

FExNet 2026

Collated SAQs: Trauma — Head, Face & Neck

ANSWER BOOKLET

Model answers for the 22 HFN trauma SAQs. References cited at the foot of each question. Items marked [core] are required for full marks. Drug doses confirmed with current ATLS / Brain Trauma Foundation / EAST / NSW ITIM guidelines.

22 questions • 244 marks

ACEM-aligned format. Sub-questions labelled a) b) c). Mark allocations indicative; references cited in the Answer Booklet. Question and answer indexes are clickable.

Answer Index

Click any entry to jump to its answer. Marks shown right.

Q1. Adult Head Injury — Canadian CT Head Rule	12	Q12. Dental Trauma — Tooth Avulsion	10
Q2. Severe TBI — Neuroprotective Management	14	Q13. Facial Burn — Airway and Management	11
Q3. Anticoagulant-Related ICH	12	Q14. C-Spine Clearance — NEXUS / CCR	12
Q4. Extradural Haematoma	11	Q15. C-Spine Fracture Patterns	10
Q5. Traumatic SAH and Diffuse Axonal Injury	10	Q16. Spinal Cord Injury Syndromes	12
Q6. Paediatric Head Injury — PECARN	11	Q17. Neurogenic Shock vs Spinal Shock	10
Q7. Geriatric Head Injury	11	Q18. Penetrating Neck Trauma	12
Q8. Impending Herniation — Hyperosmolar Therapy	10	Q19. Blunt Cerebrovascular Injury (BCVI)	10
Q9. Maxillofacial Trauma — Le Fort Fractures	11	Q20. Laryngeal Trauma	12
Q10. Orbital Trauma — Compartment Syndrome and Globe Rupture	11	Q21. Mild TBI / Concussion	10
Q11. Mandible Fracture	10	Q22. Blast Injury	12

Question 1 | Adult Head Injury — Canadian CT Head Rule (12 marks)

A 25-year-old man presents 1 hour after assault with a cricket bat to the head. Witnessed LOC for 5 minutes at scene. Now GCS 14 (E4V4M6). No focal neurology. Vomited twice.

a) List the 5 HIGH-risk criteria of the Canadian CT Head Rule. (5 marks)

- GCS <15 at 2 hours post-injury [core]
- Suspected open or depressed skull fracture [core]
- Any sign of basal skull fracture (haemotympanum, raccoon eyes, Battle sign, CSF oto/rhinorrhoea) [core]
- Vomiting ≥2 episodes [core]
- Age ≥65 years [core]

b) List the 2 MEDIUM-risk criteria. (2 marks)

- Amnesia before impact >30 minutes [core]
- Dangerous mechanism (pedestrian struck by motor vehicle, ejection from vehicle, fall >3 ft / 5 stairs) [core]

c) List 5 patient-specific factors that should mandate CT regardless of CCHR. (5 marks)

- Anticoagulation — warfarin, DOAC, heparin [core]
- Antiplatelet therapy (clopidogrel, prasugrel, ticagrelor); aspirin alone — lower threshold [core]
- Coagulopathy — chronic liver disease, haemophilia, thrombocytopaenia <100 [core]
- Persistent altered mental state / GCS not returning to 15 [core]
- Focal neurological deficit / new seizure [core]
- Penetrating injury / impalement
- Suspected non-accidental injury
- Significant scalp injury or ground-level fall in elderly
- CSF leak / pneumocephalus on imaging

References: Canadian CT Head Rule (Stiell 2001) • ACEM clinical policies and statements • Brain Trauma Foundation Guidelines (4th edition, 2016) • Tintinalli's Emergency Medicine 9e Ch 254

Question 2 | Severe TBI — Neuroprotective Management (14 marks)

A 25-year-old man is brought in after assault with a baseball bat. GCS 5 (E1V1M3), HR 55, BP 160/65, RR 8, T 36°C. CT head shows acute SDH with 8 mm midline shift. Awaiting neurosurgical theatre.

a) List 4 components of an RSI plan to MINIMISE secondary brain injury (drug, dose, rationale). (4 marks)

- **Pre-oxygenation 100% O₂ for 3 min** + apnoeic oxygenation via nasal cannula 15 L/min (prevent desat-induced secondary injury) **[core]**
- **Fentanyl 1-3 µg/kg IV** 3 min before — blunts sympathetic / ICP response to laryngoscopy **[core]**
- **Ketamine 1-2 mg/kg IV** (preferred over thiopentone — maintains MAP) OR **etomidate 0.3 mg/kg IV** if available **[core]**
- **Rocuronium 1.2 mg/kg IV** (or suxamethonium 1.5 mg/kg if no contraindication — fasciculation may transiently raise ICP) **[core]**
- Avoid hypotension — pre-load with 250-500 mL crystalloid; have noradrenaline drawn up
- Lignocaine 1.5 mg/kg IV — historically used; benefit unclear
- Trained operator, video laryngoscopy, position 30° head-up; in-line cervical immobilisation

b) List 6 measures to minimise secondary brain injury after intubation. (6 marks)

- **Maintain SBP >110 mmHg / MAP >80 mmHg** (avoid hypotension — single episode <90 doubles mortality); use vasopressors as needed **[core]**
- **SpO₂ >94%, PaO₂ >60 mmHg** — avoid hypoxia (single hypoxic event significantly worsens outcome) **[core]**
- **Normocapnia — PaCO₂ 35-40 mmHg**; avoid routine hyperventilation (vasoconstriction → ischaemia); transient hyperventilation only for impending herniation **[core]**
- **Head-up 30°, neutral position**; avoid tight ETT ties; ensure venous drainage **[core]**
- **Sedation and analgesia** — propofol + fentanyl infusions to maintain deep sedation; NMB if needed **[core]**
- **Treat seizures** — levetiracetam 40 mg/kg loading, prophylaxis for 7 days post severe TBI **[core]**
- Glucose 6-10 mmol/L — avoid hyper- and hypoglycaemia
- Temperature management — avoid pyrexia; 35-37°C target
- Hyperosmolar therapy for impending herniation: **3% saline 5 mL/kg** OR **mannitol 0.25-1 g/kg IV**
- Seizure prophylaxis; reverse anticoagulation

c) List 4 surgical indications for evacuation of acute subdural haematoma. (4 marks)

- Thickness >10 mm OR midline shift >5 mm regardless of GCS **[core]**
- GCS deterioration ≥2 points from injury to ED, OR pupillary asymmetry, OR ICP >20 mmHg **[core]**
- Rapidly expanding haematoma on serial imaging **[core]**
- Open skull / depressed skull fracture with brain injury **[core]**
- Posterior fossa SDH with mass effect (4th ventricle compression / hydrocephalus)

References: Brain Trauma Foundation Guidelines (4th edition, 2016) • ATLS 10th edition (current) • ACEM clinical policies and statements • Tintinalli's Emergency Medicine 9e Ch 254 • NSW Institute of Trauma & Injury Management (ITIM) guideline

Question 3 | Anticoagulant-Related ICH (12 marks)

A 74-year-old man on dabigatran 110 mg BD (for AF), metoprolol, and aspirin presents after a fall. GCS 15, but CT shows a small acute SDH. Last dabigatran dose 4 hours ago. eGFR 45.

a) List 4 treatments to consider for this patient with rationale. (4 marks)

- **Idarucizumab 5 g IV** (2 × 2.5 g vials over 5-10 min each, separated by <15 min) — specific monoclonal antibody reversal of dabigatran; effect within minutes **[core]**
- **Tranexamic acid 1 g IV over 10 min, then 1 g over 8 h** — CRASH-3 evidence for mTBI/severe TBI within 3 h of injury **[core]**
- Withhold antiplatelet (aspirin) and anticoagulant; review need for re-starting after acute phase **[core]**
- **Neurosurgical consultation** for ongoing monitoring, repeat imaging at 4-6 h, indications for evacuation **[core]**
- **Activated charcoal** if <2 h since dabigatran ingestion (controversial)
- **Haemodialysis** for severe / refractory bleeding (60-65% removal in 4 h) — only if idarucizumab unavailable
- Reverse other antiplatelets — desmopressin 0.3 µg/kg IV (controversial; consider for severe bleed)

b) State the reversal agent (with dose) for each anticoagulant. (4 marks)

- **Warfarin: vitamin K 10 mg IV + prothrombinex (4-factor PCC) 25-50 IU/kg IV** (per INR and weight); FFP 10-15 mL/kg if PCC unavailable **[core]**
- **Dabigatran: idarucizumab 5 g IV** (2 × 2.5 g) **[core]**
- **Apixaban / rivaroxaban: andexanet alfa** if available (not yet PBS-listed in Australia for all indications); OR **4-factor PCC 50 IU/kg IV** as alternative **[core]**
- **UFH heparin: protamine sulfate 1 mg per 100 IU heparin** in last 2-3 h (max 50 mg) **[core]**
- **LMWH (enoxaparin): protamine 1 mg per 1 mg enoxaparin** if <8 h (max 50 mg); only ~60% reversed
- **Antiplatelets:** platelet transfusion not routinely recommended for ICH on aspirin / clopidogrel (PATCH trial); DDAVP 0.3 µg/kg can be considered

c) List 2 important examination features required to guide treatment decisions. (2 marks)

- Time of last anticoagulant dose AND renal function (dabigatran is renally cleared — eGFR <30 prolongs effect significantly) **[core]**
- Weight (for PCC dosing) AND identification of any active bleeding sites (visible bleeding, haemodynamic compromise) **[core]**
- Coagulation testing (specific anti-Xa assay for DOAC; INR for warfarin; thrombin time / dilute TT for dabigatran)

d) List 2 disposition / monitoring decisions. (2 marks)

- Admit to high-acuity / HDU bed for 24 h with hourly neurological observations and serial GCS **[core]**
- Repeat CT head at 4-6 h post initial scan to assess for haematoma expansion (high-risk in anticoagulated patients) **[core]**
- Multi-disciplinary input — geriatrics, cardiology / haematology re: future anticoagulation; falls review

References: eTG (Therapeutic Guidelines, current) • Brain Trauma Foundation Guidelines (4th edition, 2016) • ACEM clinical policies and statements • ANZSBT/HSANZ Guideline on PCC Use • Australian DOAC Reversal Position Statement

Question 4 | Extradural Haematoma (11 marks)

A 22-year-old male presents after blunt assault. Initially GCS 14, declined to GCS 8 over 2 hours. CT shows a 12 mm biconvex hyperdense collection over the right temporal region with 6 mm midline shift. Right pupil dilated.

a) List 3 classical CT features of extradural haematoma. (3 marks)

- **Biconvex (lenticiform) hyperdense collection** between skull and dura [core]
- **Limited by suture lines** (does not cross sutures — distinguishes from SDH which crosses sutures but not midline) [core]
- Often associated with overlying skull fracture (temporal bone with middle meningeal artery injury most common) [core]
- Mass effect with midline shift, sulcal effacement, ventricular compression
- May contain swirl sign (active bleeding — emergency)

b) List 4 management priorities while awaiting neurosurgery. (4 marks)

- **Definitive airway** — intubation given GCS <9 and falling; RSI with neuroprotective principles [core]
- **Maintain MAP ≥ 80 / SBP ≥ 110** — vasopressors if needed; avoid hypotension [core]
- **Hyperosmolar therapy for impending herniation** — 3% saline 5 mL/kg IV OR mannitol 0.5-1 g/kg IV given fixed dilated pupil [core]
- **Urgent transfer to operating theatre** — EDH evacuation is time-critical (mortality <10% if operated <4 h, >40% if >6 h) [core]
- Reverse coagulopathy if present
- Head up 30°, sedation, normocarbia, normothermia, normoglycaemia
- Monitor for further pupil changes / Cushing's response

c) List 4 differences between EDH and SDH. (4 marks)

- **Shape:** EDH biconvex / lenticiform; SDH concave / crescentic [core]
- **Boundaries:** EDH crosses midline, NOT sutures; SDH crosses sutures, NOT midline (does cross dural reflections) [core]
- **Source:** EDH usually arterial (middle meningeal); SDH usually venous (bridging veins) [core]
- **Course:** EDH classic 'lucid interval' then rapid decline; SDH more variable, often elderly / gradual [core]
- **Risk groups:** EDH in young; SDH in elderly, anticoagulated, alcohol use
- **Mortality:** EDH <10% if treated early; SDH 30-90% in severe cases

References: Brain Trauma Foundation Guidelines (4th edition, 2016) • ATLS 10th edition (current) • NSW Institute of Trauma & Injury Management (ITIM) guideline • Tintinalli's Emergency Medicine 9e Ch 254

Question 5 | Traumatic SAH and Diffuse Axonal Injury (10 marks)

A 19-year-old male is brought in after a motor vehicle collision (front-seat passenger, restrained, head-on at 80 km/h). GCS 8 (E2V2M4). CT head shows blood in basal cisterns and Sylvian fissures, with small haemorrhagic foci at the grey-white junction.

a) List 3 CT features distinguishing traumatic SAH from aneurysmal SAH. (3 marks)

- **Distribution:** traumatic SAH usually peripheral / cortical (over convexity); aneurysmal centrally in basal cisterns **[core]**
- **Associated findings:** traumatic — coup/contre-coup contusions, skull fracture, scalp haematoma; aneurysmal — isolated SAH **[core]**
- **History:** traumatic - clear mechanism; aneurysmal — sudden severe headache without trauma **[core]**
- CT angiography helpful — aneurysm visualisation
- Volume of blood — aneurysmal often greater

b) Name 3 CT features suggestive of diffuse axonal injury. (3 marks)

- Multiple petechial haemorrhages at grey-white junction (visible on CT in <30% — MRI more sensitive) **[core]**
- Haemorrhagic foci in corpus callosum (especially splenium) **[core]**
- Brainstem haemorrhage (dorsolateral midbrain, pons) **[core]**
- GCS disproportionate to CT findings (low GCS, minimal imaging changes)
- Diffuse cerebral oedema, loss of grey-white differentiation

c) State 4 management priorities for severe TBI in this patient. (4 marks)

- ABC — RSI with neuroprotective principles; maintain SBP ≥ 110 , SpO₂ >94%, PaCO₂ 35-40 **[core]**
- C-spine immobilisation throughout (especially given mechanism) **[core]**
- ICP control — head-up 30°, sedation, normothermia, normoglycaemia; hyperosmolar therapy for raised ICP (3% saline 5 mL/kg or mannitol 0.5-1 g/kg) **[core]**
- Seizure prophylaxis — levetiracetam 40 mg/kg loading, then 1 g BD for 7 days **[core]**
- Neurosurgical / ICU consultation for ICP monitoring (EVD if hydrocephalus)
- TXA 1 g IV if <3 h from injury (CRASH-3)
- Repeat imaging at 4-6 h or with deterioration
- Trauma series — full body CT, exclude other injuries

References: Brain Trauma Foundation Guidelines (4th edition, 2016) • ATLS 10th edition (current) • CRASH-3 trial (Lancet 2019) • NSW Institute of Trauma & Injury Management (ITIM) guideline

Question 6 | Paediatric Head Injury — PECARN (11 marks)

A 2-year-old boy presents after falling from playground equipment, hitting his head. GCS 15, alert and interactive, small frontal scalp haematoma.

a) List 5 PECARN HIGH-RISK criteria in children <2 years that mandate CT. (5 marks)

- GCS <14 OR signs of altered mental status [core]
- Palpable skull fracture [core]
- Severe mechanism (MVC with ejection / death of passenger / rollover; pedestrian or cyclist without helmet vs vehicle; fall >0.9 m / 3 ft for <2 y; head struck by high-impact object) [core]
- Loss of consciousness ≥5 seconds [core]
- Non-frontal scalp haematoma (parietal, temporal, or occipital location) in <2 y [core]
- Not acting normally per parent
- (For 2-18 y: amnesia, vomiting, severe headache, altered mental status, severe mechanism, signs of basal skull #)

b) Compare PECARN, CHALICE, and CATCH decision rules (briefly state how they differ). (3 marks)

- **PECARN**: largest derivation cohort (43,000+ children); separate algorithms for <2 y and 2-18 y; aim is to identify clinically important TBI; very high sensitivity (~99%) for intervention-requiring TBI [core]
- **CATCH**: Canadian rule, 7 high-risk + medium-risk criteria; predicts need for neurological intervention [core]
- **CHALICE**: UK rule, 14 criteria; predicts any clinically significant intracranial injury; high specificity but lower sensitivity [core]
- PECARN preferred in Australian paediatric EDs (RCH endorsement); validated locally

c) List 3 important elements of your discussion with the parent who wants a CT despite low PECARN risk. (3 marks)

- Discuss low risk of clinically important TBI (<0.05% in PECARN low-risk group); CT itself carries radiation risk (cumulative lifetime cancer risk; sedation if uncooperative) [core]
- Offer observation in ED for 4-6 h with serial neurological assessment as alternative to CT [core]
- Provide clear written head-injury advice and criteria to return — vomiting, drowsiness, headache worsening, behaviour change, focal weakness [core]
- Acknowledge concerns; shared decision-making — if parent remains very concerned despite reassurance, CT may be appropriate

References: PECARN Paediatric Head CT Rule (Kuppermann 2009) • Royal Children's Hospital Melbourne CPG • ACEM clinical policies and statements • Tintinalli's Emergency Medicine 9e Ch 254

Question 7 | Geriatric Head Injury (11 marks)

An 87-year-old woman from home presents after a slip and fall down stairs with neck pain and head trauma. PMHx: AF on apixaban, hypertension, mild dementia. GCS 14 (E4V4M6); previous baseline 15.

a) List 4 specific concerns / vulnerabilities in the elderly head-injured patient. (4 marks)

- Higher risk of intracranial bleeding from minor trauma — cerebral atrophy stretches bridging veins; anticoagulation common **[core]**
- Reduced cardiopulmonary reserve — hypoxia/hypotension less well tolerated; greater secondary brain injury risk **[core]**
- Frequently anticoagulated / antiplatelet — haematoma expansion risk **[core]**
- Co-existing c-spine pathology (degenerative change, central canal stenosis); central cord syndrome risk **[core]**
- Atypical / occult presentation — pre-existing cognitive impairment, communication difficulty
- Medication interactions affecting GCS interpretation
- Higher mortality from same-grade TBI than younger adults

b) List 4 immediate management priorities specific to this patient. (4 marks)

- **Mandatory CT head AND CT C-spine** — low threshold given anticoagulant + age + mechanism; CCHR mandates CT (age >65) **[core]**
- **Reverse apixaban** — andexanet alfa if available, OR 4-factor PCC 50 IU/kg IV; consider TXA 1 g IV **[core]**
- **C-spine immobilisation with collar AND log-roll**; complete CT before clearance (NEXUS / CCR may not apply if dementia limits exam) **[core]**
- Identify and treat secondary causes / pre-syncope — ECG (AF rate, ischaemia), check BSL, U&E, FBC, lactate, screen for acute illness or infection precipitating fall **[core]**
- Falls history and risk assessment — orthostatics, medications, eyesight, environment
- MDT review — geriatrics, social work, OT/physio
- Document baseline cognitive function with collateral; compare to current state for delirium screening

c) List 3 measures for secondary prevention. (3 marks)

- Comprehensive falls risk assessment (Berg Balance, Timed Up and Go); home environment review by OT **[core]**
- Medication review — STOPP/START criteria; particularly anticholinergic and sedative load; consider continuing vs ceasing anticoagulation after multidisciplinary discussion **[core]**
- Bone health assessment — DEXA, calcium, vitamin D; bisphosphonate / denosumab if osteoporotic **[core]**
- Vision and hearing assessment
- Strength and balance training — physiotherapy referral
- Postural BP measurement; treat orthostatic hypotension

References: Canadian CT Head Rule (Stiell 2001) • ACEM clinical policies and statements • eTG (Therapeutic Guidelines, current) • RACGP Falls in Older Adults Guideline

Question 8 | Impending Herniation — Hyperosmolar Therapy (10 marks)

A 33-year-old man post intubation for severe TBI is awaiting neurosurgery. 30 minutes after CT showing acute SDH, his left pupil becomes fixed and dilated (right pupil reactive). HR 50, BP 160/100, RR 14 (ventilated).

a) Name the syndrome AND state the underlying mechanism. (2 marks)

- **Uncal (transtentorial) herniation** — uncus of temporal lobe herniates over tentorium [core]
- Compression of ipsilateral third cranial nerve (parasympathetic fibres run on outer surface) → fixed dilated pupil; Cushing's reflex (HR ↓, BP ↑) reflects raised ICP and impending brainstem compression [core]

b) State 4 immediate interventions with drug, dose, route. (4 marks)

- **3% hypertonic saline 5 mL/kg IV** over 5-10 min via central line preferred (peripheral acceptable in emergency); OR **mannitol 0.5-1 g/kg IV** over 15-20 min [core]
- **Hyperventilate temporarily to PaCO₂ 30-35 mmHg** as bridging measure (vasoconstriction lowers ICP); avoid prolonged hyperventilation [core]
- **Activate neurosurgical theatre and transfer for craniotomy / decompression** — definitive treatment; do NOT delay for further imaging [core]
- Maintain MAP ≥80 mmHg / CPP >60 mmHg (CPP = MAP – ICP); use vasopressors as needed [core]
- Head-up 30°, neutral neck, deep sedation (propofol + fentanyl), avoid coughing/straining
- Consider pentobarbital coma if refractory ICP (ICU intervention)

c) State 4 measures to monitor and titrate hyperosmolar therapy. (4 marks)

- Serial neurological exam — pupils, motor response every 15 min; ICP if monitor in situ [core]
- Serum sodium (target 145-155 with 3% saline; <160 to avoid central pontine myelinolysis) [core]
- Serum osmolality (target 300-320 mOsm/kg with mannitol; mannitol risk of intravascular volume depletion) [core]
- Strict fluid balance — IDC, hourly UO; mannitol is osmotic diuretic — replace volume [core]
- Repeat CT post-intervention to assess effect on haematoma / midline shift

References: Brain Trauma Foundation Guidelines (4th edition, 2016) • ATLS 10th edition (current) • eTG (Therapeutic Guidelines, current) • NSW Institute of Trauma & Injury Management (ITIM) guideline

Question 9 | Maxillofacial Trauma — Le Fort Fractures (11 marks)

A 20-year-old man has been punched repeatedly in the face during an altercation. Significant facial swelling, haemorrhage from mouth and nose, dental occlusion abnormal. GCS 14, HR 120, BP 105/70.

a) Describe the 3 Le Fort fracture patterns AND state one key examination finding for each. (4 marks)

- **Le Fort I (transverse maxillary)** — horizontal fracture above teeth, separating the palate from the upper maxilla. Finding: **mobile palate / upper teeth with stable nasal bridge and orbits [core]**
- **Le Fort II (pyramidal)** — fracture through maxilla and inferior orbital rims, crossing the nasal bridge. Finding: **mobile nasal bridge + maxilla; raccoon eyes; CSF rhinorrhoea [core]**
- **Le Fort III (craniofacial dysjunction)** — complete separation of midface from skull base. Finding: **mobile face en bloc — pulling maxilla anteriorly moves face including orbits [core]**
- Often combinations / asymmetric — described as Le Fort I/II/III on separate sides

b) List 4 immediate ED management priorities. (4 marks)

- **Airway control** — sit upright if no spinal concerns; suction; consider early intubation (swelling, bleeding, decreased GCS); high-risk of difficult airway — prepare surgical airway **[core]**
- **Haemorrhage control** — bilateral nasal packing (Foley catheter into nasopharynx with balloon inflation); cervical fixation of displaced fragments; oral packing; tranexamic acid 1 g IV **[core]**
- **C-spine immobilisation** — high-impact mechanism with high-risk c-spine injury **[core]**
- **CT face + CT head + CT C-spine**; maxillofacial surgical consultation; consider blunt cerebrovascular injury screen (Denver criteria) **[core]**
- Tetanus update; broad-spectrum antibiotics if open / communicating with sinuses (amoxicillin-clavulanate)
- Eye examination — visual acuity, EOM, pupils, retinal exam

c) List 3 contraindications to nasogastric tube insertion in this patient. (3 marks)

- Suspected basal skull fracture / Le Fort II or III (risk of intracranial misplacement via cribriform plate) **[core]**
- CSF rhinorrhoea or otorrhoea **[core]**
- Severe midface instability — anatomy disrupted, false passage risk **[core]**
- If NG required, place under direct vision via mouth (orogastric)

References: ATLS 10th edition (current) • Tintinalli's Emergency Medicine 9e Ch 252 • Cameron's Textbook of Adult Emergency Medicine 5e • AAOMS Maxillofacial Trauma Guideline

Question 10 | Orbital Trauma — Compartment Syndrome and Globe Rupture (11 marks)

A 35-year-old man presents with peri-orbital trauma after assault. Increasing proptosis, decreased visual acuity in the right eye, painful eye, ophthalmoplegia. Tense globe with raised intraocular pressure. CT shows fractures of the orbital floor and medial wall.

a) List 4 features suggesting orbital compartment syndrome. (4 marks)

- **Proptosis** (anterior displacement of globe) **[core]**
- **Decreased visual acuity** (RAPD = relative afferent pupillary defect — CN II compromise) **[core]**
- **Raised IOP** (>40 mmHg) — assessed by tonometry or palpation (tense globe) **[core]**
- Ophthalmoplegia / restricted EOM **[core]**
- Severe pain; chemosis; subconjunctival haemorrhage
- Cherry-red spot on fundoscopy (central retinal artery occlusion — late)

b) State the 3-step bedside ED procedure for decompressing orbital compartment syndrome. (3 marks)

- **Lateral canthotomy** — incision through skin and lateral canthal tendon, 1-2 cm horizontal lateral incision exposing the lateral canthal tendon **[core]**
- **Inferior cantholysis** — divide the inferior limb of the lateral canthal tendon, freeing the lower lid **[core]**
- Reassess — IOP should fall, globe protrude less; if not, divide superior limb of canthal tendon; ophthalmology consultation **[core]**
- Local anaesthetic — lignocaine 2% with adrenaline; haemostat clamp for 1-2 min before incision
- Time-critical — perform within 60 min of vision loss to preserve sight

c) List 4 features suggesting globe rupture (signs that would mandate STOPPING further pressure on the eye). (4 marks)

- Volume loss / soft globe (hypotony) **[core]**
- Visible vitreous, choroid, or uveal extrusion; irregular pupil (peaked) due to iris incarceration **[core]**
- Decreased visual acuity (often NLP) **[core]**
- Severe subconjunctival haemorrhage (especially circumferential 360°), 8-ball hyphaema **[core]**
- Seidel sign positive — fluorescein streaming from leak site
- History of high-velocity / sharp object
- Management: **NO further eye examination, NO IOP, NO tonometry, NO eye drops**; rigid eye shield; antiemetic; tetanus; broad-spectrum IV antibiotics; urgent ophthalmology

References: RANZCO Ophthalmology Trauma Guidelines • ATLS 10th edition (current) • Tintinalli's Emergency Medicine 9e Ch 244 • ACEM clinical policies and statements

Question 11 | Mandible Fracture (10 marks)

A 17-year-old man presents after assault with jaw pain, trismus, malocclusion, drooling. OPG shows bilateral mandibular fractures (right body, left subcondylar).

a) List 6 important physical findings to document. (6 marks)

- Malocclusion — bite asymmetry, step-off in dental arch, missing/displaced teeth **[core]**
- Mucosal laceration / gingival haemorrhage / intraoral bleeding (suggests open #) **[core]**
- Trismus or limited mouth opening **[core]**
- Inferior alveolar nerve sensory deficit (lower lip / chin numbness) **[core]**
- Tongue blade test (positive if patient cannot bite and twist a tongue depressor without breaking it) **[core]**
- External signs — facial asymmetry, swelling, ecchymosis, bony crepitus **[core]**
- Airway assessment — swelling, displacement, drooling, stridor
- Floor-of-mouth haematoma
- Tongue movement / hypoglossal nerve function
- Examine for associated c-spine, head, dental injuries

b) State 4 ED management steps with specifics. (4 marks)

- **Analgesia** — IV opioid titrated (morphine 0.1 mg/kg or fentanyl 1 µg/kg); inferior alveolar nerve block with lignocaine 2% with adrenaline **[core]**
- **Antibiotic prophylaxis** — open mandible # is any # involving tooth-bearing region: amoxicillin-clavulanate 1.2 g IV q8h or per local antibiogram **[core]**
- **Tetanus** update if last booster >5 y for high-risk wound, >10 y for clean wound **[core]**
- **Maxillofacial / OMFS referral** for definitive fixation (open reduction and internal fixation usually required); soft diet, ice, head-up positioning while awaiting **[core]**
- NBM and IV fluids as per fasting guidelines
- If significant displacement or airway concern — admit for airway monitoring
- CT face if OPG inadequate or to assess condylar / subcondylar #

References: Tintinalli's Emergency Medicine 9e Ch 252 • Cameron's Textbook of Adult Emergency Medicine 5e • eTG (Therapeutic Guidelines, current) • ATLS 10th edition (current)

Question 12 | Dental Trauma — Tooth Avulsion (10 marks)

A 15-year-old male presents 30 minutes after a cricket ball injury. His upper left central incisor (tooth 21) has been avulsed completely. He brings the tooth in his hand, having wiped it clean with a cloth.

a) List 3 abnormalities to assess. (3 marks)

- Identify the avulsed tooth and confirm permanent vs deciduous (avulsed deciduous teeth NOT replanted — risk damage to permanent tooth bud); tooth 21 is permanent (eruption ~6-7 years) **[core]**
- Check for associated soft tissue / alveolar fractures; lip / tongue lacerations; check for embedded tooth fragments **[core]**
- Assess associated injuries — exclude tooth aspiration / ingestion (CXR/AXR if missing); associated head injury, dental subluxation of adjacent teeth **[core]**

b) State 4 immediate ED management steps for the avulsed permanent tooth (per ADA / IADT guidelines). (4 marks)

- **DO NOT scrub or wipe the root** — preserves periodontal ligament cells; rinse with sterile saline / milk only if visibly contaminated **[core]**
- **Replant immediately** if possible (extra-oral time should be <60 min for best prognosis); hold by crown only, replant in correct orientation **[core]**
- If cannot replant, store in **cold milk**, **Hank's balanced salt solution**, or **saliva** (under tongue if cooperative); AVOID water (osmotic damage) **[core]**
- **Splint** for 2 weeks (flexible splint to adjacent teeth); urgent dental / OMFS review within 24 h **[core]**
- Tetanus update; antibiotic prophylaxis (amoxicillin 500 mg PO TDS for 7 days)
- Soft diet; oral hygiene; chlorhexidine mouthwash

c) List 3 possible long-term complications. (3 marks)

- Pulp necrosis (most common — likely if extra-oral >60 min); requires root canal therapy **[core]**
- External root resorption (replacement / ankylosis) **[core]**
- Internal root resorption **[core]**
- Tooth loss
- Discolouration of the tooth
- Periapical infection / periodontal disease
- Aesthetic and functional impact

References: Australian Dental Association Trauma Guideline • IADT Dental Trauma Guidelines (current) • Tintinalli's Emergency Medicine 9e Ch 245

Question 13 | Facial Burn — Airway and Management (11 marks)

A 53-year-old female collapsed onto an electric heater after a syncopal episode and sustained a deep burn to her right face including peri-orbital, cheek, and ear. Currently haemodynamically stable, GCS 15. You are in a rural ED.

a) List 4 issues to consider in your assessment. (4 marks)

- **Airway compromise** — facial burns at high risk of inhalational injury and progressive oedema; assess for stridor, hoarseness, soot in mouth/nose, singed nasal hairs **[core]**
- **Underlying cause of syncope** — cardiac (arrhythmia, AS, MI), neurological (seizure, TIA), metabolic (hypoglycaemia) **[core]**
- **Eye involvement** — corneal burns, lid burns; preservation of vision is paramount **[core]**
- **Burn depth and TBSA** — superficial / partial / full thickness; estimate using 'rule of nines' or palmar surface (1%) **[core]**
- Other injuries from fall — head, c-spine, fractures
- Toxin exposure — carbon monoxide, cyanide if smoke inhalation
- Pain control needs

b) Describe how you would communicate this burn to the tertiary burns registrar. (3 marks)

- **ISBAR / SBAR handover**: identify yourself, patient, location; situation (face burn after syncope-induced contact with electric heater); background (PMHx, medications, syncope cause screen) **[core]**
- **Burn description**: anatomical sites (peri-orbital, cheek, ear); estimated TBSA; estimated depth (e.g. mixed superficial partial and deep partial); time since injury **[core]**
- **Critical issues**: airway status, haemodynamics, eye involvement; plan and concerns; requested intervention (advice, transfer) **[core]**
- Send photographs via secure pathway (with consent / per local policy)
- Confirm transfer arrangements, fluid resuscitation advice, and expected timing

c) Outline 4 issues in management of this burn. (4 marks)

- **Early consultation re: airway** — early intubation with bougie / video laryngoscopy if ANY signs of inhalational injury; surgical airway readiness **[core]**
- **Eye care** — fluorescein staining, irrigation if needed; chloramphenicol ointment; lid care; ophthalmology consultation **[core]**
- **Wound care** — cool with running water (20 min, max 3 h post burn — but avoid hypothermia in extensive burns); analgesia; cling-wrap dressing for transport; do NOT apply creams that obscure assessment **[core]**
- **Fluid resuscitation** if >15-20% TBSA — Parkland formula 4 mL/kg/%TBSA over 24 h, half in first 8 h (titrate to UO 0.5-1 mL/kg/h) **[core]**
- Tetanus, analgesia (opioid + ketamine for procedures), anti-emetics
- Investigate and treat syncope cause
- Transfer to burns centre per ANZBA criteria

References: ANZBA Burns Guidelines • ATLS 10th edition (current) • Tintinalli's Emergency Medicine 9e Ch 216

Question 14 | C-Spine Clearance — NEXUS / CCR (12 marks)

A 25-year-old woman presents with neck pain after a low-impact fall from a trampoline. She is alert, GCS 15, has neck pain on midline palpation but no neurological deficit and no other distracting injuries.

a) List the 5 NEXUS low-risk criteria. (5 marks)

- No posterior midline cervical tenderness [core]
- No focal neurological deficit [core]
- Normal level of alertness (GCS 15) [core]
- No evidence of intoxication [core]
- No painful distracting injury [core]

b) List the 3 HIGH-risk Canadian C-Spine Rule criteria that mandate radiological clearance. (3 marks)

- Age ≥ 65 years [core]
- Dangerous mechanism — fall >1 m / 5 stairs, axial load, MVC >100 km/h or rollover or ejection, motor vehicle vs pedestrian, bicycle collision [core]
- Paraesthesias in extremities [core]

c) Compare CT vs plain XR in C-spine clearance — list 4 considerations. (4 marks)

- **Sensitivity:** CT 98-100% vs plain film 50-70% for fracture detection [core]
- **Visualisation of C7-T1 junction:** often obscured on plain XR (shoulders); CT always adequate [core]
- **Speed and combination imaging:** CT can be combined with brain CT in same session [core]
- **Trade-offs:** higher radiation dose with CT (2-5 mSv vs 0.1 mSv for plain XR); higher cost; XR adequate in young, low-mechanism, isolated neck pain — increasingly replaced by low-dose CT [core]
- MRI for ligamentous injury / cord assessment when neurological deficit despite normal CT
- Plain film NOT to be used to clear C-spine in trauma with high-risk mechanism (per ATLS, ITIM)

References: NEXUS criteria (Hoffman 2000) • Canadian C-Spine Rule (Stiell 2001) • ATLS 10th edition (current) • NSW Institute of Trauma & Injury Management (ITIM) guideline • Tintinalli's Emergency Medicine 9e Ch 257

Question 15 | C-Spine Fracture Patterns (10 marks)

A 28-year-old man fell 2 metres from a ladder, landing on his head. CT C-spine shows a fracture pattern.

a) Match each fracture to its mechanism (4 fractures). (4 marks)

- **Jefferson fracture (C1 burst)** — axial loading; bilateral fracture of anterior and posterior arches of C1 [core]
- **Hangman's fracture (C2 traumatic spondylolisthesis)** — hyperextension + distraction; bilateral pars interarticularis fractures [core]
- **Odontoid (dens) fracture** — flexion/extension with rotation; classified by Anderson-D'Alonzo type I (tip), II (base), III (extending into body) — type II most unstable [core]
- **Burst fracture** — axial loading with vertical compression; vertebral body collapse with potential retropulsion of fragments into canal [core]
- **Teardrop fracture** — flexion/compression; small anterior triangular fragment, often unstable, associated with spinal cord injury
- **Unilateral facet dislocation** — flexion-rotation; stable when isolated

b) List 3 features of an unstable cervical spine fracture. (3 marks)

- Disruption of ≥ 2 of the 3 columns (anterior, middle, posterior — Denis classification) [core]
- Displacement >3.5 mm or angulation $>11^\circ$ on flexion / extension views [core]
- Associated neurological deficit / cord involvement [core]
- Disruption of posterior ligamentous complex (interspinous, supraspinous, ligamentum flavum)
- Burst # with retropulsed fragment encroaching canal

c) List 3 immediate management steps. (3 marks)

- Maintain in-line cervical immobilisation with Philadelphia / Aspen collar; avoid extremes of motion; log-roll for transfers [core]
- Neurosurgical / spinal surgical consultation — operative vs conservative (HALO, collar) depending on fracture stability [core]
- Maintain MAP ≥ 85 mmHg (if cord injury) — spinal cord perfusion preservation; avoid hypotension [core]
- Full neurological examination including ASIA scale
- Imaging — MRI for ligamentous and cord injury; CT angiography of vessels (BCVI risk in high c-spine #)
- Trauma team activation and exclude other injuries

References: ATLS 10th edition (current) • NSW Institute of Trauma & Injury Management (ITIM) guideline • Tintinalli's Emergency Medicine 9e Ch 257

Question 16 | Spinal Cord Injury Syndromes (12 marks)

Several patients with spinal cord injuries are referred to your trauma centre. You are asked to teach junior doctors about spinal cord syndromes.

a) Complete the table for 4 spinal cord syndromes — describe signs AND mechanism (8 marks total). (8 marks)

- **Central cord syndrome: Signs** — weakness greater in upper than lower limbs, with preserved bowel/bladder and sensory function. **Mechanism** — hyperextension injury in elderly with cervical spondylosis; cord compression by buckling ligamentum flavum **[core]**
- **Anterior cord syndrome: Signs** — loss of motor function and pain/temperature sensation BELOW level; PRESERVED proprioception and vibration. **Mechanism** — anterior spinal artery occlusion or anterior cord compression (flexion injury, retropulsed fragment) **[core]**
- **Brown-Séquard syndrome: Signs** — Ipsilateral motor and proprioception loss; Contralateral pain and temperature loss (below the level — crossed Lhermitte). **Mechanism** — penetrating injury (stab/gunshot) causing hemisection of cord **[core]**
- **Posterior cord syndrome: Signs** — loss of proprioception and vibration (dorsal columns); PRESERVED motor and pain/temp; ataxia. **Mechanism** — uncommon; posterior spinal artery infarction, B12 deficiency, tabes dorsalis **[core]**

b) List 4 measures (other than spinal immobilisation) for secondary prevention of further cord injury. (4 marks)

- **Maintain MAP ≥ 85 mmHg** for 7 days — preserve spinal cord perfusion (vasopressor support if needed) **[core]**
- **Avoid hypoxia and hypotension** — both worsen secondary cord injury **[core]**
- **Prompt definitive imaging and surgical consultation** for decompression if compressive lesion identified **[core]**
- **VTE prophylaxis** — sequential compression devices initially; LMWH within 72 h if no bleeding contraindication **[core]**
- Pressure area care, regular turning
- Indwelling catheter to prevent bladder distension
- Aggressive temperature regulation
- **Methylprednisolone NOT routinely recommended** (NASCIS trials limitations; complications outweigh benefit)

References: ATLS 10th edition (current) • NSW Institute of Trauma & Injury Management (ITIM) guideline • Tintinalli's Emergency Medicine 9e Ch 258 • ASIA / ISNCSCI

Question 17 | Neurogenic Shock vs Spinal Shock (10 marks)

A 42-year-old male is brought in after a motor vehicle accident with high cervical spinal cord injury at C5. He is GCS 15 with no motor function below C5. HR 50, BP 80/50, peripherally warm and well perfused.

a) Compare clinical features of neurogenic vs spinal shock (3 features each). (6 marks)

- **NEUROGENIC SHOCK:** distributive shock from loss of sympathetic tone (T6 or above injury). Hypotension WITHOUT compensatory tachycardia (unopposed parasympathetic — bradycardia) **[core]**
- **NEUROGENIC SHOCK:** warm, well-perfused peripheries (vasodilatation); no diaphoresis; responds to vasopressors (noradrenaline + atropine for bradycardia) **[core]**
- **NEUROGENIC SHOCK:** hypothermia common (loss of vasoconstriction); urine output may be preserved **[core]**
- **SPINAL SHOCK:** a physiological state after cord injury — temporary loss of all reflex activity below the level of injury **[core]**
- **SPINAL SHOCK:** areflexia, flaccid paralysis, absent rectal tone, anal wink absent. Recovery of bulbocavernosus reflex marks end of spinal shock (24-72 h) **[core]**
- **SPINAL SHOCK:** NOT a haemodynamic state; relevant for prognostication and timing of neurological assessment **[core]**

b) List 4 management priorities. (4 marks)

- **Maintain MAP ≥ 85 mmHg** with **noradrenaline infusion** (preferred — $\alpha 1$ agonist + $\beta 1$ chronotropy) titrated to target **[core]**
- **Atropine 0.5 mg IV q3-5min for symptomatic bradycardia;** consider transcutaneous pacing for refractory bradycardia **[core]**
- **Cautious fluid resuscitation** (1-2 L crystalloid; avoid overload — pulmonary oedema risk in cervical cord injury); rule out haemorrhagic shock first **[core]**
- Active warming — warm fluids, blankets, ambient temperature; treat hypothermia **[core]**
- Spinal immobilisation; avoid stimulation triggering autonomic instability
- VTE prophylaxis; pressure area care; IDC; NG tube
- ICU admission for cardiopulmonary monitoring and ventilation if high cord level (C3-C5 → diaphragmatic weakness)

References: ATLS 10th edition (current) • NSW Institute of Trauma & Injury Management (ITIM) guideline • Tintinalli's Emergency Medicine 9e Ch 258

Question 18 | Penetrating Neck Trauma (12 marks)

A 62-year-old male is brought in after a home invasion during which he was stabbed in the right anterior neck. Wound extends from medial clavicle to cricoid level with active haemorrhage. GCS 10, combative; HR 125, BP 105/65. Right parietal scalp swelling from associated fall.

a) List 5 immediate management priorities. (5 marks)

- **Direct pressure haemostasis on wound** — manual compression; consider Foley catheter tamponade for cavity bleeding (insert, inflate with 10-30 mL saline, clamp catheter) **[core]**
- **Definitive airway** — early intubation as wound expansion / haematoma may compromise airway; prepare for difficult airway and surgical airway **[core]**
- **Two large-bore IV access** away from injured side; IO if needed; activate massive transfusion protocol **[core]**
- **Trauma team / vascular / ENT consultation** and prepare for theatre — operative exploration for hard signs (active bleeding, expanding haematoma, shock, neurological deficit, airway compromise) **[core]**
- **Imaging** — CT angiography neck if haemodynamically stable to delineate vascular, aerodigestive, and spinal injuries **[core]**
- Avoid blind probing of wound (may dislodge clot)
- Maintain MAP for cerebral perfusion given concomitant head injury; balance with permissive hypotension
- C-spine considerations — penetrating wounds rarely produce cord injury without obvious deficit

b) List 4 clinical features ('hard signs') of vascular injury mandating operative exploration. (4 marks)

- Active arterial bleeding from wound **[core]**
- Expanding / pulsatile haematoma **[core]**
- Bruit / thrill over the wound **[core]**
- Hypotension or shock not responding to resuscitation; pulse deficit distal to injury **[core]**
- Cerebral ischaemic signs (carotid injury) — focal neurological deficit
- Massive haemoptysis / haematemesis

c) List 3 harms of hard collar use in this patient. (3 marks)

- **Conceals neck wound and impairs assessment** of haematoma expansion / haemorrhage; delays operative access **[core]**
- **Increases ICP** by impeding venous return — harmful in concurrent head injury **[core]**
- **Pressure injury risk**; agitation in combative patient; airway compromise from compression of neck structures **[core]**
- Penetrating neck trauma without spinal symptoms / signs rarely benefits from immobilisation — most authorities (EAST, ATLS) advise AGAINST routine c-spine immobilisation in isolated penetrating neck trauma unless gross deformity or specific spinal cord findings

References: EAST Practice Management Guidelines (current) • ATLS 10th edition (current) • NSW Institute of Trauma & Injury Management (ITIM) guideline • Tintinalli's Emergency Medicine 9e Ch 259

Question 19 | Blunt Cerebrovascular Injury (BCVI) (10 marks)

A 32-year-old male is brought in after a high-speed MVC with seatbelt mark across the neck. He has cervical spine fracture (C2 transverse foramen involvement) and skull base fracture. GCS 15 currently. You are concerned about BCVI.

a) List 4 high-risk mechanisms / injury patterns (Denver criteria) for BCVI. (4 marks)

- Cervical spine fracture, especially involving C1-C3, transverse foramen, subluxation, or rotational component **[core]**
- Basilar skull fracture involving the carotid canal or petrous bone (carotid canal #) **[core]**
- Le Fort II / III maxillofacial fractures **[core]**
- Significant cervical seatbelt sign / blunt neck trauma with anterior soft tissue injury **[core]**
- Diffuse axonal injury with GCS <6
- Hanging / near-hanging with cerebral hypoxic-ischaemic injury
- Closed head injury with focal neurological deficit not explained by CT findings
- Symptomatic BCVI signs — Horner's, expanding haematoma, bruit

b) Name the diagnostic imaging modality of choice AND 2 alternative modalities. (3 marks)

- **CT angiography (CTA)** of head and neck — first-line; rapid, available 24/7, sensitivity ~80-100% for clinically significant injury **[core]**
- **Digital subtraction angiography (DSA)** — gold standard but more invasive; reserved for equivocal findings or interventional planning **[core]**
- **MR angiography (MRA)** — useful in pregnancy or contrast allergy; less available 24/7, longer acquisition **[core]**

c) State 3 components of management once BCVI is confirmed. (3 marks)

- **Antithrombotic therapy** — antiplatelet (aspirin 100 mg PO daily) OR anticoagulation (LMWH / heparin) — both reduce stroke risk; balance vs bleeding (head injury, fractures) **[core]**
- **Multidisciplinary review** — neurointervention / vascular surgery / neurosurgery / trauma; balance bleeding vs thromboembolic risks **[core]**
- **Repeat imaging at 7-10 days** to assess healing of dissection or pseudoaneurysm **[core]**
- Endovascular intervention (stenting, embolisation) for high-grade injuries, pseudoaneurysm, or active extravasation
- Long-term follow-up — many heal with antithrombotic therapy alone over 3-6 months

References: Denver Screening Criteria for BCVI (current) • EAST Practice Management Guidelines (current) • NSW Institute of Trauma & Injury Management (ITIM) guideline • Tintinalli's Emergency Medicine 9e Ch 254

Question 20 | Laryngeal Trauma (12 marks)

An 18-year-old man rode his motorbike into clothesline wire at 60 km/h. Closed anterior neck injury. GCS 15, HR 100, BP 120/75. Hoarse voice, soft inspiratory stridor, subcutaneous emphysema.

a) List 4 examination features suggesting significant laryngeal injury. (4 marks)

- **Voice change / hoarseness / aphonia [core]**
- **Stridor** — inspiratory (extrathoracic) or expiratory; or biphasic; respiratory distress [core]
- **Subcutaneous emphysema** in neck or chest wall — air leak from disrupted airway [core]
- **Loss of laryngeal landmarks** (loss of thyroid prominence on palpation); deformity, tenderness, ecchymosis [core]
- Haemoptysis
- Dysphagia, odynophagia, drooling

b) List 2 investigations to assess laryngeal injury. (2 marks)

- **Flexible fiberoptic laryngoscopy** — assess mucosal integrity, vocal cord function, airway patency [core]
- **CT neck with thin slices** (1 mm) — demonstrates cartilage fractures, soft tissue swelling, airway distortion [core]
- Direct laryngoscopy under GA

c) List 4 modifications to standard RSI in this patient. (4 marks)

- **Senior consultant operator** with surgical team (ENT/general surgical) on stand-by for emergency tracheostomy/cricothyroidotomy [core]
- **Smaller ETT** (size 6.0-6.5 mm); avoid blind nasal intubation; consider awake fiberoptic if cooperative [core]
- **Avoid bag-mask ventilation** (worsens subcutaneous emphysema, may convert partial to complete obstruction); use spontaneous ventilation with sevoflurane / ketamine if possible [core]
- **Avoid cricoid pressure** (may worsen laryngeal disruption) and **video laryngoscopy** preferred; have surgical airway kit open and exposed; mark cricothyroid membrane [core]
- Avoid muscle relaxant if possibility of complete obstruction (loss of spontaneous ventilation may be fatal)
- ENT/anaesthetic in attendance; double-set-up with tracheostomy ready

d) List 2 indications for IMMEDIATE surgical airway in the ED for this patient. (2 marks)

- Failed intubation in 'cannot intubate, cannot oxygenate' situation [core]
- Severe airway distortion / disruption with expanding neck haematoma OR complete or near-complete laryngeal disruption [core]
- Penetrating laryngeal trauma with active arterial bleeding compromising airway
- Rapid clinical deterioration / impending arrest

References: EAST Practice Management Guidelines (current) • ATLS 10th edition (current) • Tintinalli's Emergency Medicine 9e Ch 259 • NSW Institute of Trauma & Injury Management (ITIM) guideline

Question 21 | Mild TBI / Concussion (10 marks)

A 22-year-old amateur rugby player presents 30 minutes after a head clash during a match. Brief LOC ~10 seconds, now alert but reports headache, nausea, and feels 'foggy'. GCS 15, no focal signs. CCHR negative.

a) Define mild TBI / concussion. (3 marks)

- GCS 13-15 at 30 minutes post-injury **[core]**
- LOC <30 minutes (or no LOC); post-traumatic amnesia <24 hours **[core]**
- Functional disturbance of brain (cognitive, physical, emotional symptoms) with no structural abnormality on standard imaging if performed **[core]**
- Concussion is a subset of mTBI without structural injury

b) List 4 categories of post-concussion symptoms. (4 marks)

- **Physical** — headache, nausea/vomiting, balance disturbance, dizziness, visual disturbance, sensitivity to light/noise, fatigue **[core]**
- **Cognitive** — feeling 'in a fog', slowed thinking, difficulty concentrating, memory impairment **[core]**
- **Emotional** — irritability, sadness, anxiety, emotional lability **[core]**
- **Sleep** — drowsiness, sleep disturbance, insomnia or hypersomnia **[core]**

c) State 3 components of return-to-play / return-to-activity advice. (3 marks)

- **Symptomatic rest 24-48 h** (relative — physical and cognitive); then graduated return (Berlin Consensus / SCAT-5 framework) **[core]**
- **Stepwise progression**: light aerobic activity → sport-specific exercise → non-contact training → full contact training → return to play (each step 24 h, no symptoms before progressing) **[core]**
- **Minimum 6 days from initial injury before return to play**; no return to sport on the day of injury (universal rule); medical clearance required before contact training **[core]**
- Education re second-impact syndrome — risk of severe outcome with second concussion before recovery
- Advice — avoid alcohol, sleep medications, contact sports until cleared; warning signs to return to ED

References: Berlin Consensus on Concussion in Sport (2017) • Australian Concussion and Brain Health Position Statement (current) • ACEM clinical policies and statements

Question 22 | Blast Injury (12 marks)

Ambulance control informs you that an explosion has occurred 5 minutes from your urban ED. Multiple casualties expected including head, face, and neck injuries.

a) Describe the 4 types of blast injury. (4 marks)

- **Primary** — direct effect of pressure wave on gas-containing organs (lung, GI tract, tympanic membrane) [core]
- **Secondary** — penetrating injury from shrapnel, fragments, glass propelled by blast [core]
- **Tertiary** — blunt injury from being thrown by blast wind / displacement against fixed objects (TBI, fractures, blunt thoracoabdominal injury) [core]
- **Quaternary** — all other injuries — burns, inhalation injury, crush, exacerbation of pre-existing conditions [core]

b) List 4 actions to take BEFORE patient arrival. (4 marks)

- Activate hospital MCI / disaster plan; designate incident commander and treating teams; coordinate with HEMS / regional disaster coordinator [core]
- Establish triage area at hospital entrance; designate trauma bays for resus, areas for less-urgent (orange/yellow) and minor (green) cases [core]
- Activate blood bank for MTP; mobilise theatres and ICU; cancel elective work [core]
- Notify radiology, lab, anaesthetics, all specialties; set up a family-information centre; consider security and police involvement (esp. for suspicious devices / potential CBRN) [core]
- Stockpile supplies — IV access, chest drains, cric kits, tetanus, antibiotics; staff recall
- Don PPE if CBRN exposure suspected; decontamination area set up

c) Match the 4 types of blast injury to their MOST likely injuries. (4 marks)

- **Primary** — TM rupture (most common — pressure wave threshold), blast lung (pulmonary contusion / haemorrhage / pneumothorax), bowel perforation, globe rupture, TBI from pressure differentials [core]
- **Secondary** — penetrating wounds, shrapnel injuries, traumatic amputations, ocular foreign bodies, lacerations [core]
- **Tertiary** — blunt closed head injury, long-bone fractures, blunt thoraco-abdominal trauma, c-spine injury [core]
- **Quaternary** — burns (thermal, chemical, radiation), inhalation injury (CO, cyanide), asphyxia, crush injury, exacerbation of asthma/COPD [core]

References: EAST Practice Management Guidelines (current) • ATLS 10th edition (current) • ACEM clinical policies and statements • EMA / ACEM Major Incident Plans