

QUESTION 10 DOUBLE QUESTION (20 marks)

A 62 year old man is brought to ED having been found asleep in the garden in the sun. He is agitated, combative, with no focal neurology or signs of trauma.

Vital signs      Temp 41 deg Celsius  
                         P 118 bpm  
                         BP 90/40 mmHg  
                         RR 20 bpm  
                         SaO2 98% RA  
                         GCS 14 (E4V4M6)

i. List 4 possible diagnoses starting with the most likely (4 marks)

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- Heat stroke
- Sepsis (LRTI, UTI, skin etc)
- CNS infection (meningitis/encephalitis/brain abscess)
- Toxidrome (anticholinergic, sympathomimetic, NMS – less likely)
- Drug withdrawal – alcohol , opiates
- Neuro - Non-convulsive status epilepticus, ICH /thalamic bleed
- Endocrine – thyroid storm, DKA

ii. List 3 separate heat related illnesses and their diagnostic criteria/main clinical findings (6 marks)

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- Heat stroke (core temp > 40 (or 40.6) + CNS dysfunction)
- Heat exhaustion (any heat relates illness + significant volume depletion with normal mental status)
- Heat cramps (painful, involuntary, spasmodic skeletal muscle contractions)
- Prickly heat (pruritic, maculopapular, erythematous rash over clothed areas of the body)

iii. List 3 potential ways of cooling this patient and 1 pro and con of each (6 marks)

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- Cooled fluids – readily available, limited efficacy in dropping temp
- Evaporative – simple, effective, non-invasive and readily available method in ED, may lead to shivering
- Immersion – very effective but not practical for most patients in resus (can consider immersing hands/feet)
- Ice packs to necks/axillae/groin – readily available, non-invasive, need to be replaced regularly, not as effective as others but can be combined with eg evaporation
- Cooling blanket – not readily available, preclude use of evaporative cooling, works too slowly
- Cold gastric lavage – effective but impractical? May need to be tubed , water intoxication
- Cold peritoneal lavage – effective but invasive, not practical, requires DPL port/surgeon
- ECMO/CPB – most effective but invasive ++, delays to set up and not available most EDs

iv. List 4 potential complications of this condition from separate organ systems (4 marks)

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- Muscular – shivering, rhabdo
- Neurological – delirium, seizures, coma
- Cardiac – heart failure, arrhythmias
- Respiratory – NCPO, ARDS
- Renal – AKI, rhabdo
- GIT – Hepatitis, hepatic necrosis
- Metabolic – high K, high Na, low Ca
- Haematological – DIC

QUESTION 11 (14 marks)

You are interested in establishing an in-situ simulation program in your tertiary Emergency Department.

i. List 3 components of your pre-brief (i.e. before participants enter the scenario) that create a “safe learning environment” for participants in in-situ simulation. (3 marks)

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1. Formative rather than summative  
-Identify areas for learning and improvement; not an assessment of individual performance
2. Orientation to the environment, equipment, drugs, manikin, etc
3. Expectations of participants

-Express that the scenario is based on a clinical case, not designed to “trip-up” participants. Participants are expected to perform in their usual role and at their usual level of practice.

4. Confidentiality

-their individual performance will not be discussed outside of the session

ii. Outline 3 key components of your framework for debriefing a simulation scenario (3 marks)

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1. Reactions phase

-important that trainees first discuss reactions generated (emotions/feelings) from being in the scenario. If this is not addressed, they will not be able to engage in reflective learning

2. Identify components performed well and those that were challenging

-Learning needs identified by participants themselves; reflective learning  
 -Learner/participant centred approach

3. Analysis

-understanding of participants framework/models for decisions made  
 -use of advocacy inquiry, delta-plus principles  
 -address technical (Clinical Knowledge) and non-technical (Communication and Human Factors)

4. Summarise/“Take-home points”

-important to wrap-up session with clear statements on specific learning objectives that were identified

iii. Identify 4 potential barriers or risks to running in-situ simulation and a mitigating solution for each barrier (8 marks)

Potential Barrier/Risk	Solution
Simulation equipment/drugs used on “real patients” (ie decommissioned equipment or out-of-date drugs)	<ul style="list-style-type: none"> <li>Clearly labelled simulation equipment</li> <li>Simulation equipment stored or locked away</li> </ul>
Reluctance of participation	<ul style="list-style-type: none"> <li>Trainees are aware when it’s happening (set time/date)</li> <li>Encouraged/supported by consultant</li> </ul>

	group/DEMT
Reluctance to perform session when department busy	<ul style="list-style-type: none"> <li>• Sessions to be conducted at times of lower patient volume/acuity (eg mornings)</li> <li>• Sessions conducted during periods of maximal staffing (cross-over between shifts)</li> <li>• Agreed upon criteria for cancelling session (eg patient waiting numbers, resus patients TBS)</li> </ul>
Disturbance of patients/relatives in nearby clinical areas	<ul style="list-style-type: none"> <li>• Make patients/relatives nearby aware (communicate or signs) that mock training is occurring</li> </ul>
Available space in clinical area	<ul style="list-style-type: none"> <li>• Have a dedicated/protected area within the department for simulation</li> </ul>
Lack of equipment/funding	<ul style="list-style-type: none"> <li>• Perform low fidelity simulations with specific learning outcomes</li> <li>• Keep decommissioned or out-of-date equipment for sim use</li> </ul>

## QUESTION 12 (16 marks)

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

- i. List 6 questions specific to diving that you should ask in your history (6 marks)

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

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

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

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

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

QUESTION 13 (16 marks)

A 42 year old man has developed a febrile illness one week after returning from a business trip to Papua New Guinea.

- i. What questions specific to this case should form part of the history that you will obtain? (6 marks)

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Travel history – where exactly, urban/rural, resort/airconditioning etc, duration, prophylaxis (malaria/other), mosquito protection/bites, other exposures, sexual activities  
History of current illness – symptom onset, cyclical fevers, rash. System review - a/n/v/d, blood in stool, abdo pain – URTI/LRTI/ENT symptoms etc. Any self-administered Rx  
[ General history – normal health, PHx, meds, allergies ...altogether only constitute one point. Important but excluded by the question “...specific to this case...”]

- ii. Describe how the diagnosis of malaria can be established (3 marks)

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- Films – thin (for speciation), thick (if no parasites seen on thin film). One negative does not exclude Dx – protocols vary but typically repeat 3-4 times over 24h
- Antigen tests – esp for PF



iii. Plasmodium falciparum has several characteristics that are markedly different to the other Plasmodia species. Briefly describe 3 differences (3 marks)

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- PF does not have a hypnozoite phase leading to relapses as occurs with vivax/ovale/malariae
- PF causes high percentage parasitaemia (the other only a low %)
- Many areas have PF with chloroquine resistance – the other species are all chloroquine responsive
- Major complications (e.g. cerebral malaria, ARF etc) and mortality are significant in PF – the other species generally cause less severe disease

iv. List the 4 complications that occur in severe P falciparum infection (4 marks)

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- Cerebral malaria
- Respiratory failure (ARDS-type)
- Acute Tubular Necrosis/ARF
- Hypoglycaemia
- Haemolysis/anaemia
- Splenomegaly/rupture
- Lactic acidosis

QUESTION 14 (16 Marks)

A 62 year-old man is brought to your ED after an assault during a home invasion. He has been stabbed in the anterior right side of neck and was pushed down a steep flight of stairs with possible head and neck injuries due to the fall.

Initial assessment:

GCS            10; combative  
HR             125 per minute  
BP             105/65 mmHg  
Head:         Right parietal large boggy swelling  
Neck:         Wound at right side of anterior neck, extends from medial aspect of clavicle to level of cricoid, extensive haemorrhage

- i. List 5 immediate management priorities? (5 marks)

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-Haemorrhage control with direct pressure, care not to obstruct airway due to compression  
-IV access x2 large bore; resuscitation with O negative PRBC  
-Airway control; high risk/difficult airway; most experienced airway practitioner with use of VL; Consider intubating trachea directly if visible through wound; performed with care as possible to convert to complete transection  
-RSI with neuroprotective strategies  
-MILS given potential c-spine injury  
-Management of combative behaviour to enable overall assessment (and to achieve above safely); ketamine for analgesia and dissociative effects

- ii. List 3 potential harmful effects of hard collar use in this patient (3 marks)

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- Obscuring of neck wound during assessment/management
- Potentially exacerbate airway compromise
- Potentially increase ICP due to impedance of venous return

- iii. List 4 clinical features which would suggest this patient has a critical vascular injury (4 marks)

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- Pulsatile bleeding
- Expanding haematoma
- Palpable thrill
- Bruit on auscultation

- iv. Given his mechanism of injury you are concerned he may have sustained an acute cord injury. List 2 possible acute spinal cord syndromes in this case and identify 2 associated clinical findings (4 marks)

Acute Cord Syndrome	Clinical Finding
Complete Transection	<ul style="list-style-type: none"> <li>• Complete loss of sensation below level</li> <li>• Complete motor loss/ flaccid paralysis below level</li> </ul>
Right Hemisection (Brown-Sequard)	<ul style="list-style-type: none"> <li>• Right sided loss of motor (loss of biceps flexion) and proprioception (ipsilateral)</li> <li>• Left sided loss of pain and temperature (contralateral)</li> </ul>
Anterior Cord Syndrome	<ul style="list-style-type: none"> <li>• Motor function impairment below level</li> <li>• Pain and temperature loss below level</li> <li>• Proprioception and fine touch spared below level</li> </ul>
Central Cord Syndrome	<ul style="list-style-type: none"> <li>• Impairment Motor &gt; Sensory</li> <li>• Upper Limb &gt; Lower Limb</li> <li>• Distal &gt; Proximal</li> </ul>

QUESTION 15 (15 marks)

An elderly lady is brought to your ED by ambulance. She was found by a neighbour in her back yard.

Vital signs: GCS 9 (E3V3M3)  
BP 90/50 mmHg  
HR 45 bpm  
SaO2 90% (8L/min Hudson)  
Temp 27 deg celsius (oral and rectal)

i. List possible complications of her hypothermia on four organ systems (4 marks)

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- Respiratory – respiratory depression, suppressed gag/cough, aspiration
- Cardiac – bradycardia, hypotension, arrhythmia (AF, VF)
- CNS – decreased LOC
- Renal – AKI, rhabdomyolysis
- Haematologic – thrombosis, DIC
- Metabolic – met and resp acidosis
- Pancreatitis

ii. After one hour, the patient remains GCS 9 and temp 29 degrees despite initial treatment. You decide to perform a CT brain. List 3 pros and 3 cons of intubating prior to CT (6 marks)

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- Pros
  - Protects airway vs aspiration
  - Facilitates rapid further assessment and rapid re-warming
  - Correction of resp component of any acidosis
  - Optimises oxygenation if this is compromised
  - Optimal conditions for high quality CT – pt immobile
- Cons
  - High risk of arrhythmia with manipulation of airway
  - Modified drug therapy – slow onset of induction drugs, prolonged effect of induction drugs, risk of hyperkalemia if concurrent rhabdo
  - Resource intense – one on one nursing, ICU resources
  - Possibility that intubation avoidable if temp correction achievable in the short term

iii. The patient develops ventricular fibrillation. List five ways in which your approach to this resuscitation differs from standard ALS principles (5 marks)

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- Expectation of resistance to DC shocks
- Concurrent, aggressive rewarming is critical
- If VF is reverted, regression to VF should be anticipated until rewarmed
- No proven role for any anti arrhythmic drugs
- High suspicion of, and early treatment for, underlying metabolic eg hyperkalemia
- Prolonged resuscitation

QUESTION 16 (16 marks)

A 29 year old male is brought in by ambulance after a collapse at work. He is a machine operator at a nearby 24 hour factory. Colleagues report he collapsed to the ground whilst working. He was unresponsive and jerking all limbs for a brief period. His level of consciousness has improved on transport to ED.

Vital signs      GCS 15  
                         HR 90 bpm  
                         BP 126/84 mmHg  
                         Temp 37.5 deg C  
                         SaO2 100% (6L/min Hudson)

i. List four possible causes for his collapse (4 marks)

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- Cardiac arrhythmia
- Vasovagal syncope
- Seizure disorder ie epilepsy
- Trauma – HI
- CNS infection – meningitis/encephalitis
- CNS bleed – SAH, ICB
- Other intracranial – SOL, thrombo-embolic stroke,
- Metabolic - hi/lo BSL, hi/lo Na, low Ca, renal/hepatic failure
- Drugs/Toxins – ETOH, anticholinergics, sympathomimetics (amphetamine, cocaine, ICE), phenothiazines, organophosphates
- Drug withdrawal – ETOH, benzos, opioids, cocaine, anticonvulsants
- Pseudoseizure
- Electrocutation

ii. List four features on history and examination that may suggest that this is a seizure rather than another cause for collapse (4 marks)

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- Past history of seizures
- Time course – sudden onset/offset, brief – usually less than 2 minutes
- Description of attack – involuntary movement, incontinence, tongue biting (and location of tongue injury), drooling
- Amnesia
- Post ictal period – confusion, lethargy

iii. List four reasons why you would order an urgent CT brain (4 marks)

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- Focal neurological symptoms/signs
- Persistent reduced LOC
- Further unexplained seizure activity in ED
- Bleeding disorder
- Fever or suspected CNS infection
- Past H/O intracranial pathology or malignancy
- Suspected SAH

iv. Describe four considerations in determining that this man is fit for discharge home (4 marks)

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- No indication for admission – ie further seizures, need for urgent treatment of any underlying cause.
- Stable – no further seizures or reduced LOC
- Time of day
- Support at home/NOK
- Follow up / further investigation as appropriate for diagnosis
- Safety advice – driving, working with machinery as appropriate for diagnosis



QUESTION 17 (15 marks)

Pre-hospital bypass of smaller centres directly to designated trauma centres is routine practice in many metropolitan environments

- i. List the criteria used by paramedics to determine which trauma patients should bypass smaller centres ( 6 marks)

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Varies between jurisdictions. Usually based on “MIS(T)” criteria.

Mechanism: Vehicle crash at over 60km/h  Major deformation of the vehicle, entrapment >30 minutes  Fatal injury in the same vehicle, ejection from the vehicle  Fall from over 3 meters  Unrestrained child in a motor vehicle crash  Cyclist or pedestrian hit by vehicle at over 30km/h, driveway run-over injuries  Caustic ingestions - liquid or powder in children  Any mechanism causing injuries to multiple body regions   
CHILDREN: Driveway run-over injuries  CHILDREN: Caustic ingestion – liquid or powder

Injuries: Penetrating injury to head, neck, chest, abdomen, perineum, or back  Head injury with coma, a dilated pupil, open head injury, or severe facial injury  Chest injury with flail segment or subcutaneous emphysema  Abdominal injury with distension and/or rigidity  Spinal injury with weakness and/or sensory loss  Limb injury involving vascular injury with ischaemia of the limb, amputation, crush injury of the limb or trunk, or bilateral fractures of the femur, complex pelvic injury  Burns, partial or full thickness, more than 20% in adults, or more than 10% in children  CHILDREN: Burns, partial or full thickness, more than 10% in children

Signs: Respiratory distress - less than 10 or more than 30 breaths per minute and/or cyanosis  Systolic blood pressure less than 90 or pulse greater than 130  Difficulty in arousal, or falling level of consciousness, GCS<13

- ii. Describe the main difficulty arising from the inclusion of mechanism of injury as part of a triage tool (2 marks)

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High degree of sensitivity but poor specificity for predicting severe trauma. Results in significant over-triage

- iii. List 2 advantages and 2 disadvantages of trauma bypass (4 marks)

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Advantages: shown to reduce mortality, concentrate resources, provides sufficient number of cases to justify having full services, sufficient cases for staff exposure/training, staff satisfaction/retention

Disadvantages: over-triage places unnecessary load on MTS, de-skilling of non-MTS staff – they are then not as practised when self-presenting trauma arrives, staff dissatisfaction, longer transit times – deterioration en route, removal of patient further from normal domicile/family supports

- iv. A long distance to reach a major trauma service requires paramedics to manage patients en route. In what circumstances does the evidence support “permissive hypotension” in the pre-hospital setting? (3 marks)

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Most of the evidence comes from animal studies & the Bickell study (1994) – and that evidence which exists supports permissive hypotension mostly in the context of (a) penetrating injury and (b) short transit times to definitive care. Patients with head injury excluded from this & other trials. No good data to support this in blunt trauma.

QUESTION 18 (16 marks)

A 17 year old male is brought your district ED by his nurse mother after feeling dizzy and unwell and appearing 'pale' on the football field. He was reluctant to attend as he felt 'fine'. Presenting blood pressure 115/60. Saturations 99% on room air. RR 14. Afebrile. Triage ECG performed.

- i. Describe and interpret his ECG (5 marks) **SEE PROPS BOOKLET – IMAGE G**

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1 mark for -

- SR approx 50 bpm
- Leftward axis 1 positive 2 equiphase 3 negative
- PR interval – ok if described short (borderline – 30% assoc. with WPW)

3 marks for–

- Q waves – dagger Q's V1-5 (with narrow complex QRS)
- LVH by voltage
- Diffuse ST/T changes with T wave inversion chest leads V2-5

Interpretation – 1 mark

- Highly suspicious for HCM (or HOCM)

- ii. List up to 5 questions you would like to ask on history, regarding symptoms (5 marks)

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- Exertional – presyncope or syncope
- Lung symptoms – dyspnoea rest and exertional, PND, orthopnea. Etc
- Palpitations - atrial and vent. Dysrhythmia
- Chest pain - anginal
- Family hx - cardiac sudden death/known HCM
- (?prior Ix/Echo)

iii. List and justify up to 3 initial investigations you would like to perform (3 marks)

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- Bedside serial ECG for dynamic changes
- Bloods troponin - ischaemia (+/\_ serial)
- CXR cardiomegaly, pulmonary congestion
- Cardiac Echo ?hypertrophy ?dynamic outflow obstruction, wall motion abnormality etc
- Can have one of fbc.tft.bsl (something sensible) – alternative dx for symptoms

iv. Prior to any further investigation, he tells you he wants to discharge against your advice. List your management priorities now (3 marks)

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- Counsel patient as to ddx and possible severity/ramification e.g. sudden death
- Mother/responsible guardian involvement as technically minor under 18 (but could give valid consent to treatment being over 16)
- ?capacity assessment - retain, understand etc.
- (Other colleague involvement early e.g. expedite cardio r/v/Echo if able)
- Documentation
- Something sensible!