

FExNet 2026

# Collated SAQs: Paediatric Emergency Medicine

## ANSWER BOOKLET

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Model answers for the 22 paediatric SAQs. References cited at the foot of each question. Items marked [core] are required for full marks. Doses calculated per APLS / RCH-CPG conventions; always confirm against current local guidelines. Weight estimation (APLS):  $(\text{age} + 4) \times 2$  for 1-10 years.

**22 questions • 249 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.

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**Question 1 | Paediatric Anaphylaxis (12 marks)**

A 7-year-old boy is brought to your ED from a primary school by ambulance with widespread urticaria and respiratory distress 10 minutes after eating a peanut butter sandwich. HR 140, RR 42, SpO<sub>2</sub> 90% RA with wheeze and no stridor, BP 75/45, GCS 15.

**a) Calculate the estimated weight for this 7-year-old (state the formula). (2 marks)**

- **APLS formula** (1-10 years): weight (kg) = (age + 4) × 2 = (7 + 4) × 2 = **22 kg [core]**
- Alternative: Luscombe formula (3 × age + 7) = 28 kg; use measured weight or length-based (Broselow tape) when available

**b) List the 3 most important treatments. State drug, dose, concentration, route. (6 marks)**

- **Adrenaline 10 µg/kg IM** (1:1000 = 1 mg/mL) = 0.01 mL/kg IM into anterolateral thigh = **0.22 mL of 1:1000 IM**; repeat at 5 min if no improvement **[core]**
- **High-flow oxygen** via non-rebreather mask; fluid bolus 0.9% saline **20 mL/kg IV** (= 440 mL); repeat as needed **[core]**
- **Salbutamol nebulised 5 mg in 5 mL O<sub>2</sub>** for ongoing wheeze; consider IV salbutamol infusion 5 µg/kg/min if refractory; nebulised adrenaline 5 mg if upper airway involvement **[core]**
- Hydrocortisone 4 mg/kg IV (controversial — does NOT treat acute anaphylaxis but reduces biphasic risk)
- Antihistamines (cetirizine PO) treat skin/itch only — NOT first-line
- If hypotension persists after 2 IM doses → adrenaline infusion 0.05-0.5 µg/kg/min IV

**c) List 4 indications for inpatient admission after anaphylaxis. (4 marks)**

- Required >1 dose of adrenaline OR adrenaline infusion **[core]**
- Severe initial reaction with airway / respiratory / cardiovascular involvement **[core]**
- History of asthma, especially poorly controlled (↑ risk of fatal reaction) **[core]**
- Slow-onset or biphasic features; or persistent symptoms after 4-6 hours of observation **[core]**
- Idiopathic / unknown trigger
- Lives remote / prolonged transit to medical care
- Inadequate access to emergency response (no carer/inability to self-administer adrenaline)
- Prior protracted reaction

**References:** ASCIA Acute Management of Anaphylaxis Guidelines (current) • APLS Australia/NZ — Advanced Paediatric Life Support (current) • Royal Children's Hospital Melbourne — Clinical Practice Guideline • Tintinalli's Emergency Medicine 9e Ch 109

**Question 2 | Paediatric Asthma — Severe Exacerbation (13 marks)**

A 5-year-old boy with known asthma presents with a severe exacerbation. Estimated weight 18 kg.

**a) List 4 examination signs that classify a SEVERE (but not life-threatening) exacerbation. (4 marks)**

- Marked tachypnoea / dyspnoea (RR >40, marked accessory muscle use) [core]
- Tachycardia >140 (5+ years) — >125 (2-5 years) [core]
- SpO<sub>2</sub> <92% on room air [core]
- Inability to complete sentences / phrases; agitation or distress [core]
- Marked recession (intercostal, subcostal, sternal)
- PEFR 33-50% of predicted (where measurable)
- Loud wheeze on auscultation

**b) List 5 drugs with dose, route, and indication for treatment of severe paediatric asthma. (5 marks)**

- **Salbutamol** — 6-12 puffs MDI + spacer every 20 min × 3 (or nebulised 2.5-5 mg q20min); first-line bronchodilator [core]
- **Ipratropium** 4-8 puffs MDI + spacer (or 250 µg nebulised), 20-min × 3 doses; added bronchodilator in severe attack [core]
- **Prednisolone** 1-2 mg/kg PO (max 60 mg) — single dose if mild/moderate; OR methylprednisolone 1 mg/kg IV q6h in severe [core]
- **Magnesium sulfate** 25-50 mg/kg IV over 20 min (max 2 g) — for severe exacerbation not responding to first-line [core]
- **IV salbutamol** 15 µg/kg IV bolus over 10 min then 1-5 µg/kg/min infusion — life-threatening [core]
- **Aminophylline** 10 mg/kg IV over 1 h then 1 mg/kg/h (rarely used; ICU)
- **Adrenaline** IM if anaphylaxis suspected or peri-arrest
- Heliox 70:30 — limited availability
- Intubation / mechanical ventilation as last resort with ketamine + rocuronium induction

**c) List 4 criteria for safe discharge from ED. (4 marks)**

- Stable for ≥1-4 hours after last bronchodilator burst [core]
- Salbutamol need ≤4-hourly with maintained SpO<sub>2</sub> >94% on room air [core]
- Adequate parental understanding of action plan, spacer technique, and 'when to return' [core]
- Supply of medications + written asthma action plan [core]
- GP / paediatric follow-up arranged within 1 week
- No social red flags (transport, distance, parental anxiety)
- Daytime presentation (caution discharging at night)

**References:** eTG (Therapeutic Guidelines, current) • Royal Children's Hospital Melbourne — Clinical Practice Guideline • APLS Australia/NZ — Advanced Paediatric Life Support (current) • Australian Asthma Handbook (current)

### Question 3 | Bronchiolitis (12 marks)

A 5-month-old boy presents with 3 days of coryza and increasing breathlessness, off feeds. RR 60, SpO<sub>2</sub> 90% RA, mild recession, widespread fine crepitations.

**a) Name 3 viral organisms commonly causing bronchiolitis. (3 marks)**

- **Respiratory syncytial virus (RSV)** — most common (~70%) **[core]**
- Rhinovirus **[core]**
- Human metapneumovirus **[core]**
- Parainfluenza virus
- Influenza A/B
- Adenovirus
- SARS-CoV-2

**b) List 4 features indicating SEVERE bronchiolitis warranting admission. (4 marks)**

- Persistent SpO<sub>2</sub> <90-92% on room air **[core]**
- Severe respiratory distress (RR >70 in infant; marked recession; nasal flaring; grunting) **[core]**
- Apnoeas (especially <6 weeks corrected age or ex-premature) **[core]**
- Inability to feed adequately (<50% normal intake) or signs of dehydration **[core]**
- Age <6 weeks (or corrected for prematurity)
- Significant comorbidity (CHD, chronic lung disease, neuromuscular)
- Social factors — distance from hospital, carer concerns

**c) Complete the table — investigation AND rationale (or 'not indicated'). (3 marks)**

- **Chest X-ray:** NOT routinely indicated (hyperinflation common; can mislead). Reserve for diagnostic uncertainty, severe/atypical course, complications **[core]**
- **NPA / viral PCR:** NOT routinely needed for management; useful only for cohorting / IPC, epidemiology **[core]**
- **Blood gas:** NOT routine; reserve for severe respiratory distress / impending failure to assess CO<sub>2</sub> retention **[core]**
- Routine FBC, U&E, blood culture, urine NOT indicated in typical bronchiolitis

**d) List 2 transmission-reduction measures for hospital. (2 marks)**

- Standard precautions + droplet/contact precautions; private room or cohorting; signage **[core]**
- Hand hygiene before/after every contact; PPE (gowns, gloves, surgical masks); minimise staff rotation between affected and unaffected patients **[core]**
- Restrict visitors with respiratory symptoms; vaccinate household close contacts
- Nirsevimab / RSV monoclonal antibody for at-risk infants per current guidelines

**References:** Royal Children's Hospital Melbourne — Clinical Practice Guideline • eTG (Therapeutic Guidelines, current) • APLS Australia/NZ — Advanced Paediatric Life Support (current) • Cochrane Reviews on bronchiolitis (current)

**Question 4 | Croup (Viral Laryngotracheobronchitis) (10 marks)**

A 2-year-old boy presents with acute onset of barking cough, hoarse voice, and stridor at rest. RR 40, SpO<sub>2</sub> 96% RA, mild intercostal recession. Westley score 4.

**a) Name 3 features used to grade croup severity. (3 marks)**

- Stridor (none / inspiratory only / inspiratory and expiratory / at rest) [core]
- Recession (none / mild / moderate / severe) [core]
- Air entry / breath sounds (normal / decreased / markedly decreased) [core]
- Cyanosis (none / on agitation / at rest)
- Level of consciousness (normal / disoriented)

**b) State 4 management steps for moderate croup with drug, dose, route. (4 marks)**

- Keep child calm with parent — avoid distress (crying worsens obstruction) [core]
- **Dexamethasone 0.6 mg/kg PO** stat (max 12 mg) — first-line; or prednisolone 1 mg/kg if dexamethasone unavailable [core]
- **Nebulised adrenaline 1:1000, 5 mL (5 mg) neat** if severe / stridor at rest; effects 30 min — observe minimum 3-4 hours after [core]
- Supplemental oxygen if SpO<sub>2</sub> <94%; otherwise avoid (oxygen masks distress child) [core]
- Reassessment 30-60 min post-treatment using Westley score
- Avoid intubation unless impending failure; if needed, calm experienced operator with smaller ETT (0.5-1.0 mm less than expected)

**c) List 3 differential diagnoses for stridor in this child. (3 marks)**

- Inhaled foreign body (sudden onset, choking history, unilateral signs) [core]
- Bacterial tracheitis (toxic appearance, high fever, poor response to adrenaline) [core]
- Epiglottitis (rare post-Hib vaccine; toxic, drooling, tripod position, no cough) [core]
- Anaphylaxis with airway oedema
- Retropharyngeal abscess
- Subglottic stenosis / haemangioma (chronic stridor becoming acute)

**References:** Royal Children's Hospital Melbourne — Clinical Practice Guideline • eTG (Therapeutic Guidelines, current) • APLS Australia/NZ — Advanced Paediatric Life Support (current) • Tintinalli's Emergency Medicine 9e Ch 109

**Question 5 | Meningococcal Sepsis (14 marks)**

A 3-year-old unvaccinated boy presents with 2 days of fever, vomiting, lethargy, and a non-blanching purpuric rash that developed this morning. Pulse 180, BP 80/35, T 34.5°C, AVPU = V.

**a) List 3 descriptive features of the rash supporting meningococcal disease. (3 marks)**

- Petechial / purpuric — non-blanching with diascopy ('glass test') [core]
- Distribution: any site, often on trunk and extremities; may be widespread [core]
- Lesions vary in size — pinpoint petechiae to >1 cm purpura / ecchymoses; some may be necrotic centres (purpura fulminans) [core]
- Rapid evolution — may progress in minutes
- Associated with toxic appearance

**b) List 4 most likely bacterial pathogens. (4 marks)**

- *Neisseria meningitidis* (most likely given rash) [core]
- *Streptococcus pneumoniae* [core]
- *Haemophilus influenzae* type b (if unvaccinated) [core]
- Group A streptococcus (toxic shock) [core]
- *Staphylococcus aureus*
- *Salmonella* spp (in immunocompromised)
- *E. coli* (younger infants)

**c) State 4 immediate management priorities. (4 marks)**

- Empirical IV antibiotics within 30 min — ceftriaxone 100 mg/kg IV (max 4 g), single daily dose; do not delay for LP [core]
- Fluid resuscitation — 0.9% saline 20 mL/kg IV stat, repeat × 2 to 60 mL/kg with reassessment after each [core]
- Vasopressors if persistent shock after 40-60 mL/kg — adrenaline IV infusion 0.05-0.5 µg/kg/min via central or IO route [core]
- Early intubation if airway compromise or fluid-refractory shock; ICU referral [core]
- Source control investigations — blood culture (before antibiotics if no delay), meningococcal PCR, lactate, VBG, FBC, coagulation, U&E, glucose, calcium, magnesium
- Notify public health (Group A notifiable disease); post-exposure prophylaxis for close contacts
- Steroids in meningococcal disease — controversial; dexamethasone 0.15 mg/kg IV recommended if *H. influenzae* or pneumococcal meningitis confirmed

**d) List 3 important complications. (3 marks)**

- Disseminated intravascular coagulation (DIC) — purpura fulminans, limb ischaemia, gangrene [core]
- Adrenal haemorrhage (Waterhouse-Friderichsen syndrome) [core]
- Multi-organ failure — AKI, ARDS, myocardial dysfunction [core]
- Limb amputation, skin grafting from purpura fulminans
- Hearing loss / neurological sequelae if meningitis
- Death (case fatality 10-20%)

**References:** eTG (Therapeutic Guidelines, current) • ANZPIC paediatric sepsis pathway • Royal Children's Hospital Melbourne — Clinical Practice Guideline • APLS Australia/NZ — Advanced Paediatric Life Support (current) • Tintinalli's Emergency Medicine 9e Ch 109

**Question 6 | Gastroenteritis and Dehydration (12 marks)**

A 6-month-old boy (weight 8 kg) presents with 48 h of vomiting and diarrhoea. He is alert, sunken eyes, slightly dry mucous membranes, decreased skin turgor. CRT <2 s. HR 140, RR 44.

**a) State the percentage dehydration AND state the formula used to estimate fluid deficit. (2 marks)**

- **Moderate dehydration (5-7%)** — sunken eyes, dry mucous membranes, decreased turgor, but alert with normal CRT and mentation **[core]**
- **Deficit (mL) = % dehydration × weight (kg) × 10 = 5 × 8 × 10 = 400 mL [core]**

**b) Complete the table — for NG and IV rehydration: indication, fluid choice, AND rate/duration. (6 marks)**

- **NG indication:** failed oral trial, vomiting limiting oral intake; PREFERRED route over IV in moderate dehydration without shock **[core]**
- **NG fluid:** oral rehydration solution (e.g. Gastrolyte, Hydralyte) 25 mL/kg/h via NG over first 4 h, then maintenance — total rehydration over 24 h **[core]**
- **IV indication:** shocked / impaired mental status, ileus, severe ongoing losses, failed NG, >10% dehydration **[core]**
- **IV fluid:** **0.9% saline + 5% glucose** (or **Plasma-Lyte 148 + 5% glucose**) — isotonic to avoid hyponatraemia **[core]**
- **Rate:** bolus 10-20 mL/kg if shocked; deficit replacement over 24 h + maintenance (4/2/1 rule); reassess every 4 h **[core]**
- **Maintenance (4/2/1):** 4 mL/kg/h for first 10 kg + 2 mL/kg/h for next 10 kg + 1 mL/kg/h thereafter = 32 mL/h for 8 kg infant **[core]**

**c) List 4 clinical signs to monitor during rehydration. (4 marks)**

- Hourly heart rate, blood pressure, capillary refill, mental status **[core]**
- Urine output (target >1 mL/kg/h); fluid balance chart **[core]**
- Body weight (twice daily) — best objective measure of rehydration **[core]**
- Mucous membranes, skin turgor, fontanelle tension; mental status / alertness **[core]**
- Electrolytes (Na, K, glucose) — if IV rehydration
- Ongoing losses — vomiting and stool volume documented

**References:** Royal Children's Hospital Melbourne — Clinical Practice Guideline • eTG (Therapeutic Guidelines, current) • APLS Australia/NZ — Advanced Paediatric Life Support (current) • Tintinalli's Emergency Medicine 9e Ch 109

**Question 7 | Febrile Convulsion (11 marks)**

A 12-month-old girl presents post-seizure. Fever 39.0°C, lethargy 1 day. Generalised tonic-clonic seizure lasting 4 minutes, self-terminated. Now post-ictal but rousable.

**a) List the 4 criteria for a SIMPLE febrile convulsion. (4 marks)**

- Age 6 months to 6 years (peak 12-18 months) **[core]**
- Generalised (not focal) seizure **[core]**
- Duration <15 minutes (typically <5 min) **[core]**
- Single seizure within 24 h febrile illness; full recovery within 1 hour **[core]**
- No CNS infection, metabolic abnormality, or prior afebrile seizure

**b) Complete the table — for each investigation, state whether routinely indicated and the rationale. (7 marks)**

- **No investigations:** appropriate for SIMPLE FC in well-appearing child >12 months with clear infectious focus (URTI, AOM) **[core]**
- **Urine bag specimen:** only if clean-catch / SPA not feasible — high contamination rate, only useful if NEGATIVE; positive needs confirmation **[core]**
- **Suprapubic aspirate / catheter specimen:** GOLD STANDARD for UTI in infants <3 months; indicated if no clear focus identified **[core]**
- **Blood culture:** indicated if toxic-appearing or other features of sepsis; not routine in well-appearing child **[core]**
- **Chest X-ray:** if respiratory features (tachypnoea, hypoxia, focal chest signs); not routine **[core]**
- **Lumbar puncture:** STRONGLY consider if <12 months, complex FC, persisting altered mental status, signs of meningitis, recent antibiotic use **[core]**
- **FBC:** rarely useful; not routine in simple FC **[core]**

**References:** Royal Children's Hospital Melbourne — Clinical Practice Guideline • APLS Australia/NZ — Advanced Paediatric Life Support (current) • ACEM clinical policies and statements • Tintinalli's Emergency Medicine 9e Ch 109

**Question 8 | Paediatric Status Epilepticus (12 marks)**

A 4-year-old child with known epilepsy presents to ED still seizing 15 minutes after onset despite buccal midazolam at home. Weight 18 kg.

**a) State the stepwise pharmacological management with drug, dose, route at each step (per APLS). (6 marks)**

- **Step 1 (5 min):** midazolam 0.15 mg/kg IV/IM OR buccal/intranasal midazolam 0.3 mg/kg (= 5.4 mg buccal); OR diazepam 0.25 mg/kg IV / 0.5 mg/kg PR **[core]**
- **Step 2 (10 min):** repeat benzodiazepine — midazolam 0.15 mg/kg IV **[core]**
- **Step 3 (20 min):** levetiracetam 40 mg/kg IV over 5 min (max 3 g) — first-line per ConSEPT/EcLiPSE trials; OR phenytoin 20 mg/kg IV over 20 min (= 360 mg) **[core]**
- **Step 4 (40 min):** alternative anti-epileptic (if levetiracetam first-line, then phenytoin; if phenytoin first, then levetiracetam) **[core]**
- **Step 5 (60 min — refractory):** rapid sequence intubation with thiopentone OR ketamine + rocuronium; transfer to ICU on midazolam infusion 0.1-0.5 mg/kg/h **[core]**
- Immediate ABC, high-flow O<sub>2</sub>, IV/IO access, monitoring (ECG, SpO<sub>2</sub>, BP, EtCO<sub>2</sub>), bedside glucose; treat hypoglycaemia with 2 mL/kg 10% dextrose IV **[core]**

**b) List 4 reversible causes to investigate. (4 marks)**

- Hypoglycaemia (always check capillary glucose first) **[core]**
- Electrolyte disturbance — hyponatraemia, hypocalcaemia, hypomagnesaemia **[core]**
- CNS infection — meningitis, encephalitis (LP after seizure controlled and stable) **[core]**
- Toxin / drug ingestion — TCA, anticholinergic, salicylate, isoniazid; consider specific antidotes (pyridoxine for INH, sodium bicarbonate for TCA) **[core]**
- Trauma — non-accidental head injury, accidental TBI
- Metabolic — inborn errors of metabolism, hypoxic-ischaemic injury
- Anti-epileptic non-compliance / sub-therapeutic levels

**c) State 2 doses applicable for THIS 18 kg child. (2 marks)**

- Midazolam 0.15 mg/kg IV = 2.7 mg (round to 3 mg) IV / IM **[core]**
- Levetiracetam 40 mg/kg IV = 720 mg over 5 min **[core]**
- Phenytoin 20 mg/kg = 360 mg IV over 20 min (cardiac monitoring)
- 10% dextrose 2 mL/kg = 36 mL IV if hypoglycaemic

**References:** APLS Australia/NZ — Advanced Paediatric Life Support (current) • Royal Children's Hospital Melbourne — Clinical Practice Guideline • eTG (Therapeutic Guidelines, current) • ConSEPT (2019); EcLiPSE (2019)

**Question 9 | Fever in Young Infant — LP Indications (10 marks)**

A 2-month-old boy presents with fever 38.5°C for 24 hours. He is alert and feeding, but parents report he is 'not himself'.

**a) List 4 examination features that would prompt lumbar puncture. (4 marks)**

- Bulging or tense fontanelle; neck stiffness (rare in <3 months — absence does NOT exclude meningitis) **[core]**
- Altered mental status — irritability not consoled by parent, lethargy, decreased tone **[core]**
- Seizure (especially focal or prolonged) **[core]**
- Petechial / purpuric rash; signs of sepsis **[core]**
- Apnoea / abnormal breathing
- Focal neurological signs
- Toxic appearance (per Yale Observation Scale or clinician gestalt)

**b) List 3 contraindications to immediate LP. (3 marks)**

- Cardiovascular instability / shock — resuscitate first **[core]**
- Raised ICP signs — bulging fontanelle with decreased GCS, posturing, papilloedema, focal neuro signs (CT before LP) **[core]**
- Coagulopathy / thrombocytopaenia (platelets <50, INR >1.5) **[core]**
- Local infection at LP site
- Recent prolonged seizure (focal — defer LP until imaging)

**c) State the empirical IV antibiotic regimen for suspected sepsis in this 2-month-old. (3 marks)**

- **Cefotaxime 50 mg/kg IV q6h** (or ceftriaxone 50 mg/kg IV q24h — avoid in jaundiced neonate) **[core]**
- **+ Benzylpenicillin 60 mg/kg IV q6h** (Listeria, GBS coverage in <3 months) **[core]**
- **+ Aciclovir 20 mg/kg IV q8h** if HSV encephalitis suspected (seizure, focal signs, vesicles, abnormal LP) **[core]**
- Replace cefotaxime with vancomycin 15 mg/kg IV if MRSA risk
- Continue once HSV/listeria excluded; review with results

**References:** eTG (Therapeutic Guidelines, current) • Royal Children's Hospital Melbourne — Clinical Practice Guideline • APLS Australia/NZ — Advanced Paediatric Life Support (current) • Tintinalli's Emergency Medicine 9e Ch 109

**Question 10 | Brief Resolved Unexplained Event (BRUE) (11 marks)**

*An 8-week-old girl is brought to ED at 3 am after a brief (15-20 sec) episode of cyanosis, floppiness, and apnoea 10 minutes after a breastfeed. She has been well since. Born at 36 weeks via forceps. No other history.*

**a) List the 5 criteria defining a BRUE (per AAP 2016). (5 marks)**

- Age <1 year **[core]**
- **Brief** (typically <1 minute) **[core]**
- **Resolved** — back to baseline at the time of evaluation **[core]**
- **Unexplained** — no identifiable medical cause after history and examination **[core]**
- Characterised by ≥1 of: cyanosis or pallor; absent, decreased, or irregular breathing; marked change in tone (hyper/hypotonia); altered level of responsiveness **[core]**

**b) List 3 broad differential categories AND a specific example for each. (3 marks)**

- **GI** — gastro-oesophageal reflux disease, infant feeding difficulty **[core]**
- **Infection** — pertussis, RSV, UTI, meningitis, sepsis **[core]**
- **Neurological** — seizure, central apnoea, raised ICP **[core]**
- **Cardiac** — arrhythmia (long QT, SVT), structural heart disease
- **Metabolic** — hypoglycaemia, electrolyte disturbance, inborn errors of metabolism
- **Inflicted / NAI** — abusive head trauma, smothering, Munchausen by proxy
- **Toxic** — poisoning, drug exposure

**c) State 3 features defining LOWER-RISK BRUE allowing consideration of discharge. (3 marks)**

- Age >60 days at presentation **[core]**
- Gestational age ≥32 weeks AND post-conceptual age ≥45 weeks **[core]**
- First (not recurrent) BRUE; duration <1 min; no CPR required by trained provider; no concerning history (no NAI red flags, no family history of sudden death) and normal exam **[core]**
- Note: this 8-week patient is HIGHER-RISK (post-conceptual age ~44 weeks, ex-premature, episode 15-20 s)

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**References:** Royal Children's Hospital Melbourne — Clinical Practice Guideline • AAP BRUE guideline 2016 • APLS Australia/NZ — Advanced Paediatric Life Support (current)

**Question 11 | Intussusception (12 marks)**

A 10-month-old boy presents with episodic inconsolable crying with knee-drawing, intermittent vomiting, and red currant jelly stool. AVPU = A. Pulse 140, BP 85/45, RR 26.

**a) List 4 clinical features supporting intussusception. (4 marks)**

- Episodic colicky abdominal pain — child draws up knees, screams, then settles between episodes **[core]**
- Vomiting — initially non-bilious, becomes bilious as obstruction progresses **[core]**
- **Red currant jelly stool** (late sign — blood and mucus from ischaemic mucosa) **[core]**
- Palpable sausage-shaped mass in right upper quadrant (Dance sign) **[core]**
- Pallor and lethargy between episodes
- Age 6-36 months (peak 5-9 months); male predominance
- Recent viral illness (often gastroenteritis-like)

**b) Name the imaging modality of choice AND state 3 features. (3 marks)**

- **Abdominal ultrasound** — first-line; sensitivity 98-100%, specificity 88-100% **[core]**
- **Target / 'doughnut' sign** on transverse view — concentric rings (inner intussusceptum, outer intussusciens) **[core]**
- **'Pseudo-kidney' sign** on longitudinal view **[core]**
- Free fluid, lymphadenopathy, lead point (Meckel's, polyp, lymphoma in older children)
- Plain AXR may show paucity of bowel gas in RUQ, mass, or features of obstruction (less sensitive)

**c) List 2 reduction options AND state when each is used. (3 marks)**

- **Air enema reduction** (or contrast enema) — first-line if stable, no peritonitis, no perforation; success ~85-90% **[core]**
- **Surgical reduction** — laparoscopic / open; indicated if peritonitis, perforation, failed enema reduction, or peritoneal contamination suspected **[core]**
- Second air enema attempt may be considered if clinically stable and partial reduction at first attempt

**d) List 2 complications of intussusception. (2 marks)**

- Bowel ischaemia / perforation (medical emergency) **[core]**
- Peritonitis / sepsis **[core]**
- Recurrence (5-10% after enema; lower after surgical)
- Bowel obstruction with electrolyte disturbance, dehydration

**References:** Royal Children's Hospital Melbourne — Clinical Practice Guideline • Cameron's Textbook of Paediatric Emergency Medicine 3e • Tintinalli's Emergency Medicine 9e Ch 109

**Question 12 | Non-Accidental Injury (13 marks)**

A 6-month-old infant is brought to the ED with a swollen, bruised left thigh. The mother states the child fell off the couch. X-ray confirms a spiral fracture of the femur. You are concerned about non-accidental injury.

**a) List 5 historical features supporting NAI. (5 marks)**

- **Inconsistent or changing history** — different versions from different carers; story changes over time **[core]**
- **Mechanism inconsistent with injury** — infant unable to walk, mechanism cannot explain spiral fracture (twisting force) **[core]**
- **Delay in presentation** — significant interval between injury and seeking care **[core]**
- **Fracture in non-ambulatory child** — concerning at any age <1 year; femur fracture in pre-walking infant is high suspicion **[core]**
- Previous attendances for injury or other concerns **[core]**
- Family history — domestic violence, drug/alcohol use, carer mental health concerns
- Multiple presentations to different hospitals ('forum shopping')
- History of injury 'caused by sibling' (especially infant siblings)

**b) List 3 OTHER injury patterns suspicious for NAI (excluding fractures). (3 marks)**

- **Bruising in pre-mobile infant** ('those who don't cruise rarely bruise'); bruises in unusual sites (face, ears, abdomen, genitalia, buttocks) **[core]**
- **Burns** — patterned burns (cigarette, iron, scald with sharp demarcation) **[core]**
- **Bite marks**, finger-tip bruises, ligature marks **[core]**
- Retinal haemorrhages with subdural haemorrhage (abusive head trauma / shaken baby syndrome)
- Genital/perianal injuries; STIs in pre-pubertal child
- Visceral injuries — duodenal haematoma, pancreatic injury

**c) State 5 management priorities for this case. (5 marks)**

- **Treat the medical injury** — analgesia, splint, paediatric orthopaedic review **[core]**
- **Mandatory notification to child protection** per state legislation (e.g. NSW DCJ, Vic DFFH); ALL doctors are mandatory reporters in Australia **[core]**
- **Detailed contemporaneous documentation** with diagrams / photographs (with consent), exact verbatim history; preserve clothing as evidence **[core]**
- **Admit to hospital** — provides safety, allows skeletal survey (mandatory in <2 y with suspected NAI), social work assessment **[core]**
- **Skeletal survey + retinal exam** within 24 h to identify other occult injuries **[core]**
- Examine siblings for similar concerns
- Inform carers respectfully of concerns and process
- Multidisciplinary review — paediatrician, social work, police if escalation needed
- If parent/carers requests discharge — apply for emergency hospital order or police hold per state legislation

**References:** Royal Children's Hospital Melbourne — Clinical Practice Guideline • ACEM clinical policies and statements • RACP NAI guidelines • State child protection legislation

**Question 13 | Neonatal Jaundice (12 marks)**

A 7-day-old breastfed boy presents with jaundice. Parents report he is feeding well, but appears more yellow today.

**a) List 6 causes of neonatal jaundice AND a cardinal assessment finding for each. (6 marks)**

- **Physiological jaundice** — onset day 2-3, resolves day 7-10; total bilirubin  $<250 \mu\text{mol/L}$  [core]
- **Breastmilk jaundice** — well-fed, gaining weight; persists weeks 2-4 of life [core]
- **Breastfeeding jaundice** (poor feeding) — weight loss  $>10\%$ , dehydration, decreased urine output [core]
- **Haemolysis** — ABO/Rh incompatibility (Coombs +), G6PD, hereditary spherocytosis; pallor, raised reticulocytes, low Hb [core]
- **Sepsis** — fever, lethargy, poor feeding, raised WCC, raised CRP [core]
- **Biliary atresia** — pale stools, dark urine, **conjugated** hyperbilirubinaemia  $>20\%$  total or  $>25 \mu\text{mol/L}$  (URGENT — surgical intervention by 8 weeks) [core]
- **Hypothyroidism** (congenital) — prolonged jaundice, abnormal Guthrie / TSH
- **Crigler-Najjar / Gilbert syndrome** — unconjugated, no haemolysis, persistent
- **Cephalohaematoma / extensive bruising** — visible on exam

**b) List 4 investigations to perform AND justification. (4 marks)**

- **Total and conjugated (direct) bilirubin** — plot on age-specific nomogram (Bhutani / NICE); differentiates conjugated (always pathological) [core]
- **FBC + film + reticulocytes** — haemolysis screen; blood group + Coombs / DAT — alloimmune [core]
- **U&E; + LFTs** — hydration; liver dysfunction [core]
- **TFTs and Guthrie / newborn screen result** — congenital hypothyroidism; metabolic disorders [core]
- G6PD screen (especially Mediterranean, Asian, African ethnicity)
- Septic screen (FBC, CRP, blood culture, urine, LP if ill-appearing)
- Abdominal ultrasound if conjugated jaundice suspected — biliary atresia

**c) State 2 indications for phototherapy or exchange transfusion. (2 marks)**

- **Phototherapy**: total bilirubin above the age-specific phototherapy line on Bhutani / NICE nomogram (varies by gestational age and risk factors) [core]
- **Exchange transfusion**: total bilirubin above exchange line; signs of acute bilirubin encephalopathy (lethargy, poor feeding, hypertonia, opisthotonos, retrocollis); failure to respond to intensive phototherapy [core]

**References:** Royal Children's Hospital Melbourne — Clinical Practice Guideline • NICE NG98 Neonatal jaundice • APLS Australia/NZ — Advanced Paediatric Life Support (current) • eTG (Therapeutic Guidelines, current)

## Question 14 | Neonatal Collapse — Duct-Dependent CHD (12 marks)

A 4-week-old girl is brought in by ambulance — found by mother grey and floppy. On arrival: centrally cyanotic, mottled, weak respiratory effort, CRT 5 sec, unrecordable saturations. Mother reports known congenital heart defect awaiting repair.

### a) List 4 immediate preparation steps before arrival. (4 marks)

- Prepare resuscitation bay — neonatal resuscitaire, warmer, suction; weigh on Broselow tape **[core]**
- Draw up neonatal resuscitation drugs — adrenaline (1:10 000), 0.9% saline 10 mL/kg, dextrose 10% 2 mL/kg, prostaglandin E1 **[core]**
- Activate paediatric / neonatal team — paediatrician, anaesthetics (neonatal intubation), retrieval service **[core]**
- Prepare for intubation — uncuffed ETT 3.0-3.5 mm; umbilical venous access (UVC) kit **[core]**
- Notify retrieval service (NETS / WCH) for paediatric cardiology centre transfer

### b) Complete the table — for each form of duct-dependent circulation, give 2 examples. (4 marks)

- **Duct-dependent SYSTEMIC circulation:** hypoplastic left heart syndrome, critical aortic stenosis / interrupted aortic arch / coarctation **[core]**
- **Duct-dependent PULMONARY circulation:** tetralogy of Fallot, pulmonary atresia / tricuspid atresia / critical pulmonary stenosis **[core]**
- **Duct-dependent for MIXING:** transposition of the great arteries (TGA) **[core]**
- Total anomalous pulmonary venous return (obstructed) — duct-independent but presents similarly

### c) State the dose, route, and rationale for prostaglandin E1. (2 marks)

- **Prostaglandin E1 (alprostadil) IV infusion 5-10 ng/kg/min** (start 5; up to 100 if no response); central or peripheral access — does not require dilution to specific concentration **[core]**
- Reopens / maintains patency of ductus arteriosus, restoring systemic, pulmonary, or mixed flow depending on lesion **[core]**
- Side effects: APNOEA (anticipate intubation), fever, flushing, hypotension

### d) List 2 OTHER causes of neonatal collapse to consider. (2 marks)

- **Sepsis** (Group B strep, E. coli, Listeria) — broad-spectrum antibiotics: cefotaxime + benzylpenicillin **[core]**
- **Inborn errors of metabolism / congenital adrenal hyperplasia** — hypoglycaemia, hyperkalaemia, metabolic acidosis **[core]**
- **Non-accidental injury** — abusive head trauma, smothering
- **Severe dehydration / pyloric stenosis** — vomiting, weight loss

**References:** APLS Australia/NZ — Advanced Paediatric Life Support (current) • Royal Children's Hospital Melbourne — Clinical Practice Guideline • ACEM clinical policies and statements • Tintinalli's Emergency Medicine 9e Ch 109

**Question 15 | Salt-Wasting Crisis (CAH) (10 marks)**

A 10-day-old baby boy (4 kg) presents flat, not feeding, vomiting, dry mucous membranes. VBG: pH 7.28, pCO<sub>2</sub> 28, Na 128, K 7.1, Cl 88, HCO<sub>3</sub> 13, BE -6, glucose 2.2.

**a) List 3 most important blood gas abnormalities. (3 marks)**

- **Hyponatraemia** (Na 128) with **hyperkalaemia** (K 7.1) — salt-wasting **[core]**
- **Metabolic acidosis** with respiratory compensation (HCO<sub>3</sub> 13, pCO<sub>2</sub> 28) **[core]**
- **Hypoglycaemia** (glucose 2.2) **[core]**

**b) List 3 differential diagnoses other than CAH. (3 marks)**

- Sepsis with shock **[core]**
- Pyloric stenosis (typically hypochloraemic metabolic alkalosis — but may have profound dehydration) **[core]**
- Inborn errors of metabolism (organic acidaemia, urea cycle defects) **[core]**
- Duct-dependent congenital heart disease
- Acute kidney injury
- Galactosaemia or other endocrinopathies

**c) List 2 specific tests to confirm congenital adrenal hyperplasia. (2 marks)**

- **17-hydroxyprogesterone (17-OHP)** — markedly elevated in 21-hydroxylase deficiency (most common form, >90%) **[core]**
- **Plasma cortisol, aldosterone, renin; ACTH; serum androgens (DHEAS, androstenedione, testosterone)** **[core]**
- Adrenal androgen profile
- Newborn screening result (Guthrie card includes 17-OHP)

**d) State 2 immediate treatments with dose. (2 marks)**

- **Hydrocortisone 25 mg IV STAT** (or 100 mg/m<sup>2</sup>); then 25 mg q6h, tapering — provides glucocorticoid AND mineralocorticoid effect at high dose **[core]**
- **0.9% saline 20 mL/kg IV bolus** (= 80 mL); repeat as needed for shock; THEN **0.9% saline + 5-10% dextrose** at maintenance + deficit replacement **[core]**
- **Treat hyperkalaemia** if K >7 with ECG changes — calcium gluconate 0.5 mL/kg of 10% IV; consider salbutamol nebulised; insulin / glucose if persistent
- **10% dextrose 2 mL/kg IV** for hypoglycaemia

**References:** Royal Children's Hospital Melbourne — Clinical Practice Guideline • APLS Australia/NZ — Advanced Paediatric Life Support (current) • eTG (Therapeutic Guidelines, current) • ACEM clinical policies and statements

**Question 16 | Pyloric Stenosis (10 marks)**

A 3-week-old male infant is brought to ED by his mother with progressive non-bilious projectile vomiting after every feed for 5 days. He has lost 200 g since birth. Hungry after feeds. VBG: pH 7.52,  $\text{HCO}_3^-$  32, Cl 84, K 3.0.

**a) State the diagnosis AND name the classical biochemical abnormality. (3 marks)**

- **Hypertrophic pyloric stenosis** — typically presents 2-12 weeks of age, male predominance 4:1, first-born **[core]**
- **Hypochloraemic, hypokalaemic metabolic alkalosis** with paradoxical aciduria **[core]**

**b) List 3 features of clinical examination supporting this diagnosis. (3 marks)**

- Visible gastric peristalsis (left to right across upper abdomen) during/after feed **[core]**
- Palpable 'olive' (pyloric mass) in right upper quadrant after vomit **[core]**
- Signs of dehydration — sunken fontanelle, dry mucosa, reduced skin turgor, oliguria **[core]**
- Hungry / eager to feed despite vomiting (hallmark)
- Failure to thrive — weight below birth weight or static

**c) Name the diagnostic imaging investigation AND state 2 diagnostic criteria. (2 marks)**

- **Pyloric ultrasound** **[core]**
- Pyloric muscle thickness  $\geq 3$  mm AND pyloric channel length  $\geq 15$  mm; failure of relaxation after feed **[core]**

**d) State 2 management priorities — emphasise the order. (2 marks)**

- **FLUID AND ELECTROLYTE CORRECTION FIRST** — 0.9% saline 10-20 mL/kg bolus if shocked; then 0.45% saline + 5% dextrose with K supplementation to correct alkalosis and electrolytes BEFORE surgery (alkalosis worsens post-anaesthetic apnoea risk) **[core]**
- **Surgical pyloromyotomy (Ramstedt's procedure)** — only AFTER biochemistry is corrected (Cl  $>100$ ,  $\text{HCO}_3^- <28$ ) **[core]**
- NG decompression if persistent vomiting
- Avoid empirical antibiotics — not infective
- Paediatric surgical consultation

**References:** Royal Children's Hospital Melbourne — Clinical Practice Guideline • Cameron's Textbook of Paediatric Emergency Medicine 3e • Tintinalli's Emergency Medicine 9e Ch 109

**Question 17 | Paediatric DKA (12 marks)**

A 9-year-old girl with new diagnosis presents with vomiting, polyuria, polydipsia, deep rapid breathing. Weight 30 kg. BSL 27, pH 7.10,  $\text{HCO}_3^-$  8, ketones 5+. GCS 14.

**a) State the 3 diagnostic criteria for paediatric DKA. (3 marks)**

- **Hyperglycaemia** — blood glucose  $>11$  mmol/L [core]
- **Acidosis** — venous pH  $<7.3$  OR  $\text{HCO}_3^- <15$  [core]
- **Ketonaemia** — blood ketones  $>3$  mmol/L (or significant ketonuria) [core]

**b) State 6 specific paediatric DKA management principles. (6 marks)**

- **Cautious fluid resuscitation** — single 10 mL/kg 0.9% saline bolus only if shocked, then deficit + maintenance over **48 hours** (avoid  $>4$  L/m<sup>2</sup>/24 h to reduce cerebral oedema risk) [core]
- **Insulin 0.05-0.1 unit/kg/hour IV infusion STARTED 1 HOUR AFTER fluid resuscitation** — do NOT bolus insulin (cerebral oedema, rapid osmolar shift) [core]
- **Add glucose to fluid when BSL  $<14-17$**  — switch to 0.9% saline + 5% dextrose; do NOT stop insulin (continues to clear ketones) [core]
- **Potassium replacement** — 40 mmol/L K added to maintenance fluid once urine output established (K shifts intracellularly with insulin → hypokalaemia) [core]
- **Hourly neurological observations** — watch for cerebral oedema (headache, irritability, decreased GCS, papilloedema, posturing, Cushing's triad) [core]
- **Bicarbonate AVOIDED** in paediatric DKA — associated with worsened outcomes / cerebral oedema [core]
- Continuous monitoring — ECG, SpO<sub>2</sub>, BP, GCS, hourly BSL and ketones, 2-4 hourly U&E; and gas
- ICU / HDU referral; paediatric endocrinology
- Identify precipitant — infection, missed insulin, new diagnosis

**c) State 3 immediate steps if cerebral oedema develops. (3 marks)**

- **Mannitol 0.5-1 g/kg IV over 10-15 min OR 3% hypertonic saline 5 mL/kg IV** [core]
- **Reduce IV fluid rate by 1/3**; head-up 30°; secure airway / intubate if GCS  $<8$  (avoid hyperventilation - worsens outcome) [core]
- Urgent CT head (after stabilisation); transfer to PICU; senior support [core]
- Repeat osmotherapy at 30 min if no improvement

**References:** ISPAD/APEG paediatric DKA guideline 2022 • APLS Australia/NZ — Advanced Paediatric Life Support (current)  
• Royal Children's Hospital Melbourne — Clinical Practice Guideline

**Question 18 | Toddler Fracture (10 marks)**

A 2-year-old girl presents reluctant to weight-bear after her mother says she pulled a drawer onto her foot. Tibial X-ray shows undisplaced spiral fracture of the distal tibial diaphysis.

**a) List 4 examination findings to look for in this child. (4 marks)**

- Tenderness on palpation of the tibial shaft (may be subtle); pain with rotation **[core]**
- Refusal to weight-bear / antalgic gait if able; observe gait barefoot if can mobilise **[core]**
- Skin / soft tissue assessment — bruising patterns; check for ecchymosis or swelling at fracture site **[core]**
- Neurovascular status — distal pulses, capillary refill, sensation, motor function **[core]**
- Examine knee, ankle, opposite limb; full musculoskeletal screen including spine for occult injury
- General examination — bruises elsewhere, growth, developmental milestones

**b) List 3 pharmacological analgesia options with drug, dose, route, and one adverse effect. (3 marks)**

- **Paracetamol 15 mg/kg PO/PR q4h** (max 90 mg/kg/day) — hepatotoxicity in overdose; minimal at therapeutic doses **[core]**
- **Ibuprofen 10 mg/kg PO q6h** (max 30 mg/kg/day) — GI upset, renal impairment in dehydrated child; avoid <3 months **[core]**
- **Intranasal fentanyl 1.5 µg/kg** (via mucosal atomiser) — respiratory depression, drowsiness; alternative to IV in young children **[core]**
- Oxycodone 0.1-0.2 mg/kg PO — sedation, vomiting, constipation
- Morphine 0.1-0.2 mg/kg IV — sedation, hypotension, respiratory depression
- Topical lignocaine / EMLA for procedures

**c) List 3 features that would prompt concern for non-accidental injury in this case. (3 marks)**

- Mechanism inconsistent with injury — drawer falling does not typically cause spiral tibial fracture (twisting force required) **[core]**
- Delay in presentation; changing or implausible history **[core]**
- Multiple bruises in unusual sites or different stages of healing **[core]**
- Other unexplained injuries (ear, frenulum, abdomen)
- Carer behaviour — minimisation, hostility, lack of concern, evasive answers
- Pre-mobile child with fracture (less applicable to a 2-year-old who walks but spiral # in toddler warrants thought)

**References:** Royal Children's Hospital Melbourne — Clinical Practice Guideline • ACEM clinical policies and statements • APLS Australia/NZ — Advanced Paediatric Life Support (current) • Tintinalli's Emergency Medicine 9e Ch 109

**Question 19 | Foreign Body Aspiration (11 marks)**

A 3-year-old boy presents with progressively worsening wheeze and SOB over 2 days. RR 50, SpO<sub>2</sub> 89% on 6 L O<sub>2</sub>, T 37.4. Wheeze is unilateral on right upper zone.

**a) List 6 causes of wheeze in a child AND 2 historical features supporting each. (6 marks)**

- **Asthma** — recurrent episodes; atopy / family history; trigger (URTI, exercise, allergen) **[core]**
- **Viral-induced wheeze / bronchiolitis** — preceding URTI symptoms; age <2 years **[core]**
- **Foreign body aspiration** — sudden onset of choking; UNILATERAL findings; ages 1-3 years **[core]**
- **Anaphylaxis** — exposure to allergen; associated urticaria, angio-oedema, GI symptoms **[core]**
- **Pneumonia / bronchitis** — fever; productive cough; localised crackles
- **Cardiac (heart failure / vascular ring)** — feeding difficulty, sweating, hepatomegaly
- **Cystic fibrosis** — failure to thrive; chronic cough; family history
- **Tracheobronchomalacia** — chronic cough, stridor, noisy breathing

**b) List 3 CXR findings supporting inhaled FB. (3 marks)**

- Unilateral hyperinflation (especially on expiratory film) — air-trapping distal to FB **[core]**
- Unilateral atelectasis / collapse **[core]**
- Mediastinal shift on expiration (towards unaffected side) — ball-valve mechanism **[core]**
- Radio-opaque foreign body (uncommon — most are radiolucent organic matter)
- Unilateral pneumonic consolidation post-obstruction

**c) State 2 management priorities. (2 marks)**

- **Urgent referral for rigid bronchoscopy** under general anaesthetic — definitive diagnostic and therapeutic; performed by paediatric ENT / thoracic surgeon **[core]**
- **Maintain calm, position of comfort, oxygen** while awaiting bronchoscopy — DO NOT perform back blows / abdominal thrusts in conscious child with partial obstruction (may dislodge to complete obstruction) **[core]**
- If complete obstruction develops — BLS: 5 back blows then 5 chest thrusts (infant) or abdominal thrusts (child >1 year)
- Prophylactic antibiotics post-removal if post-obstructive pneumonia

**References:** Royal Children's Hospital Melbourne — Clinical Practice Guideline • APLS Australia/NZ — Advanced Paediatric Life Support (current) • ANZCOR Guidelines (current) • Tintinalli's Emergency Medicine 9e Ch 109

**Question 20 | Paediatric Drowning (10 marks)**

A 3-year-old boy was found face-down in a pool 5 minutes before paramedic arrival. CPR commenced by mother. On arrival to ED: GCS 6, RR 12 (assisted), HR 60, T 32°C, SpO<sub>2</sub> 88% on bag-mask.

**a) List 4 immediate management priorities. (4 marks)**

- **Airway and ventilation** — early intubation with cuffed ETT (size = age/4 + 4 = 4.0 mm); PEEP 5-10 to recruit alveoli; monitor EtCO<sub>2</sub> [core]
- **Continue CPR per ANZCOR paediatric ALS** if no pulse — 15:2 ratio, 100/min compressions; continue resuscitation until normothermic if hypothermic arrest [core]
- **Active rewarming** — warm fluids, warm blankets, warm humidified ventilation; consider ECMO rewarming if temp <30°C with arrest (retrieval centre) [core]
- **C-spine precautions** if mechanism suggests trauma (diving, fall into pool); maintain in-line stabilisation [core]
- IV/IO access; bedside glucose; treat hypoglycaemia 2 mL/kg 10% dextrose
- NG decompression (gastric distension common after rescue ventilation)
- Targeted temperature management 32-36°C for 24-48 h post-arrest

**b) List 3 important investigations. (3 marks)**

- Arterial blood gas — assess oxygenation, ventilation, acid-base, lactate [core]
- CXR — pulmonary oedema, aspiration, pneumothorax post-CPR [core]
- Bedside echocardiography — wall motion, ejection fraction, pericardial effusion [core]
- FBC, U&E, glucose, coagulation; troponin
- CT head if depressed GCS not explained, suspected trauma, focal neurology
- ECG — long QT, Brugada (consider triggers for drowning)

**c) List 3 prognostic factors. (3 marks)**

- **Submersion duration** — <5 min favourable, >25 min very poor [core]
- **Time to ROSC / first effective ventilation** — shorter is better [core]
- **Initial rhythm and GCS on arrival** — asystole / fixed dilated pupils / GCS 3 are poor prognostic signs [core]
- Water temperature — cold water (rapid hypothermia) may be neuroprotective
- Witnessed vs unwitnessed; bystander CPR commenced quickly

**References:** ANZCOR Guideline 12 — Paediatric Advanced Life Support • APLS Australia/NZ — Advanced Paediatric Life Support (current) • Royal Children's Hospital Melbourne — Clinical Practice Guideline • Tintinalli's Emergency Medicine 9e Ch 199

**Question 21 | Paediatric Resuscitation — Sizing and Drugs (10 marks)**

A 3-year-old boy (estimated weight 14 kg) is brought in with cardiac arrest. Your team needs equipment and drug doses calculated rapidly.

**a) Calculate ETT size, ETT depth at lip, defibrillation energy, AND fluid bolus volume for this child. (4 marks)**

- **ETT size** =  $(\text{age}/4) + 4 = (3/4) + 4 = 4.5 \text{ mm uncuffed}$  (or 4.0 mm cuffed) [core]
- **ETT depth at lip** =  $(\text{age}/2) + 12 = (3/2) + 12 = 13.5 \text{ cm}$ ; or ETT size  $\times 3 = 13.5 \text{ cm}$  [core]
- **Defibrillation** = **4 J/kg** = 56 J biphasic [core]
- **Fluid bolus** = 10-20 mL/kg = 140-280 mL 0.9% saline (10 mL/kg in DKA, sepsis with caution; 20 mL/kg in trauma) [core]

**b) State the doses of 4 essential resuscitation drugs. (4 marks)**

- **Adrenaline** 10 µg/kg IV/IO = 140 µg = 1.4 mL of 1:10 000; q3-5min [core]
- **Amiodarone** 5 mg/kg IV/IO = 70 mg (for VF/pVT after 3rd shock) [core]
- **Adenosine** 100 µg/kg IV first dose (= 1.4 mg); 200 µg/kg second dose; rapid push with flush [core]
- **10% Dextrose** 2 mL/kg IV for hypoglycaemia = 28 mL [core]
- Atropine 20 µg/kg (min 100 µg, max 600 µg)
- Calcium gluconate 10% 0.5 mL/kg IV (for hyperkalaemia, calcium-channel blocker overdose)
- Naloxone 10 µg/kg IV

**c) State 2 paediatric-specific reversible causes (4 H's and 4 T's). (2 marks)**

- **Hypoxia** — most common cause of paediatric arrest; respiratory cause predominates over primary cardiac [core]
- **Hypovolaemia** — sepsis, dehydration, haemorrhage [core]
- **Hypoglycaemia / hypokalaemia / hyperkalaemia / hypothermia**
- **Tension PTX, tamponade, toxins, thromboembolism**

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**References:** APLS Australia/NZ — Advanced Paediatric Life Support (current) • ANZCOR Guideline 12 — Paediatric Advanced Life Support • Royal Children's Hospital Melbourne — Clinical Practice Guideline

**Question 22 | Paediatric Mental Health and Behavioural Crisis (10 marks)**

A 14-year-old girl presents to ED following an impulsive ingestion of unknown number of paracetamol tablets after an argument with her parents. She is now agitated, demanding to leave.

**a) List 3 immediate medical priorities for the paracetamol ingestion. (3 marks)**

- **Establish ingestion details** — time, dose (per kg), formulation (immediate vs sustained release), co-ingestants; calculate dose-mg/kg **[core]**
- **4-hour paracetamol level** (post-ingestion); plot on Rumack-Matthew nomogram. If known dose >200 mg/kg or >10 g, start NAC empirically without waiting **[core]**
- **NAC infusion if indicated** — 200 mg/kg over 4 h, then 100 mg/kg over 16 h (per current Australian protocol); do NOT delay **[core]**
- Consider activated charcoal 1 g/kg PO if presents within 1 h of immediate-release ingestion (and patient cooperative)
- Bloods — paracetamol, INR, ALT, U&E, lactate, VBG
- Consult Poisons Information Centre 13 11 26

**b) List 4 components of de-escalation strategy. (4 marks)**

- Calm verbal approach, low voice, respectful communication; offer choices **[core]**
- Quiet, low-stimulus environment; safe staffing ratio; involve parent/familiar adult if helpful **[core]**
- Acknowledge emotions; validate without colluding; explain medical concerns clearly **[core]**
- Offer comfort measures (food, warmth, blanket); address physical needs (toileting) **[core]**
- Avoid threats, ultimatums, restraint as first-line
- Mental Health team / CYMHS engagement early

**c) State 3 considerations regarding mandatory holding this 14-year-old in ED. (3 marks)**

- **Mental Health Act provisions** (state-specific): involuntary admission for assessment if mentally ill or disordered AND risk to self/others; minimum age and process varies **[core]**
- **Common law / duty of care** — clinicians may use reasonable force to prevent self-harm; document carefully **[core]**
- **Capacity (Gillick competence) assessment** — can the minor refuse treatment? Even with capacity, life-saving treatment can usually be given against wishes by parental consent OR court order **[core]**
- Mandatory CYMHS / mental-health team review; safety plan, follow-up arranged
- Consider parental notification, child protection involvement if NAI / safeguarding concerns
- Pharmacological sedation — use cautiously; midazolam 0.05-0.1 mg/kg IM or olanzapine 5-10 mg PO/IM

**References:** eTG (Therapeutic Guidelines, current) • Royal Children's Hospital Melbourne — Clinical Practice Guideline • ACEM clinical policies and statements • ACEM Acute Behavioural Disturbance Position Statement • State Mental Health Act