

QUESTION 1 – DOUBLE QUESTION (21 marks)

With regard to skin and soft tissue infections

- i. List 5 non-infectious conditions that masquerade as unilateral leg cellulitis and indicate the symptoms/signs and/or tests that help to differentiate the condition from cellulitis (10 marks)

Cellulitis mimic	Differentiating symptoms/signs/investigations

Contact dermatitis - contact dermatitis lesions are pruritic. Clinical features include erythema, oedema, vesicles, bullae, and oozing. The reaction is generally limited to the site of contact and is associated with burning, stinging, or pain. Usually well-demarcated. Frequently a history of contact with causative agent

Acute gout - severe pain, warmth, erythema, and swelling overlying a single joint. The diagnosis can be established by synovial fluid analysis, which should demonstrate the characteristic urate crystals of gout or the calcium pyrophosphate crystals of pseudogout. Additional clues suggestive of gout include involvement of the first metatarsophalangeal joint, prior self-limited attacks of arthritis, and presence of tophi.

Insect bite - inflammatory reaction at the site of the punctured skin, which appears within minutes and consists of pruritic local erythema and oedema. May/may not give history of bite or outdoor activities. In some cases, a local reaction is followed by a delayed skin reaction consisting of local swelling, itching, and erythema.

Stasis dermatitis – Stasis dermatitis is an inflammatory dermatosis of the lower extremities that occurs in patients with chronic venous insufficiency. It is usually bilateral but can be unilateral in the setting of anatomic asymmetry. The diagnosis is usually established clinically

Drug reaction - presents with an erythematous maculopapular rash that involves the trunk and proximal extremities. It may be accompanied by pruritus, low-grade fever, and mild eosinophilia. The diagnosis is suspected in a patient receiving drug treatment who presents with a rash of recent onset. The clinical suspicion can be substantiated by histopathologic examination of a skin biopsy

Superficial thrombophlebitis - tender, palpable cord along affected vein often present.

History of cannulation.

DVT – tenderness +/- Homan's, diffuse swelling history of prior DVT, prolonged immobility, or hypercoagulable state.

Vasculitis - macular and papular lesions are characteristically nonblanchable due to the presence of extravasated erythrocytes in the dermis, which occurs as a result of damaged vessel walls. The diagnosis is established by skin biopsy

- ii. List 3 choices of oral antibiotic which cover *Streptococcus pyogenes* **and** *Staphylococcus aureus* (3 marks)

Flucloxacillin 500-1000mg QID

Cephalexin 500-1000mg QID

Clindamycin 450mg TDS

- iii. Briefly explain the pharmacodynamic advantage conferred by combining a beta-lactam antibiotic with:
- (a) Probenecid (2 marks)

- Decreases renal excretion of drugs that undergo active tubular secretion – especially weak acids & including B-lactam antibiotics. Pharmacokinetic principles → longer period where concentration of drug stays above MIC

- (b) Clavulanic acid (2 marks)

- Inhibitor of bacterial B lactamases and protect hydrolysable penicillins from inactivation. Weak antibiotic action in their own right. Do not alter the antibacterial spectrum of the parent antibiotic

iv. Regarding the management of abscesses, write short notes on the role of the addition of an antibiotic to simple incision and drainage of the abscess (4 marks)

- Generally considered that I&D is sufficient and antibiotics are not required.
- However, with surrounding cellulitis may be indicated.
- Further, there is a small benefit of the addition of Bactrim (7% reduction in “failure” of treatment) – which has to be balanced against the risk of antibiotic adverse effects.
- Higher prevalence of Staph aureus and in some populations resistant forms means if an antibiotic is used it should cover MSSA e.g. bactrim

QUESTION 2 (15 marks)

A 65 year old male presents with severe sudden onset left flank pain. He is pale, sweaty and agitated.

Vital signs: GCS 14
Automated BP 160/145mmHg, palpable brachial pulse (but not radial)
P 130 bpm
RR 27 bpm
Central CR 5 sec

i. List 4 differential diagnoses (4 marks)

- Lumbar back pain
- Epidural abscess with septic shock
- Ruptured AAA
- Aortic dissection with rupture
- Renal colic
- Spontaneous retroperitoneal haemorrhage
- Perforated DU

ii. Why is there discrepancy between palpable pulses and automated BP and what is your action (3 marks)

- The automated oscillometric BP is unreliable in very low BP and will often give extraneous results
- Action: perform manual BP and/or site arterial line at appropriate time

iii. You suspect a ruptured abdominal aortic aneurysm. List 2 pros and 2 cons for ultrasound and CT imaging (8 marks)

Ultrasound

- Pro: fast, no radiation, bedside, rapidly rule in other diagnoses
- Con: requires training, specificity/sens level not as good as CT, not good for detecting type/extent of AAA or surgical planning in terms of EVAR/open repair

CT

- Pro: high sensitivity/specificity, accurate-extent/type of aneurysm, allows planning for vascular surgeons. Accurate at ruling in/out other diagnoses
- Con: radiation, logistics-potential deterioration in CT scanner, potential for AKI if already severe renal impairment although not critically important. Lag time to images and interpretation/report

QUESTION 3 (15 marks)

A 5 year old is brought to the Emergency Department with worsening asthma for the last 4 hours.

i. What are four clinical features of life threatening asthma (4 marks)

- Confusion
- Coma
- Exhaustion
- Poor respiratory effort
- Silent chest
- Cyanosis
- Hypotension

ii. List your immediate pharmacological management (3 marks)

- Ventolin 6 puffs by MDI or nebuliser Q20min x3
- Ipratropium bromide 4 puffs Q20 min
- Prednisolone 1mg/kg (methylpred/hydrocort alternatives)

- iii. Despite appropriate escalation of management the patient's condition deteriorates over several hours and they are intubated in the ED. Complete the following table (5 marks)

Parameter	Setting	Justify
Respiratory Rate		
Tidal volume		
Peak inspiratory pressure		
PEEP		
I:E ratio		

<i>Parameter</i>	<i>Setting</i>	<i>Justify</i>
<i>Respiratory Rate</i>	<i><10/min</i>	<i>Normal RR in 5y 20-30, answer should be less than this to allow time for expiration</i>
<i>Tidal volume</i>	<i>5-7ml/kg</i>	<i>Decreases barotrauma</i>
<i>Peak inspiratory pressure</i>	<i>35-50cmH20</i>	<i>Necessary to overcome high airway pressures</i>
<i>PEEP</i>	<i>0-5cm H20</i>	<i>Patient has high intrinsic PEEP - low extrinsic PEEP prevents gas trapping</i>
<i>I:E ratio</i>	<i>1:4-8</i>	<i>Allows time for expiration</i>

- iv. After connecting to the ventilator the patient suddenly deteriorates becoming progressively hypotensive and tachycardic. Give three possible causes (3 marks)

- dynamic hyperinflation/gas trapping, tension pneumothorax, effect of induction agents, other (hypovolaemia, equipment failure - tube dislodgement/O2 not connected)

QUESTION 4 (16 marks)

You are the senior doctor in charge of a tertiary ED at 3pm when Ambulance Control state that there has been an explosion nearby.

- i. What 5 pieces of information are important to obtain from Ambulance Control (5 marks)

(METHANE acronym)

- Confirm that a Major Incident has been declared
- Exact location
- Type of incident
- Hazards
- (Access/egress)
- Number of casualties (total and likely coming to your facility)
- (Emergency services present/required)

- ii. List 7 steps that you should perform after receiving this phone call (7 marks)

- Declare a Major Incident as per Major Incident Protocol in your hospital → should cascade to executive/senior management to co-ordinate roles outside ED
 - Find/follow major incident role-description cards
 - Take role of Medical Co-ordinator or Senior Emergency Physician until/unless another more appropriate person can
 - Consider need for decontamination of all patients prior to entering ED
 - Close all other entry points to ED except one triage route
 - Liaise with senior nursing and senior management to form key roles: triage officer, resuscitation teams, acute patients treating staff, green walking patients treating staff
 - Assess current ED staffing and potential staffing (who can be called in)
 - Identify areas to see Resus (red), Acute (yellow) and Walking (green) patients.
 - Clear the emergency department of as many patients as possible
- iii. Patients start arriving rapidly on foot and by ambulance. Using a triage sieve, classify (red, yellow, green) the following patients (4 marks)
1. Female 40s, lying on ambulance stretcher, GCS 14, RR 33, BP 105/80, P 110

 2. Male 30s, limping up to triage unassisted, GCS 15, RR 26, BP 95/50, P 105

 3. Female 20s, sitting in a wheelchair, obvious compound tibial fracture, GCS 15, RR 28, P 120

 4. Male 50s, lying on stretcher, GCS 13, RR 25, BP 105/60, P 110

- Red
- Green
- Red
- Yellow

QUESTION 5 (12 marks)

Precipitous deterioration can occur around the time of intubation in several specific situations.

- i. Explain the pathophysiology of the cardiovascular collapse that can occur at induction of a patient with **severe aortic stenosis** (4 marks)

- AS leads to concentric LV hypertrophy and a poorly compliant ventricle which is highly dependent on pre-load for adequate diastolic filling
 - If you drop the pre-load (or the aortic end-diastolic pressure) – e.g. by vasodilation - LV filling is poor & stroke volume low
- Also dependent on diastolic filling time – so causing tachycardia is also bad (atrial fibrillation is very bad as highly dependent on atrial “kick” – normal heart = 20% of diastolic ventricular filling but in AS up to 40%)

- ii. Cardiovascular collapse can occur at the induction, intubation and ventilation of a patient with **severe metabolic acidosis**. Outline measures you would take to prevent this from occurring (4 marks)

- Patients typically have respiratory compensation ++, need to match their minute volume peri-intubation or acidosis precipitously worsens → poor myocardial contractility, diminished catechol responsiveness

- Pre-oxygenate with their spontaneous resps (or NIV-assisted at matched RR), note ETCO₂ (and try not to let it climb), RSI but with breaths delivered throughout induction phase (no apnoea), rapid intubation, match previous minute volume

iii. Explain the pathophysiology of the cardiovascular collapse that can occur at induction, intubation and ventilation of a **severe asthmatic** (4 marks)

- Often ill for quite a while prior to arrival with decreased oral intake so under-volume to begin with
- Typically have maximal endogenous sympathetic outflow – this decreases with induction → relative vasodilation
- Positive pressure ventilation with inadequate expiratory time → raised ITP, decreased VR etc
- Consider pneumothorax

QUESTION 6 (14 marks)

A 62 year old man presents with a cold, painful, numb left leg. You suspect an acute ischaemic limb.

- i. List 4 features on **history** that would suggest acute arterial embolism rather than thrombosis as the cause (4 marks)

- Minimal history of atherosclerotic disease
- No or minimal history of claudication
- Acute or sudden onset of symptoms
- History of AF
- History of valvular heart disease (mitral vlv stenosis) or prosthetic valve
- known atrial myxoma
- known endocarditis
- known LV aneurysm or cardiomyopathy

- ii. List 4 features on **examination** that would suggest acute arterial embolism rather than thrombosis as the cause (4 marks)

- Presence of AF
- Clinical signs of bacterial endocarditis
- Heart murmurs suggesting valvular disease
- Presence of abdominal aortic, femoral or popliteal aneurysm
- Degree of demarcation sharp rather than more diffuse in thrombotic disease
- Absence of chronic ischaemic changes in limb (e.g. wasting, hair loss, skin atrophy ulceration)
- Good proximal and contralateral pulses
- Site of demarcation at major bifurcations of arteries
- More extensive gangrene or more obviously limb threatening

iii. Name 2 revascularisation strategies (2 marks)

- Intra-arterial thrombolysis
- Catheter embolectomy
- Surgical embolectomy
- Arterial bypass surgery

iv. Name 4 post reperfusion complications that may arise (4 marks)

- Compartment syndrome
- Hyperkalaemia
- Acidosis
- Re-occlusion and ischaemia
- Rhabdomyolysis, myoglobinuria
- Renal failure
- Myocardial depression & hypotension

QUESTION 7 (15 marks)

You are a retrieval doctor tasked to a scene of a suspected electrical injury of a technician working at an electrical substation. On approach, he can be seen 5 metres from the potential source and is wet from the overhead rain. The patient is groaning and you note a burn on his right hand, holes in the soles of his shoes, and partially torn and charred clothing.

i. Outline 5 initial management priorities at the scene (5 marks)

- **safe approach/scene safety** – paramedic, fire (*responder safety directed by wider team, high risk of provider injury so must not approach until all clear*)
- trauma assessment approach with meaningful interventions (*risk of trauma, avoid delays*)
- humanitarian – analgesia/anaesthesia (*expectation of severe pain*)
- plan destination – trauma/burns centre (*avoid secondary transfer*)
- fluid management, temperature management (*Parklands not valid, risk of hypothermia from skin burns, wet patient exposed outdoors*)

ii. List 4 features of the history or examination that suggest significant injury (4 marks)

- potential high voltage
- wet skin
- thrown distance from the site with possible associated trauma

QUESTION 8 (13 marks)

A 72 year old female presents with jaw pain and inability to close her mouth after yawning.

i. What is the most likely diagnosis (1 mark)

- Anterior TMJ dislocation

ii. List three risk factors for this (3 marks)

- Previous TMJ dislocation
- Ligamentous laxity syndrome eg Ehler Danlos or Marfan
- TMJ dysfunction or previous trauma

iii. List three mechanisms that can cause this problem (3 marks)

- Iatrogenic: Dental procedures, laryngoscopy
- Extreme mouth opening eg yawning, eating, vomiting, laughing, oral sex...
- Seizures
- Dystonic drug reaction
- Trauma

iv. Describe two techniques for reduction (no need to describe analgesia/anaesthesia) (6 marks)

- **Traditional:** Patient seated with head supported posteriorly. Physician stands in front with elbows flexed. Mandible held with gloved thumbs intraorally just lateral to lower molars. Down and backward manipulation
- **Modified traditional.** Physician stands behind the patient with hands in the same position. Down and backwards pressure from thumbs
- **Syringe:** Reduce one side at a time. 5 or 10ml syringe between posterior upper and lower molars. Patient bites down on syringe whilst it is rolled back and forth between the teeth until reduced. Typically other side reduces spontaneously
- **Wrist pivot:** Physician faces patient, grasps mandible with thumbs under chin and fingers on occlusal surfaces lower molars. Upward force with thumbs and downward pressure by fingers. Pivots wrists forwards
- **Gag:** Elicit gag reflex and reflex inhibition of muscles may result in relocation. Beware vomiting

QUESTION 9 (15 marks)

IMAGES FOR THIS QUESTION ARE IN THE PROPS BOOKLET – IMAGES A-F

i. Which of the M-mode (**images A & B**) demonstrates a pneumothorax? (1 mark)

- A

ii. Why is the other image NOT consistent with pneumothorax (4 marks)

- Image B demonstrates 'lung pulse' [repeated vertical lines that are seen only below the pleural line].
- This represents the lung's 'jiggle' as oxygenated blood fills it. This artefact is useful because it's not seen in pneumothorax. It's seen only in lung, even unventilated lung.

iii. Which of the M-mode IVC images (**images C & D**) is consistent with a tension pneumothorax? (1 mark)

- D

iv. Why is the other image NOT consistent with pneumothorax? (4 marks)

- Image C demonstrates an IVC that collapses almost completely on inspiration, therefore the intrathoracic pressure is very low on inspiration.
- By contrast, in image D the IVC is behaving like a 'lead pipe' and is almost unchanged

with respiration, suggesting either fluid overload or ++ high filling pressures as in the case of all obstructive shock [this IVC would also be seen in pericardial tamponade or massive PE]

- v. Which image (**IMAGE E or F**) is consistent with pleural sliding? (1 mark)

- E

- vi. Why is the other image NOT consistent with pleural sliding? (4 marks)

- Image F actually is an M mode image of cardiac motion [the right ventricle free wall just under the chest wall]. The clues are [a] the lung should be bright but this is dark [because filled with blood], and [b] the zig-zag direction of movement represents updown movement toward and away from the chest wall. This is not something the lung does! [Except in effusions, but that's a different story and would be in time with breathing, not the heartbeat]