaneous respiration present

Question 18 (18 marks)

A 68 year old woman has presented to your tertiary emergency department with lethargy, shortness of breath and a presyncopal episode.

Her FBE is shown below:

Hb	68 g/L	(130 - 170)
Hct	0.33 L/L	(0.36 - 0.50)
RCC	$3.6 \times 10^{12}/L$	(4.2 - 5.9)
MCV	68 fL	(80 - 99)
MCH	24 pg	(26 - 34)
MCHC	304 g/L	(315 - 365)
Plt	$163 \times 10^9/L$	(150 - 400)
WCC	$4 \times 10^9/L$	(4 - 12)

Part a (4 marks)

List four (4) possible causes for this result

Model Answer

- Iron deficiency anaemia
- Thalassaemia
- Sideroblastic anaemia
- Multiple myeloma
- Chronic systemic illness eg chronic infection, inflammation, malignancy – although more likely normocytic anaemia

Part b (8 marks)

The decision is made to transfuse 1 unit of packed red blood cells.

Complete the table listing four (4) possible complications of blood product transfusion and a clinical feature you would expect to find with each.

Model Answer

	Reaction	Incidence	Clinical feature
Immunological acute (<24 hours)	Acute haemolytic transfusion reaction (AHTR)	1:76,000	Fever, tachycardia, chills, rigors, SOB, chest pain, flank pain, shock, oliguria, haemoglobinuria and haemoglobinaemia
	Fatal acute haemolytic reaction	1:1.8 million	
	Febrile non-haemolytic transfusion reaction (FNHTR)	0.1%–1% (with universal leucocyte depletion)	($\geq 38^{\circ}\text{C}$ or $\geq 1^{\circ}\text{C}$ above baseline, if baseline $\geq 37^{\circ}\text{C}$) during or shortly after transfusion. This is usually an isolated finding. The symptoms of an FNHTR may also include chills, rigors, increased respiratory rate, change in blood pressure, anxiety and a headache.

	Mild allergic reactions (urticarial)	1%–3%	Urticaria
	Severe allergic reactions (anaphylaxis)	1:20,000–1:50,000	Urticaria, wheeze, SOB, hypotension, vomiting
	Transfusion-related acute lung injury (TRALI)	1:1,200–1:190,000	Acute onset of fever, chills, dyspnoea, tachypnoea, tachycardia, hypotension, hypoxaemia and noncardiogenic bilateral pulmonary oedema leading to respiratory failure during or within six hours of transfusion.
Non immunological acute (<24 hours)	Non-immune mediated haemolysis (physical or chemical destruction of blood)	Rare	The symptoms vary depending on the degree of haemolysis and the amount of component transfused. Most non-immune-mediated haemolysis situations are benign, but life-threatening haemolysis with severe anaemia and renal failure may occur. Patients often present with fever and increased pulse rate. Transfused patients may develop haemoglobinuria and haemoglobinuriaemia.
	Transfusion transmitted bacterial infection (for clinically apparent reactions) due to platelets	Approximately 1:250,000 (in Australia)	rigors, high fever, severe chills, hypotension, tachycardia, nausea and vomiting, dyspnoea, or circulatory collapse during or soon after transfusion. In severe cases, the patient may develop shock with accompanying renal failure and disseminated intravascular coagulation (DIC) .
	Transfusion transmitted bacterial infection (for clinically apparent reactions) due to red cells	Approximately 1:2.5 million (in Australia)	
	Transfusion-associated circulatory overload (TACO)	1%	Acute respiratory distress from pulmonary oedema
Immunological delayed (>24hours)	Delayed haemolytic transfusion reaction (DHTR)	1:2,500–1:11,000	Signs and symptoms are similar to an acute transfusion reaction but are less severe. The patient may have fever,

			inadequate post-transfusion rise in Hb, jaundice, high LDH, reticulocytosis, spherocytosis, positive antibody screen and a positive direct antiglobulin test (DAT).
	Post transfusion purpura	rare	
	Transfusion-associated graft versus host disease (TA-GVHD)	Rare	
	Alloimmunisation - RBC antigens	1%	
	Alloimmunisation - HLA antigens	10%	
	Transfusion – related immune modulation (TRIM)	Not known	
Non-immunological delayed (>24 hours)	Iron overload requiring chelation therapy	May occur after >20 RBC units	
	Iron overload with organ dysfunction	May occur after 50-100 RBC units	
	Transfusion-transmissible infections	For incidence rates refer to risk estimates for transfusion-transmissible infections	

Part c (6 marks)

Shortly after starting the blood transfusion, the patient reports feeling sweaty, nauseated and lightheaded.

Her vital signs are listed below:

HR 125 bpm
 BP 80/60 mmHg
 Temp 39°C
 RR 18 bpm
 SaO₂ 97% on room air

State six (6) of your next steps for this patient.

Model Answer

- Cease blood transfusion and check patient ID with blood label
- Resuscitation with bolus of crystalloid, ongoing IV hydration to maintain urine output and consider diuretics
- Commence inotropes with noradrenaline/adrenaline
- Broad spectrum IV antibiotics based on clinical signs and symptoms for possible sepsis/transfusion transmitted bacterial infection
- Investigations to confirm diagnosis of acute haemolytic transfusion reaction or sepsis: return sample to blood bank for culture, send fresh patient blood for culture, urgent re crossmatch, DAT, FBE, LDH, bilirubin, haptoglobin, coags, electrolytes, urinalysis
- Notify blood bank of the reaction and document reaction

Question 19 (18 marks)

You have radio contact from the Ambulance service regarding a toddler with an estimated age of 2 years. He had been seen unresponsive in a locked vehicle parked on the street near some shops. Police have forcibly entered the vehicle and paramedics have extracted him and are en route, unaccompanied by any family members.

Initial Vitals are:

HR	210 bpm
BP	60/- mmHg
RR	30
Temp	40.2°C
GCS	4 with intermittent seizure activity

Part a (1 marks)

What is the most likely diagnosis?

Model Answer

Heat stroke

Part b (4 marks)

Apart from seizures, list four (4) possible complications from this

Model Answer

- Neurological injury
- Rhabdomyolysis
- DIC
- ARDS
- Acute kidney injury/high urate
- Ischaemic colitis
- Lactic acidosis

Part c (10 marks)

En route he has had 240 mL saline given through an IV line.

On arrival he is still having occasional seizure activity with vomitus on clothes and face

Vital signs on arrival to ED are:

HR	190 bpm
BP	70/30 mmHg
Temp	39.8°C
GCS	4

List and justify five (5) management steps you will initiate, with endpoints where appropriate

Model Answer

- Cooling (cool fluids IV / exposure/sprays or immersion/ice packs esp to groin axilla/cooling/catheter)
- Fortuitously due to their relative body mass, BSA, small children much less likely to need cooling through peritoneal fluids/chest tubes/ dialysis etc than adults with heat stroke

- Intubation for airway protection
- Volume restoration – with end points (BP or urine production). rx shock &/OR rhabdo
- Inotropic therapy
- No role for dantrolene

Part d (3 marks)

After some time his parent arrives.

State three (3) key points need to be included in your discussion with the parent

Model Answer

- Detailed history of event or as much as parent recalls (documentation also key)
- Need for admission to paediatric ICU
- Significant chance of long term neurological injury or non-survival
- Need for involvement of jurisdictional child welfare / child protection services

Question 20 (12 marks)

A 28 year old male carpenter presents to your emergency department with fever and severe right arm pain. He sustained an open wound to his right hand two weeks prior.

Part a (6 marks)

Excluding CRP and White cell count, list three (3) laboratory investigations and state their utility in risk stratification for necrotising fasciitis.

Model Answer

Table 4

Laboratory risk indicator for NF: A score of =5 points indicates a low risk (< 50% probability) of NF; 6–7 points indicate an intermediate risk (50%–75% probability) of NF; 8 points or more indicate a high risk (> 75% probability) of NF.

INVESTIGATION	SCORE
Serum C-reactive protein = 150 mg/L	4 points
White blood cell count	
• 15 000/μL–25 000/μL	1 point
• > 25 000/μL	2 points
Hemoglobin	
• 11.0–13.5 g/dL	1 point
• < 11 g/dL	2 points
Serum sodium < 135 mEq/L	2 points
Serum creatinine > 1.6 mg/dL (141 mmol/L)	2 points
Serum glucose > 180 mg/dL (10 mmol/L)	1 point

[Open in a separate window](#)

NF—necrotizing fasciitis.

Data from Anaya and Dellinger⁹ and Wong et al.³²

Part b (3 marks)

Based on your assessment, the diagnosis of necrotising fasciitis is highly probable.

He doesn't have any allergies.

Prescribe your antibiotic regime for this patient.

Model Answer

For empirical therapy for necrotising skin and soft tissue infection not associated with water exposure, in combination with surgical debridement, as a three-drug regimen, use:

1	meropenem 1 g (child: 20 mg/kg up to 1 g) intravenously, 8-hourly	  
OR		
1	piperacillin + tazobactam 4+0.5 g (child: 100 +12.5 mg/kg up to 4+0.5 g) intravenously, 6-hourly	  
PLUS with either of the above regimens		
	vancomycin (adult and child) 25 to 30 mg/kg intravenously, as a loading dose; see Principles of vancomycin use for subsequent dosing and principles of use	  
PLUS EITHER		
1	clindamycin 600 mg (child: 15 mg/kg up to 600 mg) intravenously, 8-hourly	  
OR		
2	lincomycin 600 mg (child: 15 mg/kg up to 600 mg) intravenously, 8-hourly.	  

Part c (3 marks)

Using the following table, showing your formula, calculate the following characteristics for accuracy of CT scan in necrotising fasciitis.

	Presence of Necrotising fasciitis intra-operatively	
CT findings	Confirmed	No necrosis
Positive	13	4
Negative	0	38

Model Answer

CT findings	Presence of Necrotising fasciitis intra-operatively	
	Confirmed	no Necrosis
Positive	13	4
Negative	0	38

Courtesy:

Martinez M, Peponis T, Hage A, Yeh DD, Kaafarani HMA, Fagenholz PJ, King DR, de Moya MA, Velmahos GC. The Role of Computed Tomography in the Diagnosis of Necrotizing Soft Tissue Infections. *World J Surg.* 2018 Jan;42(1):82-87. doi: 10.1007/s00268-017-4145-x. PMID: 28762168.

1. Sensitivity
2. Positive Likelihood ratio
3. Negative Predictive Value

Test	Disease		n	Total	
	Present	Absent			
Positive	True Positive	a = 13	False Positive	c = 4	a + c = 17
Negative	False Negative	b = 0	True Negative	d = 38	b + d = 38
Total	a + b = 13		c + d = 42		

Disease prevalence

If the ratio of cases in the Disease Present and Disease Absent groups does not reflect the disease prevalence, enter:

disease prevalence (%):

Results

Statistic	Value	95% CI
Sensitivity	100.00%	75.29% to 100.00%
Specificity	90.48%	77.38% to 97.34%
Positive Likelihood Ratio	10.50	4.13 to 26.67
Negative Likelihood Ratio	0.00	
Disease prevalence (*)	23.64%	13.23% to 37.02%
Positive Predictive Value (*)	76.47%	56.13% to 89.20%
Negative Predictive Value (*)	100.00%	
Accuracy (*)	92.73%	82.41% to 97.98%

1. Sensitivity 100
2. Specificity 90.48
3. Positive Likelihood ratio 10.5
4. Negative Predictive Value 100

		Disease:		
		Sick	Healthy	
Test result:	Positive	True positive (TP)	False positive (FP)	→ PPV
	Negative	False negative (FN)	True negative (TN)	→ NPV
		↓ Sensitivity	↓ Specificity	

		Status of person according to "gold standard"		
		Has the condition	Does not have the condition	
Result from screening test	Positive	a True positive	b False positive	← Row entries for determining positive predictive value
	Negative	c False negative	d True negative	← Row entries for determining negative predictive value
		↑ Column entries for determining sensitivity	↑ Column entries for determining specificity	

$$\text{Sensitivity} = [a / (a + c)] \times 100$$

$$\text{Specificity} = [d / (b + d)] \times 100$$

$$\text{Positive predictive value (PPV)} = [a / (a + b)] \times 100$$

$$\text{Negative predictive value (NPV)} = [d / (c + d)] \times 100$$

$$\text{Positive LR} = \text{sensitivity} / (100 - \text{specificity}).$$

$$\text{Negative LR} = (100 - \text{sensitivity}) / \text{specificity}.$$

Question 21 (12 marks)

A 70 year old male presents to your Emergency Dept with a two day history of intermittent palpitations and lethargy. His only past medical history is hypertension and his regular medications are Irbesartan and Aspirin. The patient lives alone, is independent with his ADLs and drinks 2 glasses of wine with dinner each night.

On arrival his vital signs are:

HR	140 -160/min, irregular
BP	100/65 mmHg
RR	20
SaO ₂	98% (room air)
GCS	15

ECG - atrial fibrillation with 1 mm ST depression V3-6.

Part a (4 marks)

List your top two (2) treatment options for this patient with a justification for each.

Model Answer

1. Treatment options- rhythm vs rate control. In this case, as unclear time onset, preferred rate control. Urgent TOE to exclude thrombus prior cardioversion in the acute setting impractical for EDs.

Accept any beta-blockers, Digoxin, Amiodarone as long as reasonable low dose or titratable regime with rationale as to drug choice. Magnesium considered adjunct so will not score points.

Seek and treat causes too vague and score no point unless specify – eg sepsis with specific antibiotics ACS with antiplatelet/anticoag/cath lab.

Part b (2 marks)

After treatment, the patient remains in AF with a rate of 100-120/min, BP 120/70 mmHg. Serial troponin levels are minimally elevated. He is admitted to the SSU for ongoing telemetry and management. What would you prescribe for ongoing management of the new AF and provide a justification.

Model Answer

- This is to probe for ongoing regime after initial treatment. Often patients sent to SSU/ward with no/minimal consideration for ongoing rate control. Requires reasonable dose, taking into account previous treatment mentioned for initial rate control. Good rationale stating pros +/- cons of drug choice.

Part c (6 marks)

The junior SSU doctor asks if the patient should be discharged with anti-coagulation. State six (6) points to describe and provide reasoning for your approach to anti-coagulation in this patient

Model Answer

1. Essentially checks knowledge and understanding of CHA₂DS₂VA and HASBLED scores with reference to this patient's risk of stroke. Approach should mention consideration of these scoring systems, patient's ability to understand and frailty/risk of falls, medication compliance and extremes of weight (<60kg >120kg). Patient can be referred to GP/cardiologist to re-consider anticoagulation on discharge, but rationale needs to be provided.

If anticoagulation mentioned, reasonable doses should be stated. This patient's HASBLED score is 2 (age and alcohol use) with CHADSVA score 2 (HT, age>65) – suggesting high consideration stroke prevention as nonvalvular AF.

Warfarin only considered in high CHADVA score and high bleeding risk, and for valvular AF.

Antiplatelets not recommended for stroke prevention despite stroke risk.

HASBLED equal and > 3 = high risk, justifies caution with anticoag with increase surveillance if prescribed.

Drug	CrCl < 30	CrCl 30-49	CrCl >50	Lower dose considerations
Apixaban	no	2.5mg BD	2.5mg BD	
Rivaroxaban	15mg OD (CrCl 15-29)	15mg OD	20mg OD	
Dabigatran	no	150mg BD	150mg BD	110mg if high bleeding risk

CHA2DS2VA score - CONDITION		POINTS
C	Congestive cardiac failure: Congestive heart failure includes recent signs, symptoms or admission for decompensated heart failure; this includes both HFrEF and HFpEF, or moderately to severely reduced systolic left ventricular function, whether or not there is a history of heart failure	1
H	Hypertension: History of hypertension, whether or not the BP is currently elevated.	1
A2	Age ≥ 75 years	2
D	Diabetes mellitus	1
S2	Prior Stroke/TIA/ or other thromboembolism	2
V	Vascular disease: - Peripheral artery disease - Prior myocardial infarction - Aortic plaque: i.e. complex aortic atheroma or plaque on imaging (if performed)	1
A	Age 65 - 74 years	1

Current National Heart Foundation Guidelines recommend the following:

SCORE	RISK	TREATMENT
0	Low	No therapy (antiplatelet or oral anticoagulant) is indicated.
1	Moderate	Consider oral anticoagulation therapy
≥ 2	High	Oral anticoagulation therapy is recommended if there are no contraindications. Patient values and preferences should also be taken into account.

Question 22 (12 marks)

A 70 yo male presents to ED with new onset flashes and floaters in his right eye. You suspect posterior vitreous disease.

Part a (12 marks)

Complete the table below to differentiate the degrees of the condition.

Model Answer

cause	Clinical symptom (4)	Diagnostic Clinical finding (4)	Management (2)
Posterior retinal detachment	Flashes worse in dark room Floaters cobwebs	No visual field defect No RAPD	Conservative, review
Posterior retinal haemorrhage	Cobweb, floaters	Blood in posterior chamber	Conservative review
Retinal tear	Cobweb floaters	Tear seen on viewing retina	laser
Retinal detachment	Visual field defect If macula involved decrease in visual acuity	Visual field defect Flap on ultrasound Detachment seen on fundoscopsy	Laser + /-surgery

Question 23 (12 marks)

A 35yo man presents to the emergency department, 30 minutes after an accidental exposure at his worksite to hydrofluoric acid. He reports extreme pain to his hands and arms.

His observations are:

HR	110 bpm
BP	150/80 mmHg
RR	20
SpO2	98% (room air)
GCS	15

Part a (5 marks)

List five (5) points on initial assessment that will assist in your risk stratification for this patient

Model Answer

- Concentration of solution
- % BSA involved
- Contact time
- Mode of exposure (spray, explosion, submersion etc)
- Is this a mixed product? (often coformulated with sulphuric acid) – maybe too niche knowledge?
- First aid administered/decontamination at scene
- Presence of respiratory symptoms
- Presence of ocular symptoms
- Extent of apparent injury – significant subjective pain with little obvious damage, BSA/hyperaemia/blanching/blistering/white discoloration/ desquamation/joint/tendon involvement/neurovascular involvement

Features of hypoCa – tetany, muscle spasm, dizziness/collapse (due to arrhythmia), seizures, cardiac arrest

PMHx if justified and directly impacts (e.g known long QT syndrome)

Part b (3 marks)

List three (3) ECG features that would suggest systemic fluorosis

Model Answer

- ST/QT prolongation (hypoCa)
- Prolonged PR interval and QT interval (hypoMg)
- Peaked T waves etc etc (hyperkalaemia)

Part c (4 marks)

Fill in the table below with an advantage and disadvantage for the two treatment options for pain from hydrofluoric acid burns which is refractory to topical calcium gel treatment.

Model Answer

Treatment option	Advantage	Disadvantage
Subcutaneous infiltration of Calcium gluconate	Ideal for small areas Rapid pain relief	Initial pain Dosing limited to 0.5-1 ml/cm ² (and thus Ca admin limited)

		Contra-indicated on digits
Regional infusion (Bier's Block) with Calcium gluconate	High penetration of Ca ²⁺ ions into tissues Familiar procedure	Ischaemic pain Rx limited by limb ischaemic time Potential for iatrogenic tissue ischaemia Difficult to perform if both arms exposed (have to do one at a time!) May not be effective if burns distal to cannulation site
Intraarterial infusion of calcium gluconate	Most effective method Once arterial line in situ, can be repeated again.	Risk of arterial spasm and limb ischemia Unfamiliar procedure for most Would need to go to ICU or HDU for this in most places.

Other sensible advantages/disadvantages may be acceptable.

Do not accept the opposite of an advantage as a disadvantage for the same treatment option

Question 24 (12 marks)

An 18 yo female is brought to your ED by her concerned family reporting weight loss and increasing lethargy.

The patient engages only superficially with assessment.

The following VBG is performed:

pH	7.54
pCO ₂	92 mmHg
pO ₂	28 mmHg
HCO ₃	70 mmol/L
Hb	154 g/L
Na	132 mmol/L
K	2.9 mmol/L
Ca	1.05
Cl	??
Glu	4.2 mmol/L
Lac	4.5 mmol/L

Part a (4 marks)

State four (4) significant abnormalities present in the above VBG including calculations where relevant.

Model Answer

- Severe metabolic alkalosis – pH 7.54, HCO₃ 70
- Expected pCO₂ – $0.7 \times 70 + 21 = 70$ ie concomitant respiratory acidosis
- Undetectable Cl – likely GI loss due to vomiting
- Lactate 4.5 – element of cellular hypoperfusion – Hb likely spuriously elevated (probably low at baseline)
- Pseudo hypoK⁺ - expect K⁺ for pH 7.55 of $5.0 - 3 \times 0.5 = 3.5$

Part b (4 marks)

List four (4) differential diagnosis for this patient

Model Answer

- functional vomiting eg anorexia/bulimia
- gastric outlet obstruction
- gastroparesis
- cannabis hyperemesis
- hyperemesis gravidarum

Part c (4 marks)

The patient is now stating she wishes to leave but her parents disagree with this.

State four (4) essential elements required to demonstrate competence.

Model Answer

- the ability to maintain and communicate a choice
- the ability to understand the relevant information
- the ability to remember information relevant to the decision
- the ability to appreciate the situation and its consequences
- the ability to use or weigh the information in a rational fashion.

Question 25 (12 marks)

You are working as the duty consultant at a tertiary trauma centre when a 26-year-old man is brought in following a suicide attempt. He jumped in front of an oncoming train, which ran over his right arm, leaving the rest of him largely unscathed. Extrication from the scene was prolonged.

On arrival the patient is agitated and in significant pain. His current vital signs are:

GCS	13 (E3 V4 M6)
HR	130 bpm
BP	100/80 mmHg
RR	24
SaO ₂	100% RA
T	34.7°

This is a photo of the affected limb.



Part a (4 marks)

List four (4) signs of peripheral arterial injury

Model Answer

Any of:

- Absent or diminished distal pulses
- Pulsatile arterial bleeding
- Large expanding or pulsatile haematoma
- Palpable thrill over vessel
- Audible bruit over vessel

Part b (2 marks)

Other than parenteral opioids, state two (2) options for immediate pain management.

Model Answer

Any of:

- Ketamine IV at analgesic doses (0.1-0.3mg/kg)
- Intubation with sedative and analgesic infusions
- Hard board or practical description of limb immobilisation

Part c (6 marks)

State six (6) points about your ongoing management priorities in the emergent care of this patient.

Model Answer

- Inclusive of six conceptual points:
- Haemodynamic resuscitation with warmed blood products, ratio 1:1:1, and reasonable end points (shock index <1 , or permissive hypotension strategy).
- Intubation, with avoidance of hypotension (eg. IV ketamine 1mg/kg).
- Active warming with forced warmed air blanket aiming core temp $>35^{\circ}\text{C}$.
- Urgent surgical team attendance to expedite theatre for operative management (vascular, ortho, plastics).
- Infection prevention with IV cephazolin 2g and ADT.
- Manage life-threatening hyperkalaemia following crush injury; IV calcium gluconate, insulin-dextrose.
- Wound management including limb splinting, sterile saline lavage, haemostatic dressings.

Question 26 (12 marks)

35 year old male is brought in by ambulance after an MVA travelling at 80km/hr with right sided chest pain.

His Vitals are:

RR	24
O ₂ sats	94% on 4L
HR	120 bpm
GCS	14 (E4V4M6)
BP	138/92 mmHg

His xray is below



Part a (4 marks)

List four (4) abnormal findings on his CXR

Model Answer

- Clavicle fracture
- Haemothorax
- Multiple rib fractures with flail
- Subcut emphysema
- ? deep sulcus sign
- Multiple rib fractures with flail and haemorthorax – high risk of deterioration and needing ICC insertion

Part b (6 marks)

List six (6) possible complications of an ICC insertion in this patient.

Model Answer

- Injury to staff
- Intra-abdominal placement
- Intra-cardiac placement
- Lung injury
- Placement in subcut tissues
- Infection empyema
- Pain
- Intercostal vessel injury

Part c (2 marks)

State two (2) indications for urgent operative management of this patient

Model Answer

- 1500 mls of blood drained (a class III hemorrhage or "massive hemothorax) immediately on chest tube insertion.
- Ongoing drainage of > 200 mls per hour for more than 2 - 4 hours, (this is probably a more important factor than the initial amount that is drained)
- Ongoing hemodynamic instability, despite fluid - blood resuscitation.

Question 27 (18 marks)

An 80 year old woman is brought in by ambulance after being found wandering aimlessly on the streets. She appears to be confused and disoriented. Her vital signs are:

HR	92 /min
BP	165/100 mmHg
RR	20 /min
SaO ₂	95% (room air)
GCS	14 (confused)

Part a (6 marks)

State and justify three (3) initial key investigations you would perform on this patient in the ED

Model Answer

- Accept any in the following categories. As there are many types of investigations, no marks are to be scored for repeat categories.
- Sepsis
- Medications/Toxins – sedatives/opiates, anticholinergics, risk of chronic toxicity (e.g. Digoxin, lithium, metformin, salicylates), steroids, alcohol/herbal remedies, beta-blockers (propranolol, sotalol)
- CVA/seizures
- ACS
- Dehydration
- Hypoxia/hypotension
- Urinary retention/constipation
- Environmental (e.g. Pain, sleep deprivation, sudden change environment)
- Metabolic – hypoglycemia, hypo/hypernatremia, hypercalcemia, hepatic encephalopathy, wernicke's, thyroid.

Part b (3 marks)

Whilst waiting for police to assist with identifying the patient, she declines treatment and tries to leave.

List three (3) principles of care that are important in this situation

Model Answer

- Duty of care (primary responsibility to patient)
- Beneficence (duty to do what's best for patient)
- Autonomy (patient's right to make own decisions)

Part c (3 marks)

State three (3) factors you need to consider in determining if the patient can leave the ED.

Model Answer

- Competency -understand medical condition, treatment options, recommendations, potential adverse outcomes, and likelihood of these. Able to accept information as reality. Maintain and communicate choice. Understand relevant info/situation/consequences. Rationalise information given in decision making.
- Consent – informed, specific, freely given with no undue influence, with opportunity to reflect and ask questions. Can be withdrawn at any time. Cannot be given by relatives under enduring medical power of attorney.

- Implied consent if patient is deemed not competent – authority to treat as long as following criteria met. Emergency condition, non-competent patient (impaired rational thinking) and no contravening legal directive. (e.g. intoxication/drug ingestion as acting in best interest of patient)
- Patient's own wishes and values, religious and cultural beliefs
- Likelihood of improvement if treatment provided

Part d (6 marks)

The patient is calmer after a dose of Haloperidol 0.5mg PO. Please complete the table listing your approach, with limitations, to ongoing management of agitation in this patient in the ED. Please be specific

Model Answer

Situation	Approach	Limitation
To facilitate CTB	Accept BZD, Ketamine, Quetiapine, Olanzapine, Haloperidol. Accept dual agents as long as low doses/monitoring discussed	Specific limitations. No marks for vague concept
Agitation during night shift in ED	Olanzapine 2.5mg IM/O, Haloperidol 0.5mg IM/O, Risperidone 0.25-0.5mg O(liquid). Quetiapine 12.5mg preferred if Parkinson's/Lewy body dementia. Nonpharm approach – toilet, pain, quiet section ED/low lights, 'special' dedicated staff to re-direct patient. Restraints – last resort (no marks if mentioned as 1st line)	
Ongoing agitation on transfer to ward	Non-pharm strategies, and reasonable PRN low doses with Max/24 hours	