

FEx Net 2022 Collated SAQs: Environmental Answers

1. Altitude
2. Cold
3. Collapse
4. Diving
5. Diving
6. Diving
7. Drowning
8. Drowning
9. Electrocution
10. Heat
11. Heat
12. Heat
13. Jellyfish
14. Lightning
15. Octopus
16. Snake
17. Snake
18. Snake

Question 1 (15 marks)

You have agreed to be the expedition doctor for a trek to the Everest base camp. (altitude 5300m)

i. Outline the proposed pathophysiology of:

Acute Mountain Sickness (AMS)/High Altitude Cerebral Oedema (2 marks)

- Vasogenic cerebral oedema. Hypoxia appears to cause cerebral vasodilatation, leading to increased cerebral blood volume and blood flow.
- Leaky BBB – due to loss of autoregulation and increased permeability.

High Altitude Pulmonary Oedema (2 marks)

- Non cardiogenic, hydrostatic oedema.
- Widespread but uneven pulmonary vasoconstriction. Heterogeneity of the response causes diversion of flow to the less constricted areas with subsequent capillary leakage.

ii. List 2 risk factors for the development of High Altitude Pulmonary Oedema at any given altitude (2 marks)

- Rapid ascent
- Genetic predisposition
- Any pre-existing pulmonary hypertension (e.g. previous VTE/PE, cardiac shunts – e.g. ASD)
- Exertion
- Cold
- Use of sleeping medication
- Excessive salt ingestion

iii. List 5 clinical features of AMS (5 marks)

- Headache – worse with bending over or valsalva
- Anorexia, nausea, sometimes vomiting
- Lassitude, weakness, irritability
- Retinal haemorrhages
- Fluid retention - peripheral/facial oedema

iv. For severe High Altitude Pulmonary Oedema, list 4 treatment options (4 marks)

- Immediate descent
- Oxygen
- Minimise exertion
- Nifedipine
- Portable hyperbaric compression chamber
- CPAP/EPAP mask

Question 2

(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)

- 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)

- 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)

- 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 3

Passmark = 10/14

Questions:

**1. List 5 possible differential diagnoses for this man's presentation
(5 marks)**

Trauma – eg Head injury, C Spine injury with cord involvement, Tension pneumothorax
Marine envenomation – box jellyfish, Irukandji, sea snake
Toxicology- drug intoxication or withdrawal
Drowning
Medical problem – asthma, SAH, seizure
Anaphylaxis
Barotrauma with arterial gas embolism (if patient was scuba diving)

2. What is the likely diagnosis & state why? (2 marks)

Box jellyfish (*Chironex fleckeri*) stings with systemic envenomation
Local exposure characterised by classic pattern of linear welts.
Sudden collapse at scene suggests systemic envenomation.

3. What is your initial management of this condition? (4 marks)

Apply vinegar liberally to visible sting sites and remove tentacles
Ice also acceptable as a first aid measure
Titrated analgesia for pain including IV opiates (Drug, dose, route) and Mg sulphate 10mmol
Cardiac monitoring & ECG to assess for arrhythmias
Antivenom (1-3 ampoules in 100mL N/Saline over 20 mins) indicated due to signs of systemic envenomation

4. List 3 indications for antivenom in this condition? (3 marks)

1. Cardiorespiratory arrest
2. Cardiovascular instability
 1. Collapse
 2. Hypotension
 3. Dysrhythmia
3. Local Pain refractory to Opiate Analgesia
4. Respiratory Depression
 - Hypoventilation
 - Difficulty with breathing, swallowing or speaking

Question 4 (19 marks)

A 30 year old male is brought by ambulance to your Urban District ED from a local beach following a SCUBA dive. His dive buddy reports that the patient appeared to be behaving abnormally and possibly had brief seizure-type movements during their dive at a depth of 35 metres.

i. List 3 diving-related causes of confusion or behaviour change at depth (3 marks)

- Hypoxia – example from aspiration, breath-holding, gas supply failure
- Nitrogen narcosis
- Contaminated gas mix – example tanks filled near petrol-powered compressor with entrainment of CO
- Oxygen toxicity – if diving on high concentration O₂

Because of the problem at 35 metres, the buddy forced a rapid ascent and omitted a decompression stop at 10 metres. On the dive boat, the patient began to vomit and was very unsteady on his feet.

ii. List 3 differential diagnoses for this presentation and outline historical or examination features that would support each differential (9 marks)

Differential Diagnosis	Supporting Findings
Decompression Illness ("The Bends")	Delayed onset after exiting water, subtle neuro findings (esp retention), associated symptoms (joint pains, rash)
Arterial Gas Embolism	Onset immediately on surfacing, stroke-type neuro findings, other arterial embolic/occlusive findings, associated PTx/pneumomediastinum or subcut gas
Vestibular dysfunction (e.g. perilymph fistula, cochlear catastrophe)	Exam c/w "peripheral" vertigo, positional, rotational sensation, nystagmus

- iii. Complete the following table of changes in bubble size with change (altitude or depth) from sea level (4 marks)

Altitude	10,000 feet	14 mL
	2,000 feet	11 mL
	Sea Level	10 mL
Depth	10 metres	5 mL
	20 metres	3.3 mL

- iv. List 3 relative contraindications to helicopter retrieval in this patient (3 marks)

- DCI/AGE – diving-related “bubble problems” because of Boyle’s Law
- Intra-cranial/intra-spinal air
- Other air if not decompressed (e.g. pneumothorax, bowel obstruction)
- Cardiac arrest requiring compressions (LUCAS et al may change this??)
- Aggressive, combative patient (risk to aircraft & crew unless adequately sedated/restrained)

Question 5 (12 marks)

A 39 year old SCUBA diver presents to your Emergency Department with a rash to his torso after ascending from a dive on the Great Barrier Reef two hours ago.

See image in Props book.

a) State the two (2) most likely differential causes for the rash. **(2 marks)**

- **Cutaneous Decompression illness** (cutis marmorata)
- Dermatitis/Allergic reaction (eg to wet suit)
- 2/2 to pass

b) List six (6) risk factors for a SCUBA diver developing decompression illness. **(6 marks)**

- Increased dive duration
- Multiple dives
- Dehydration
- Strenuous exercise after diving (within 4 hours)
- Cold
- Alternative answers: ascent to altitude soon after diving, smoking, alcohol, obesity,
- 4/6 to pass

The patient develops weakness in his legs and urinary retention. There are concerns that he has Spinal Decompression Illness and the decision is made to retrieve him to the nearest hyperbaric chamber, 300km away.

c) State two (2) advantages and two (2) disadvantages for using an Aeromedical Helicopter to retrieve this patient. **(4 marks)**

- 2/4 to pass
- Advantages:
 - **Speed: fastest way to transfer patient between hospitals**
 - Quick to mobilise,

- can transfer directly between hospitals (if both have heliports),
- less turbulence than fixed wing
- Disadvantages:
 - **Requires ascent to altitude and helicopter cannot be pressurised**
 - Vibration (may worsen DCI),
 - exposure to cold (may worsen DCI),
 - small cabin space (compared to ambulance and fixed wing),
 - may not be able to fly at night and in certain weather conditions.

References: Emergency Medicine Manual by Dunn. Chapters on Problems of Ascent and Inter-Hospital Transfer

Question 6

Answers:

1. List 8 key features in the history that you would need to assess this patient's risk of decompression illness. (8 marks) 6/8

Number of dives & ascents

Depth of dive

Time spent at bottom

Decompression or safety stops performed

Which gases used in SCUBA apparatus

Timing of collapse in relation to resurfacing (AGE vs DCI)

Past medical history (esp cardiac, seizures)

Medications

Pattern of symptoms (barotrauma vs AGE vs Decompression illness)

2. List 5 body systems that may be affected by decompression illness and give one example for each. (10 marks) 7/10

Neurological (confusion, memory loss, headache, visual disturbance, ALOC)

Cardiac/Respiratory (chest pain, APO, hypoxia)

Musculoskeletal (myalgia, arthralgias)

Vestibular (vertigo, tinnitus, hearing loss, ataxia)

Skin (rash)

3. Outline 4 key considerations in transporting this patient by helicopter. (4 Marks) 2/4

Maintain horizontal position if concern re AGE

Needs high flow O2

Patient needs to be flown at sea level altitude.

Delay to recompression leads to poorer outcomes, hence need for urgent transport.

Transport to nearest centre with decompression chamber.

Passmark: 15/22 Adjust to ../10 please

Question 7

You are the in charge consultant at an urban district hospital. You receive a batcall about a 2 year old who has been dragged unconscious from a backyard pool. It is the middle of winter.

His vital signs en route are:

HR	70	GCS	Unresponsive
BP	70/40	Temp	30 degrees
O2 sats 90% (bag valve mask FiO2 1.0)			

List 4 predictors of poor outcome in drowning (4 marks)

- i) Long immersion time > 10 mins
- ii) Delay to CPR
- iii) Time to first breath
- iv) Coma on arrival in ED
- v) Presence of cardiac arrest at scene
- vi) Water temperature – cold is more neuroprotective
- vii) Severe metabolic acidosis

You intubate this child on arrival. This is his initial CXR. List 2 relevant features at this stage of the patient's management (2 marks).

- i) Bilateral coalescing pulmonary infiltrates – concern for ARDS (must mention)
- ii) ETT appropriately placed
- iii) NGT below diaphragm - aspiration risk and affect on ventilation if GIT no decompressed

What ventilation strategies would you use (2 marks)

Low volume ventilation

ARDS ventilation

What are your other initial management priorities (3 marks)

i) Protective lung ventilation strategies and maintenance of oxygenation

Justification: ARDS/ALI, VQ mismatch predicted given CXR, prevention of secondary brain injury from hypercarbia/hypoxia

ii) Cardiovascular support and fluid resuscitation

Justification: hypovolaemia (from cold diuresis +/- hydrostatic pressure of water on the body following prolonged immersion) and arrhythmias predicted. Prevention of secondary brain injury from hypotension.

iii) Rewarming to 34 degrees and prevention of shivering

Justification: To prevent organ/systemic complications of hypothermia - CNS/resp/metabolic/GI/haematological (coagulopathy).

iv) Disposition planning and contacting retrieval services

Justification: Patient requires paediatric ICU management at a tertiary centre, may require haemodialysis/ECMO

Question 8 (18 marks)

You are on duty in a small urban district hospital. You attend to an 8 year-old boy who was rescued from the bottom of a saltwater backyard pool, unconscious. He was resuscitated by pre-hospital personnel and presents with the following vital signs:

HR 72 bpm, regular

BP 90/60 mmHg

RR 24 bpm

SaO₂ 100 % on high flow oxygen

- i. Outline 5 key features in your examination of this child (5 marks)

-
-
-
-
-
- Temperature
 - Signs of lung injury/aspiration from immersion
 - Signs of perfusion/haemodynamics
 - Neurological deficit
 - Evidence of C spine injury

- ii. List 5 factors which determine this child's prognosis (5 marks)

-
-
-
-
-
- Immersion time
 - Water temperature
 - Presence of CPR and effectiveness
 - Response to resus/ROSC prehospital
 - Neurological state/GCS prehospital
 - Comorbidities
 - Intercurrent traumatic injuries

- iii. The child's GCS improves to 14. Despite high flow "non-rebreather" mask oxygen, he shows signs of respiratory distress from aspiration pneumonitis. Complete the table outlining 3 escalating modalities that could be used to improve his oxygenation. Describe initial settings and sizes as appropriate (6 marks)

Treatment/modality	Settings
High Flow humidified nasal prong O ₂	FiO ₂ variable using blender – start 0.21 & titrate up. Increasing CPAP type effect with increasing flow rate. 8 year old estimate 30kg – usual "formula" is 2L/kg/min flow but max is 60L/min. Start at 6L/min & titrate up
NIV	mask CPAP or BiPAP high FiO ₂ (>0.6 or more??), 10/5 or similar
Invasive	6mm cuffed ETT, 5-7ml/kg TV

- Bag-mask oxygen with PEEP valve

- iv. List 4 potential disadvantages of the use of non-invasive mask ventilation (CPAP or BiPAP) for this child in the aero-medical retrieval context (4 marks)

- huge O₂ supply required (may not be feasible)
- limited evidence for effectiveness in non-cardiogenic pulm oedema or aspiration syndromes
- may delay "proper" treatment
- mask potentially claustrophobic/uncomfortable in an already scary aero-med environment
- air insufflation → increase risk of emesis

Question 9 (15 marks)

A 27 year old man climbed over an electricity sub-station fence and sustained an electrical injury while grabbing a metal pole with his right hand. He arrives 30 minutes later complaining of tingling in his right arm and a numb left foot.

A CLINICAL PHOTOGRAPH IS SHOWN IN THE PROPS BOOKLET, PAGE 8

- i. Describe the wound seen on the foot (1 mark)

- Deep, full thickness burn to plantar aspect forefoot
- Depressed central area with surrounding eschar
- Sensible answer

- ii. Complete the table outlining factors that determine the severity of an electrical injury (8 marks)

Category	Explanation
Voltage	High voltage defined as > 1000V (some say 600V)
Current	0.5-2mAmp –tingling 1-4mAmp – pain threshold 6-22mAmp – tetanic contraction, unable to let go 18-30mAmp – respiratory arrest > 70mAmp – VF > 2000mAmp – asystole
Resistance	Wet skin much better conductor than dry → increase likelihood of injury resistance increases – nerves/vessels -> muscles -> bone

Type of current	Low voltage AC more likely to → VF High voltage AC, and DC -more likely to cause muscle contractions that throw person away from source -more likely to cause asystole

- iii. For each of the three categories below, what specific injuries or problems may occur in the patient described in the stem? For each, describe the pathophysiological process (6 marks)

	Injury	Pathophysiology
Cardiac	Variety of dysrhythmias	High voltage injury likely (substation) Evidence of trans thoracic current
Nervous system	Peripheral nerve injury/parasthesia/paralysis	Current down arm and leg
Limb soft tissue	Cutaneous burns Vascular injury	Current from hand-foot Vasospasm/thrombosis/ischaemia Heating of tissue

Question 10 (24 marks)

There has been a 3-day heat wave involving the south-eastern region (parts of NSW, Victoria and South Australia) with daytime temperatures 38-40 degrees Celsius and overnight minimum temperatures of 28-30 degrees Celsius.

- i. List 4 groups who are particularly at risk of developing non-exertional heat-related illness and include your reasoning (8 marks)

At-risk group	Explanation
The elderly	Co-morbid disease – esp CV, renal. More likely on scary meds – esp diuretics, things that stop you vasodilating etc
The very young	SA:mass ratio; unable to get themselves out of heat – rely on others – e.g. baby in car
The poor/lonely	No air-conditioning/insulation, no transport to be able to get to cooler places
The crazy	May not modify behaviours to stay cool, lots of meds with impacts on cooling
The obese	
Chronic illness of any sort	

ii. What is the classic definition of heatstroke? (1 mark)

- Core temp > 40 C, CNS dysfunction & anhydrosis (the latter is often not present & is not an absolute diagnostic criterion)

iii. Provide 3 differential diagnoses of heatstroke in each of the 2 listed categories (6 marks)

Drug intoxication:

- anticholinergics, sympathomimetics (cocaine, amphetamines etc), salicylate/aspirin toxicity, serotonin syn, NMS

Infections:

- meningitis, encephalitis, brain abscess, systemic sepsis, malaria (cerebral)

iv. Complete the table listing 3 cooling methods and 2 advantages and 2 disadvantages of each (9 marks)

Cooling method	Advantages	Disadvantages
Evaporative	Simple, readily available, noninvasive, can access patient, relatively effective	Shivering, ideally need some equipment (fans, spray bottles), monitoring equipment can get wet
Immersion	Noninvasive, effective	Logistically difficult to perform, cumbersome, can't easily access patient, can't carry out monitoring, shivering
Ice packs/cooling blankets	Noninvasive, relatively effective, easy to perform, can be combined with other techniques	Shivering, discomfort – poorly tolerated, need ice
Lavage – gastric/peritoneal etc	Effective Rapid	Invasive Airway risk
Bypass	Rapid	Invasive

Candidate number _____

Question 11 (21 marks) – DOUBLE QUESTION

A 20 year old male is brought to your ED with confusion and hyperthermia following a marathon. You think he has exertion related heat stroke.

- i. What are the management priorities in this situation (5 marks)

- Remove him from the race/exertion
- Cooling – shade, spray/fan, remove clothing, ice packs/baths
- Cautious hydration – PO if able IVF if not
- Check metabolic function – BSL + Na
- Seek & treat complications – e.g. rhabdo, seizure, ...
- Consider intubation if not improving (avoid sux)
- Consider possibility of other competitors having problems

- ii. What investigations would you perform and why (4 marks)

- EUC – Low Na, High K, Impaired renal function
- CK – High risk muscle damage and rhabdo
- Coags/LFTs – Risk of DIC
- BSL – Metabolic derangement
- UA – Myoglobinuria
- ECG – Cardiac arrhythmias
- Ongoing core rectal temp

Candidate number _____

Heat illness affects some groups more than others and non-exertional heat stroke is more common during heat waves.

iii. Define heat wave (2 marks)

- BOM definition - three days or more of high maximum and minimum temperatures that is unusual for that location
- Acceptable definition should include concept of prolonged period of high temperature unusual for that location and/or that results in adverse health effects

iv. List 4 risk factors for classic non-exertional heat stroke (4 marks)

- Environmental – Prolonged extreme high temperatures/humidity
- Situational – Lack of acclimatization, poor Na and H₂O intake
- Patient related – Extremes of age, poor health, malnourished, alcohol, mental health
- Meds – Psychotropics, serotonergics, anticholinergics, sympathomimetics
- Medical – Sepsis, dehydration, chronic neurological conditions

v. List three drugs/medications from different classes that increase the risk of heat stroke and explain the pharmacological reason(s) for the effect for each (6 marks)

Medication	Explanation

- Interference with sweating, caused by:
 - Anticholinergics, e.g. tricyclics antidepressants and benztropine
 - Beta-blockers

Candidate number _____

- Antihistamines
 - Phenothiazines
 - Vasoconstrictors
- Interference with thermoregulation, caused by:
 - Antipsychotics or Neuroleptics (e.g. risperidone, clozapine, olanzapine)
 - Serotonergic agonists
 - Stimulants (Amphetamine, cocaine)
 - Thyroxin
- Decreased thirst, caused by:
 - Butyrophenone e.g. haloperidol and droperidol,
 - Angiotensin-converting enzyme (ACE) inhibitors
- Dehydration or electrolyte imbalance, caused by:
 - Diuretics (especially loop diuretics)
 - Any drug causing diarrhoea or vomiting (colchicines, antibiotics, codeine)
 - Alcohol
- Reduced renal function, caused by:
 - NSAIDS
 - Sulphonamides
 - Indinavir
 - Cyclosporin
- Aggravation of heat illness by worsening hypotension, caused by:
 - Vasodilators e.g. nitrates (GTN) and calcium channel blockers
 - Anti-hypertensives
- Levels of drug affected by dehydration (possible toxicity for drugs with a narrow therapeutic index), caused by:
 - Digoxin
 - Lithium
 - Warfarin
 - Antiepileptics
 - Biguanides (e.g. Metformin)
 - Statins
- Altered state of alertness, caused by:
 - Any drugs which alter the state of alertness (e.g. alcohol, benzodiazepine, narcotics and many more)

Question 12

Questions:

1. List 5 possible differential diagnoses.

(5 marks) 3/5

Heat stroke - environmental

Sepsis

Drug ingestion – anticholinergic, sympathomimetic

Meningitis

UTI

Pneumonia

Thyroid storm

Phaeochromocytoma

Seizure

Metabolic causes

2. List and justify 6 investigations you would perform in ED in this patient.

(6 marks) -4/6

Evidence of multi-organ failure due to heat stroke

ABG – metabolic acidosis and respiratory alkalosis

Electrolytes – hypokalaemia, hypocalcaemia, hypophosphataemia or hyperkalaemia – rhabdomyolysis

Renal function – renal impairment in dehydration

CK – increased in rhabdomyolysis

Coags – abnormal in DIC

Urinary myoglobin – present in rhabdomyolysis

BSL – ensure normoglycaemia

Septic screen – BC, urine, CXR +/- LP

Urine drug screen – exclude ingestion as cause for hyperthermia

ECG – may be arrhythmias if electrolyte abnormalities

Metabolic screen – urine VMA, TFTs

3. Outline your approach to cooling this patient in the ED. (8 marks) 5/8

Close monitoring of skin and core temperature (rectal temp, IDC catheter)

Remove clothing

Active cooling to < 40 degrees (give 2 options minimum)

Tepid water spray with fan cooling

Ice water packs in axilla and groin

Cooling blankets

Cold IV fluids.

May require RSI for sedation and paralysis if unsuccessful or unable to tolerate cooling.

N.B No role for anti-pyretics in heat stroke.

Passmark: 12 /19 (adjust to /10)

(6.5/10)

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Question 13 (11 marks)

You are working in a rural hospital in North Queensland and the ambulance bring in a 19 year old man with a suspected jellyfish envenomation.

What 2 jellyfish have life-threatening envenomation? (2 marks)

1: Box Jellyfish / Chironex

2: Irukandji

Compare and contrast them in terms of their clinical features (4 marks)

	1: Box Jellyfish	2: Irukandji
Timing of pain	Immediate	Delayed 15-30min or so
Location of pain	At site of sting	Generalised / trunk
Skin changes	Characteristic laddering lesion	None
Cardiac arrest?	Early	None

He has been stung by this jellyfish



What is the name of this jellyfish? (1 mark)

Irukandji

Candidate Name: _____

Discuss the components of management relevant to this envenomation (4 marks)

Prehospital:

- Apply vinegar / no PBI

Hospital:

- Analgesia – fentanyl aliquots titrated to pain
 - If refractory: MgSO₄ controversial / PCA / ketamine
- Control hypertension if refractory to opioid (GTN infusion), aim systolic BP <160
- Admit to HDU setting / seek and treat complications such as MI/APO

Candidate Name: _____

Question 14 :

A 55-year old man is brought to ED by ambulance after being found collapsed on a golf course. He received bystander CPR for 5-10 minutes at the scene. On arrival to ED, he is haemodynamically stable, spontaneously ventilating and alert but slightly confused.

Vital signs:

HR	120	/min
BP	190/100	mmHg
GCS	14	E4, V4, M6
RR	26	/min

A photograph of the patient is below.

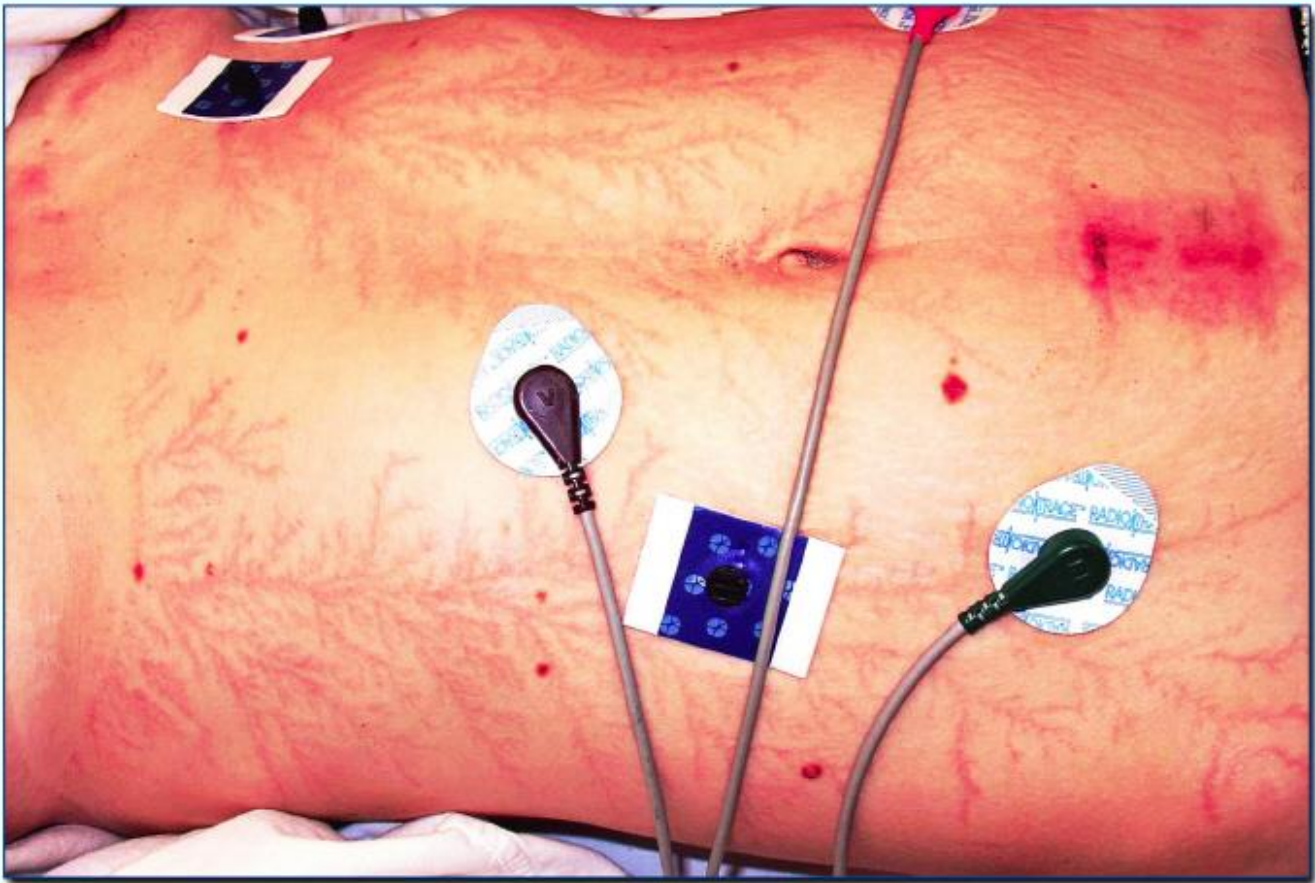


Image reproduced from Dunn's Emergency Medicine Manual, 6th edition

i. What is the most likely diagnosis? List two (2) features from the photograph that support this diagnosis (2 marks)

Diagnosis

- Lightning strike

Clinical features

- Lichtenberg figures (ferning / feathering)
- Burns from belt buckle

ii. List four (4) immediate complications that you would assess for (4 marks)

- Keraunoparalysis – transient limb paralysis or sensory changes with vascular spasm (reversible distal limb ischaemia).
- Muscle injury - compartment syndrome, rhabdomyolysis.
- Neurological injury – seizures, LOC, hemiplegia, peripheral nerve injury.
- Eye injury – e.g. corneal burns, retinal detachment, optic nerve injury, delayed cataracts.
- Ears – ruptured tympanic membranes (in 50%), sensorineural deafness.
- Burns
- Blast injury, secondary trauma
- Hypoxic brain injury post CPR

iii. List one (1) important delayed complication requiring specialty follow-up (1 mark)

- Eye complications – particularly cataracts.
- Burns
- Neurological syndromes – e.g. paralysis, neuropathies.

iv. List and justify three (3) investigations for this patient. (3 marks)

- CT brain - ? CNS injury
- ECG - ? arrhythmia
- CK - ? rhabdomyolysis
- UEC - ? potassium
- Urine dip - ? myoglobinuria
- Others – troponin (?AMI), nerve conduction studies, audiometry

Question 15 (11 marks)

A 10 year old boy collapses on the beach in Queensland after playing in a small rock pool. He had been handling a small sea creature. He is brought to your rural ED by paramedics who identified the creature as a blue ring octopus.

- i. Identify the type of toxin and its mechanism of action (2 marks)
 - Tetrodotoxin – Na channel blockade – causing neurotoxicity (similar to puffer fish toxin but more rapid onset)
- ii. Describe the clinical features you would expect this child to exhibit in early and late stages of the toxidrome (4 marks)
 - Rapidly progressing descending flaccid paralysis within minutes

Stage of toxidrome	Clinical signs
Early signs – list 2	Peri-oral paraesthesia Ptosis, blurred vision, diplopia, dysphagia
Late signs – list 2	Progressive descending flaccid paralysis Respiratory failure and respiratory arrest

- iii. Identify the definitive management step for the toxidrome from the blue ring octopus (1 mark)
 - Intubation and mechanical ventilation – paralysis usually resolves with 24hrs
 - NO ANTIVENOM available
- iv. List 2 other marine creatures which may cause collapse on an Australian beach and identify the mechanism of the collapse (4 marks)

Marine Creature	Mechanism of collapse
BOX JELLYFISH	Collapse and sudden death within minutes of the sting, from dysrhythmias and probable direct cardiac toxicity
SEA SNAKE	Venom has combination of post synaptic neurotoxins and myotoxins. Collapse is from symmetrical descending flaccid paralysis ie POST SYNAPTIC NEUROTOXIN

Question 16

1.

Bite site assessment (1)

Lymphadenopathy (1)

Evidence of bleeding / coagulopathy eg bleeding gums (1)

Evidence of neurotoxicity – peripheral weakness, cranial nerves (max 2 marks for this stuff)

Respiratory assessment – eg PEFR (a mark on its own)

2.

Coag

CK

(no other answers)

3.

12 hours observation (essential to pass)

Normal examination for neurotoxicity

Normal 12 hour coags

Normal 12 hour CK

Parental considerations addressed including access back to hospital if needed (max 2 marks for reasonable responses in this domain)

Question 17 Answers

List 5 steps you would perform as part of your immediate management. (5 marks)

Immediate transfer to resus bay / high-visibility cubicle

Pressure immobilization bandage.

IV access

Draw blood for tests

Swab for VDK

My thoughts.....

? Half points only for –

Urgent Toxinologist / Poisons consultation.

-2 points if PIB not applied.

Use of prophylactic antibiotics is still questionable.

Based on the clinical information provided, what snake is most likely responsible for the envenomation in this case.

Taipan

Complete the table: (5 marks)

Clinical effects of Australian snakes based on definite cases of systemic envenoming.

Snake	Coagulopathy	Neurotoxicity	Systemic Symptoms	Myotoxicity	Thrombotic Microangiopathy	Cardiovascular effects
Brown	VICC	Rare and Mild	<50%	--	10%	Collapse (33%) Cardiac arrest (5%)
Tiger	VICC	Uncommon	Common	Uncommon	5%	Rare
Black	Anticoagulant	--	Common	--	--	
Death Adder	--	Common	Common	--	--	--
Taipan	VICC	Common	Common	Rare	5%	Uncommon
Sea Snake	--	Uncommon	Common	Common	--	--

Question 18

Clinical Syndrome	Causative Snake
Coagulopathy – VICC (Venom induced consumption coagulopathy)	Brown, Tiger, Taipan
Coagulopathy - Anticoagulant	Mulga/Black
Neurotoxicity	Death Adder, Taipan, Tiger, (Brown-rare/mild)
Myotoxicity	Mulga, Tiger, Black (Taipan)
Systemic Symptoms (nausea, vomiting, headache, abdominal pain, diarrhoea, diaphoresis)	Tiger, Black, Death Adder, Taipan, Brown
Thrombotic microangiopathy	Brown, Tiger, Taipan
Cardiovascular Effects	Brown

NB – only 5 marks allocated (half mark for each box) as candidates could just state the 5 effects of either Brown or Tiger snake using these as their example of causative snake for every syndrome.

Reference:

Table 30.1.1 Clinical syndromes associated with the major venomous Australian snakes and the recommended antivenom, Cameron's Textbook of A&E Emergency Medicine 4th Ed.

b.

- Indication for antivenom unchanged
- Dosage of antivenom unchanged
- The volume of toxin to be neutralised is unchanged (as per dosage of antivenom for children) and best care of mother is the best care of the baby

c.

- Staff able and willing to manage snakebite management including definitive treatment of severe envenoming and treatment of potential complications
- Lab facilities able to do Ix 24/7
- Antivenom stocks adequate for definitive treatment in the right timeframe

Pass marks a 6/8 b 2/2 c 2/3 total 10/13