



PAEDIATRIC FELLOWSHIP EXAMINATION REPORT

August / November 2011

This report is prepared to provide candidates, tutors and their Supervisors of training with information about the way in which the Examiners assessed the performance of candidates in the Examination. Answers provided are not model answers but guides to what was expected. Candidates should discuss the report with their tutors so that they may prepare appropriately for the future examinations

The exam included two 2.5 hour written papers comprising of 15 ten-minute short answer questions each. Candidates were required to score at least 50% in the written paper before being eligible to sit the oral part of the exam. The oral exam comprised 8 interactive vivas and two separate hot cases.

The tables below provide an overall statistical analysis as well as information regarding performance in the individual sections. A comparison with the previous three examinations is also provided.

The Written section of the Examination was held in Brisbane, Melbourne and Sydney. The Clinical and Viva sections of the examination were held in Brisbane at the Mater Children's Hospital.

STATISTICAL REPORT

Overall pass rates	2008	2009	2010	2011
Total number presenting (written + carry + OTS)	5	6	13	10
Total number invited to the oral section	4	5	8	6
Total number successful at orals	4	5	7	5
	100%	100%	88%	83%
Overall pass rate	4/5	5/6	7/13	5/10
	80%	83%	54%	50%

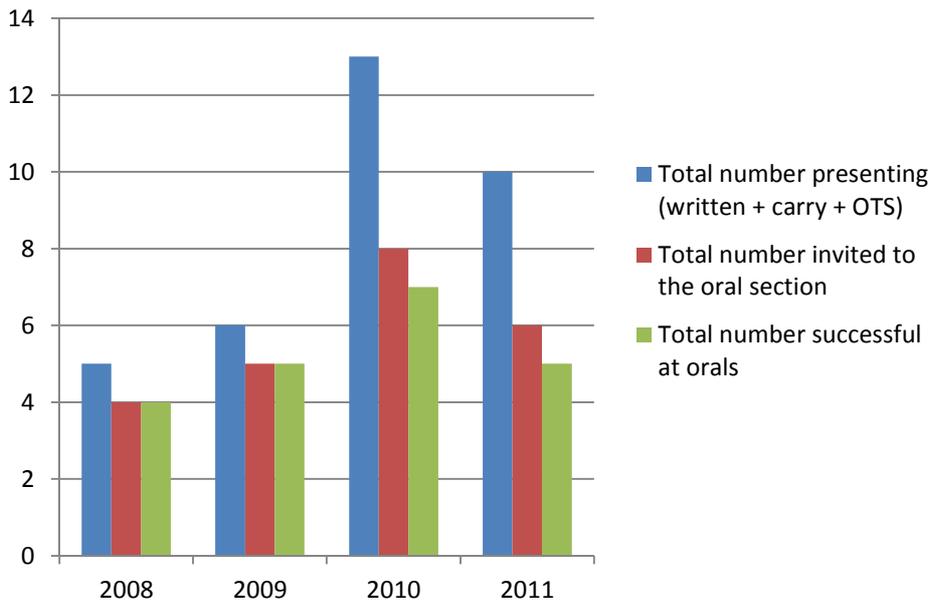
Sectional pass rates	2011	
	Pass rate	Highest individual mark
Hot Case 1	83%	90%
Hot Case 2	50%	67%

Total number successful in the Hot Case section	5
Overall Hot Case pass rate	83%

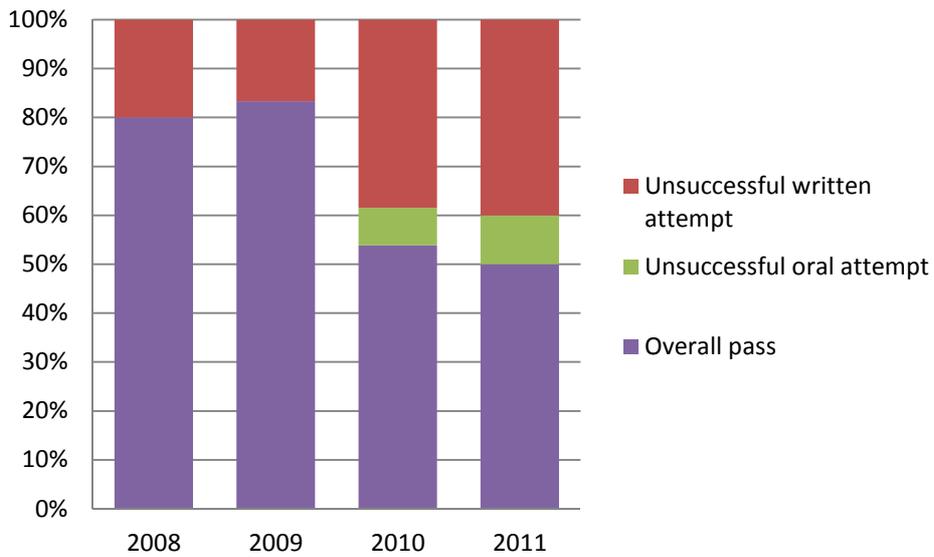
Sectional pass rates	2011	
	Pass rate	Highest individual mark
Viva 1	83%	75%
Viva 2	100%	68%
Viva 3	100%	95%
Viva 4	33%	65%
Viva 5	33%	88%
Viva 6	67%	72%
Viva 7	17%	50%
Viva 8	33%	80%

Total number successful in the Viva section	5
Overall Viva pass rate	83%

Overall performance



Overall performance



WRITTEN EXAMINATION REPORT

Question 1

A four year old girl is admitted to your PICU following an uncomplicated extracardiac Fontan procedure. Cardiopulmonary bypass time was 70 minutes. Her underlying diagnosis is an unbalanced atrioventricular septal defect (AVSD) with a dominant left ventricle. She has previously had a Damus Kaye Stanzel anastomosis and a Blalock-Taussig shunt as a neonate, followed by a bidirectional cavopulmonary shunt at three months of age.

Pre-operative echocardiogram:

Good systolic ventricular function with mild A-V valve regurgitation.

Pre-operative cardiac catheter:

Mean Pulmonary Artery Pressure: 14 mmHg
Left Ventricular end Diastolic pressure: 10mmHg
Pulmonary vascular resistance: 2 woods units

Observations on admission:

Temperature: Core 36.1 °C, peripheral 32.0 °C
Heart rate: 180 beats per minute (narrow complex on monitor)
Blood pressure: 50/30 mmHg
SVC pressure: 18 mmHg

Arterial Blood Gas:

Parameter	Value	Normal range
pH	7.19*	7.35 – 7.45
PaCO ₂	41 mmHg	31 – 42
PaO ₂	75* mmHg	80 – 105
HCO ₃	15* mmol/L	22 – 26
Base Excess	-10* mmol/L	-2 to +2
Lactate	6.0* mmol/L	1.0 – 1.8

a) List the causes of low cardiac output following the Fontan procedure.

- General
 - Hypovolaemia (Capillary leak, bleeding, ascites)
 - Tamponade
 - Dysrhythmia
 - Pleural effusion
- Mechanical
 - Cavo-pulmonary (Fontan) obstruction
 - Elevated pulmonary vascular resistance
 - AVVR
 - Cardiac dysfunction
 - Thrombosis

- b) What are the three (3) most likely causes in this patient?
- Elevated pulmonary vascular resistance
 - Cardiac dysfunction
 - Dysrhythmia
 - (Cavo-pulmonary conduit obstruction)
- c) Outline your approach to immediate investigation and management.
- Ensure surgeon/cardiologist aware
 - Assess circulation (pressures, rhythm)
 - Fluid collections? – pericardial/pleural/ascetic?
 - Echocardiography – function, AVVR, fenestration
 - Management options
 - Manipulation of ventilation (?extubation)
 - Pacing
 - Nitric oxide
 - Inotropes/vasodilators
 - Fenestration
 - Fontan takedown
 - ECLS

Question 2

Critically evaluate the use of corticosteroids in severe sepsis (including children).

- Action of steroids, including effects on endothelium, adrenergic receptors, cytokine transcription, neutrophils, iNOS.
- Evidence in adults
 - Surviving sepsis guidelines (CCM 2008)
 - Annane et al, JAMA 2002
 - CORTICUS study, NEJM 2008
- Evidence in children
 - Significant incidence of relative adrenal insufficiency in septic shock in children
 - (Menon et al PCCM 2002, Hatherill et al Arch Dis Child 1999)
 - Replacement steroids may have a role in refractory septic shock
 - Recommended duration uncertain
 - Risks

Question 3

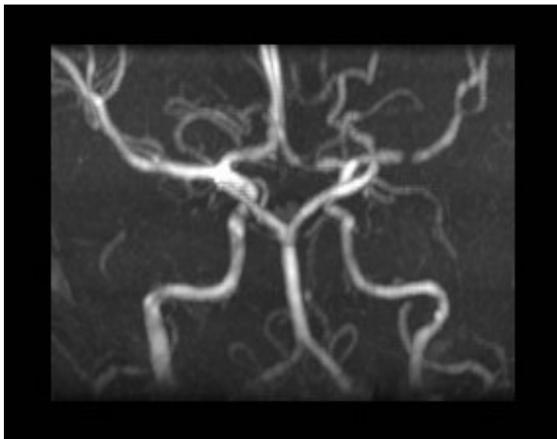
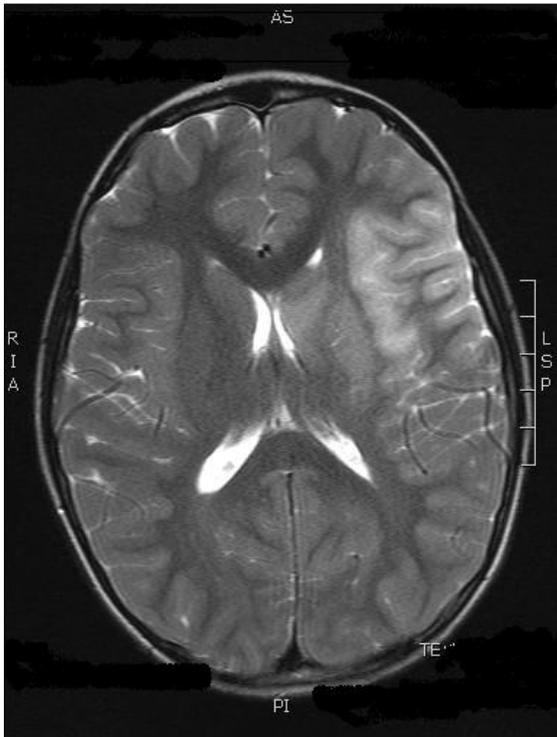
A five day old 3 kg infant is in your PICU following uncomplicated repair of coarctation of the aorta two days ago. He has had persistent hypoglycaemia despite receiving intravenous dextrose and being started on nasogastric feeds.

He is receiving 9 ml/hr of 10% dextrose intravenously.
His blood sugar is 1.5mmol/L.

- a) How much intravenous dextrose is this child receiving?
- 5 mg/kg/minute (likely inadequate substrate)
- b) List five (5) likely causes of hypoglycaemia in a neonate in PICU.
- Inadequate substrate
 - Perioperative stress, Inadequate intravenous supply, Inadequate glucose stores
 - Inadequate production
 - Hormonal: GH, Cortisol/counter-regulatory hormone insufficiency
 - Metabolic: Defects in GNG, AA, FAO (eg MCAD, MMA)
 - Hyperinsulinism
 - Transient: maternal diabetes, perioperative stress
 - Prolonged: pancreatic hypertrophy/adenoma, genetic disorders
 -
- c) Outline your approach to the investigation of neonatal hypoglycaemia.
- Clinical examination
 - Hepatomegaly, midline defects, macrosomia
 - What are the glucose requirements?
 - 4-6 mg/kg/min: ? substrate deficiency; > 8 mg/kg/min: ? hyperinsulinism
 - Bloods (taken when serum glucose low)
 - BSL, insulin level, cortisol level/GH, ABG (acidosis often associated with metabolic causes)
 - Imaging
 - US/MRI for midline defects

Question 4

A 12 year old girl is brought to the Emergency Department by ambulance. She was observed by bystanders to have right-sided seizures that became generalised. Her seizures are eventually controlled following intubation and propofol infusion. Following an abnormal CT she is taken to MRI. Selected images from MR scan and angiogram are shown below.



a) List the possible aetiologies.

- Idiopathic (>50%)
- Cardiac disease (25%) - PFO
- Thrombophilia: sickle cell, anticoagulant deficiencies eg protein C, Anti-phospholipid Ab's
- Infection-related: varicella, meningoenephalitis
- Vasculitis eg. SLE

b) Outline your approach to further investigation.

- Echocardiography + bubble study
- Bloods: FBC, UEC, glucose, Metabolic screen, ESR/CRP, thrombophilia screen, ANA etc, Viral serology
- Urine: metabolic, toxicology
- CSF: viral studies-VZV, HSV, EBV, entero, bacterial

Question 5

a) List five (5) indications for tracheostomy in children.

- Upper airway obstruction /syndromic
- Long term ventilation required:
- Secretion control eg bulbar palsy
- Preop major head and neck surgery
- Allow weaning from ventilator eg myopathy

b) Compare and contrast the pros and cons of open surgical and percutaneous tracheostomy insertion. You may present your answer in table form.

	Pros	Cons
Surgical	<ul style="list-style-type: none">• Direct visualisation therefore safer procedure• Greater bleeding control• Method of choice for smaller children and babies, small airways	<ul style="list-style-type: none">• Requires ENT surgeon and OT• May worsen tracheomalacia
Percutaneous	<ul style="list-style-type: none">• Can be done in ICU• Does not require OT or ENT surgeon/ can be done by intensivist	<ul style="list-style-type: none">• Only suitable for larger children• Need suitable skills and two people, for bronchoscopy and tracheostomy placement• Blunt procedure: higher risk of bleeding/complications• May form false tracks

c) Briefly outline the decannulation process in a child with chronic tracheostomy.

- Ensure ready for decannulation:
 - Ventilation requirement, secretions, ?upper airway obstruction, conscious state
- Process:
 - Adequate supervision (ENT surgeon or other), SpO₂ monitoring, airway trolley
 - Remove tracheostomy tube, cover (sleek/occlusive dressing), monitor 24 hours

Question 6

A 3.5 kg baby is admitted to the PICU following an uncomplicated arterial switch procedure. After 12 hours she is passing 0.2 ml/kg/hr of urine and you wish to start peritoneal dialysis.

Serum biochemistry is shown below:

Parameter	Value	Normal range
Sodium	136 mmol/L	135 – 145
Potassium	3.9 mmol/L	3.5 – 5.4
Urea	4.0 mmol/L	1.3 – 5.7
Glucose	5.6* mmol/L	3.6 – 5.4
Lactate	2.0 mmol/L	0.5 – 2.2

- a) Write an initial prescription for peritoneal dialysis (PD).
- Dwell time: 1 hour
 - Volume: 35 ml/ 10ml/kg
 - Dialysate: 1.5%
- b) List three (3) indications for PD following cardiac surgery.
- oliguria/ anuria
 - acute renal failure from preop shock, prolonged crossclamp time
 - electrolyte imbalance: hyperkalaemia
 - fluid overload: post bypass

Two alternative sets of serum electrolytes after six hours of PD are shown below [i] & ii].

Parameter	i)	ii)	Normal range
Sodium	120* mmol/L	145 mmol/L	135 – 145
Potassium	3.2* mmol/L	6.2* mmol/L	3.5 – 5.4
Urea	4 mmol/L	12* mmol/L	1.3 – 5.7

- c) List options for improving the effectiveness of your PD in each case.
- i) reduce dwell time,
increase volume of dialysate to 15 or 20 ml/kg or
increase concentration of dialysate
 - ii) remove K from dialysate if added
Increase dwell time to 1.5-2 hours per cycle
increase volume of dialysate
- d) The PD catheter allows fluid in but not out. List approaches to this problem.
- flush catheter
 - reposition child
 - put in another cycle
 - put in two further cycles and insert crossflow catheter: in one catheter, out the other
 - try frusemide,

Question 7

Critically evaluate decompressive craniectomy in traumatic brain injury, including reference to paediatrics.

- Rationale: reduce ICP by making more room for brain to swell
- General Points: variety different techniques, +/- duroplasty; outcome research limited; Increase in use of technique over 10-15 years; concern may result in more survivors with poor outcome
- DECRA trial (ANZICS): Detailed knowledge of design, results, limitations and implications of this study expected.
- Small RCP in children from 2001: Decompressive craniectomy reduced ICP. 54% vs 14% controls were normal or mild disability at 6 months.
- Summary Statement: may have a place for select patients, significant concerns about general application, literature not conclusive.

References

Childs Nerv Syst 2001;17(3):154-62
NEJM 2011;364(16):1493-1502

Question 8

A neonate returns from cardiac theatre following an arterial switch procedure with an "open chest" (delayed sternal closure).

- a) List the indications and the rationale for delayed sternal closure following paediatric cardiac surgery.
- Indications
 - Chest wall oedema
 - To avoid cardiorespiratory compromise: complex CHD: Stage one Norwood
 - Placement of ECLS cannulae
 - Haemodynamic instability/. arrhythmia
 - Respiratory instability
 - Persistent bleeding
 - Rationale
 - Allow time for return of cardiac function
 - Release pressure on myocardium
 - Access (bleeding, ECMO cannulation)
 - Myocardial and chest wall oedema to settle
 - Assess bleeding
- b) List parameters which suggest that the baby is ready for chest closure.
- Minimal chest wall oedema
 - No bleeding
 - Good lung function
 - Cardiovascularly stable on stable/low inotropic support
 - No sepsis

c) Outline your preparation for chest closure in the PICU.

- Sedate and paralyse
- Ventilate fully
- Connect pacemaker
- Good venous access
- Monitoring: IAL, CVP
- Emergency drugs and fluids available
- Preoperative antibiotic dose

References

J Thorac Cardiovasc Surg 1997;113:886-893

PCCM 2005;6(2):249

CCM2000;28(4):1249-51

Question 9

A six month old girl is admitted to your unit following complete repair of Tetralogy of Fallot.

Two hours post-op observations and investigations are as follows:

SpO₂ 93%, easy to ventilate in FiO₂ 0.4
HR 186 beats per minute (sinus rhythm)
BP 82/40mmHg, CVP 9 mmHg

An arterial blood gas demonstrates a mild metabolic acidosis with lactate 3 mmol/L. She is not bleeding and her drains are patent.

An echocardiogram shows “Mildly depressed systolic function, no pericardial effusion, no residual ventricular septal defect (VSD). Residual (mean) right ventricular outflow tract (RVOT) gradient 40 mmHg. Findings consistent with restrictive right ventricular physiology.”

a) What is meant by restrictive right ventricular physiology?

- Diastolic dysfunction with poorly relaxing right ventricle.
- Atrial contraction manifest as diastolic forward flow in PA

b) List the clinical implications and management of restrictive right ventricular physiology.

- Poor RV diastolic function, low cardiac output, higher CVP required, poor response to catecholamines and tachycardia, poor response to positive pressure ventilation, aetiology – preop hypertension, +/- coronary ischaemia, residual obstruction.
- Volume to CVP 10 (may need higher), limit catecholamines (if able), potential role for milrinone (beware hypotension), adjust ventilation to minimise intrathoracic positive pressure during diastole (shorten insp times, low PEEP strategy – problem if this causes atelectasis), ?? pulmonary vasodilators, ??residual outflow obstruction), role of negative pressure ventilation.

References

Circulation 1995;91:1782–89

Question 10

An infant remains in the PICU two weeks after neonatal repair of a ventricular septal defect (VSD) and hypoplastic aortic arch with coarctation. He has persistent chylous pleural effusions, losing up to 10 mls/kg/hr.

An echocardiogram shows good systolic function, no residual VSD and no gradient across the aortic arch.

- a) Describe your fluid replacement regimen.
- Characterisation of previous 24 hours loss and anticipation to prevent hypovolaemia.
 - Needs fluid similar to “chyle” water and salt, protein including immunoglobulins and some factors (eg antithrombin III)
 - Nutritional supplementation may be required – role of enteral feeds vs TPN (lipid and fat soluble vitamins)
- b) What other management strategies are available for this problem?
- Nutrition – enteral feeds with monogen or Total Parenteral Nutrition (how long)
 - +/- octreotide trial
 - +/- pleurodesis (how)
 - +/- thoracic duct ligation
 - +/- pleuro-peritoneal shunting
- c) What investigations will you perform?
- Venous Doppler ? thrombosis
 - Cardiac evaluation – echo for diastolic function, cathlab for pressures and residual problems
 - Serum proteins including albumin, immunoglobulins, clotting, ATIII level
 - Nutritional evaluation including micronutrients (indirect calorimetry?)
 - Lymphocyte counts (loss in chyle)

Reference

J Paed Child Health 2008;44:716-21

Question 11

A six year old girl is admitted to your PICU one hour following a burn injury at home when her dressing gown caught fire. She has 60 % burns including her face. She is intubated and ventilated. Over the next two hours an intra-arterial line, femoral central line, a nasogastric tube and a urinary catheter are inserted.

She has received 600 mls of fluid as 0.9% NaCl (normal saline). Her heart rate is 165 beats per minute, blood pressure 110/65 mmHg, CVP 12. Urine output has been 60 mls this hour. Her weight is assumed to be 20 kg.

- a) How will you calculate her fluid requirements for the next 24 hours?
- Estimate of maintenance needs, increased requirements from burns
 - Parkland formulae or estimate from SA (unit based policy)

- b) Justify your fluid choice.
- Candidates expected to identify she has had 30ml/kg already – this may be enough, too little or too much ie tachycardic but her urine output is acceptable.
 - Answer expected is a rationale for whatever choice – crystalloid as NaCl vs Hartmanns vs 4% (or 20%) albumin. Downsides of each choice expected along with recognition of a lack of strong evidence to support choice.
 - Role of red cell transfusion or blood products
- c) What will your resuscitative end points be?
- Candidates should recognize the complexity of the problem given the limitations of heart rate, arterial blood pressure, CVP in the groin, and urine output
 - Interaction from mechanical ventilation if lung injury
 - Role of echo to exclude myocardial injury, assess filling
 - +/- other devices PiCCo if used, Doppler, pulse wave variation
 - Metabolic (acid base) status
 - Urine output: crude but global

Question 12

There is accumulating evidence that some anaesthetic and sedative drugs may harm the developing brain.

- a) Briefly describe the proposed mechanisms of, and evidence for such detrimental effects
- NMDA antagonists and GABA agonists both trigger neuronal apoptosis in experimental infant animals via both:
 - I. receptor upregulation following blockade resulting in overexcitation
 - II. decreased trophic stimulation
 - Effect is dose and time dependent
 - Shown for all sedative/anaesthetic agents in animal studies
 - Worse with agents or combinations that work via both NMDA and GABA receptor
 - Maximum effect is at time of peak synaptogenesis (in humans equates to weeks 20-26 gestation).
 - Direct evidence in humans lacking but some evidence that early exposure to anaesthesia may result in learning problems later in life.
 - Evidence that pain may promote neuronal apoptosis at least as severe as anaesthetic agents
 - Unclear whether these agents speed up normal apoptosis or trigger new events.
 - No current guidelines on what to do
- b) Discuss how this may affect your analgesia and sedation practice in the PICU
- Could be nil – direct evidence is animal and may not be applicable – mainly rat pups at high doses.
 - Limiting exposure would seem sensible.
 - May chose not to use certain combinations of drugs.

References

BJA 2010;105(51):i61-i68
 JAMA 2011;305(17):1749-51
 NEJM 2011;364(15):1387-90

Question 13

A 2 week old girl has had 2 failed extubations in PICU following repair of hypoplastic aortic arch and ventricular septal defect (VSD) at 5 days of age.

She was born at 34 weeks and diagnosed day 1 by echo after a murmur was heard.

a) List 10 potential causes for extubation failure in this infant.

- Apnea of prematurity
- Drugs
- Perioperative brain injury
- Phrenic nerve injury – diaphragmatic palsy
- Subglottic oedema from ETT
- Vocal cord palsy (recurrent laryngeal nerve injury)
- Pulmonary oedema
- Lung consolidation/collapse
- Chest infection
- Premature lungs
- Generalised weakness: critical illness and/or malnutrition
- Cardiac Failure

b) Outline your approach to assessment and investigation. (5 marks)

- Exam and Review
 - Drugs
 - Ventilator settings
 - Respiratory rate
 - Fluid balance/nutrition
 - Lab results – particularly Hb
 - Secretions
 - Observe breathing pattern
 - Level of consciousness
 - Ability to cough
 - Assess general tone/strength
 - ETT size and fit
- Investigations
 - CXR
 - Echo
 - Head imaging – USS or CT or MRI
 - Laryngoscopy/Bronchoscopy if indicated
 - Diaphragmatic screening
 - Bronchogram

References

Chest 2008;134(4):768-774

Pediatr Crit Care Med;2005;6(2)

Question 14

An 18 month old boy is admitted to your PICU following an asphyxial insult. He was initially pale, pulseless and not breathing when found tangled in a window blind cord by his mother. Bystander CPR was carried out for 15 minutes until the ambulance arrived.

Ambulance officers recorded a Glasgow Coma Score (GCS) of 4, a heart rate of 70 beats per minute and no respiratory effort. He had bag/mask ventilation in the ambulance on the way to the hospital.

He was intubated in the Emergency Department for hypoxia (SpO₂ 70%). His heart rate is now 100 beats per minute, mean blood pressure is 65 mmHg, core temperature is 34.5°C.

Outline your approach to prediction of neurological outcome in this clinical situation.

- Cause of arrest, anoxia time, duration CPR are not reliably predictive of outcome.
- Admission clinical findings in this case do not allow prediction of outcome.
- Nil useful in first 24 hours
- Below tests useful after 24 hours
 - EEG Suppression and burst suppression = poor outcome
 - SSEP Bilateral absence of N20 accurately predicts very poor outcome
- Clinical examination may be difficult to perform if cooled
- The following indicate poor neurological outcome:
 - Myoclonic Status within 24 hours
 - No pupillary response or corneal reflex within 1-3 days
 - Absent or extensor motor response at 3 days
- Serum markers: High serum neuron-specific enolase predicts poor outcome
- CT/MRI: Findings not reliably predictive of outcome. MRI better after 3 days at predicting poor outcome only.

References

Neurology 2006;67(2):203-210

Pediatr Crit Care Med 2008;9(1):32-39

J Peds 2002;141(1):45-50

Question 15

You receive a telephone call from a doctor (GP anaesthetist) at a small regional hospital remote from the nearest tertiary paediatric hospital. A male infant age five days has presented with a 12-hour history of poor feeding and rapid breathing. The doctor suspects that the infant may have coarctation of the aorta.

The vital signs are:

Heart rate: 190 beats per minute
Respiratory rate: 65 breaths per minute (Soft grunt audible)
Pulse oximetry: 84 % (In face mask oxygen 6 litres per minute)
Blood pressure: 60 mmHg systolic (Estimated manually in right arm)
Central capillary refill: 4 seconds

The baby appears a "grey colour" and is poorly responsive. There are good right arm and carotid pulses, however femoral pulses not palpable. There is a soft systolic murmur at the left sternal edge. The abdomen appears distended but soft. The nappy is dry. The doctor has inserted an intravenous cannula and given cefotaxime 50mg/kg. He has performed a venous blood gas with the following results:

Parameter	Value	Normal Range
pH	7.10*	7.34 – 7.43
pCO ₂	61* mmHg (8* kPa)	32 – 45 (4.2 – 5.9)
pO ₂	32* mmHg (4.2* kPa)	Arterial 80 – 100 (10.6 – 13.3)
Bicarbonate	18 mmol/L	18 – 25
Base excess	-10* mmol/L	-4 to +3
Glucose	4 mmol/L	3.3 – 5.8
Lactate	9* mmol/L	0.5 – 2.25
Na ⁺	129* mmol/L	135 – 148
K ⁺	5.7* mmol/L	3.5 – 5.0
Cl ⁻	101 mmol/L	99 – 110
Urea	8.2* mmol/L	2.1 – 6.5
Hb	182 g/L	160 – 200

He is requesting advice and retrieval of the infant. You are informed that local fog will delay a retrieval team arriving for another eight hours.

Outline your approach to providing telephone support to the doctor.

- Infant is critically ill with likely duct dependent circulation
- Need to judge local skills, equipment and tailor advice.
- ABC approach.
- Will need intubation using appropriate drugs, CXR.
- Ventilation strategy, use of local ventilator.
- Advice re sedation, possible depressant effect on circulation.
- IV access options including UV.
- Circulatory support: fluid bolus, suitable inotrope and dose to be given peripherally.
- Prostaglandin E₁ to open duct.
- General support: maintenance hydration, temperature, blood sugar, fluid balance

Question 16

A 22 month old girl is recovering after severe H1N1 pneumonia and multi-organ failure. At the peak of her illness she was requiring high frequency oscillatory ventilation (HFOV) and muscle relaxants for severe acute respiratory distress syndrome (ARDS), pressors and inotropes for shock, haemofiltration for oliguric renal failure and parenteral nutrition for failure of enteral feeding (high volume aspirates).

She has received a course of steroids and had several changes of broad spectrum antibiotics. She is in the fourth week of her PICU admission and is receiving conventional ventilation and enteral feeding. Her oedema is resolving, her sedation is weaning and she appears extremely weak.

On examination she has muscle wasting, severe muscle weakness with no spontaneous movement of her limbs, and absent deep tendon reflexes.

a) Tabulate your differential diagnosis and possible aetiology/mechanism for her weakness.

Diagnosis	Aetiology /mechanism
Critical illness polyneuropathy	Multifactorial including systemic inflammation +/- effect of relaxants, aminoglycosides
Critical illness myopathy	Multifactorial including systemic inflammation, deconditioning
Rhabdomyolysis	Infective Flu A
Steroid myopathy	steroids

b) How will investigations help you to differentiate between these diagnoses?

- Nerve conduction studies abnormal in CIPN
- EMG abnormal in CIM, SM
- Early CK abnormal in rhabdomyolysis

Question 17

Endocrine disturbances may occur in the week following acute traumatic brain injury in children.

Tabulate the endocrine disturbances, mechanism, and management.

Disturbance	Mechanism	Management
Stress induced hyperglycaemia	Counter-regulatory stress hormone response - cortisol	Limit administration further glucose Likely to be short lived Consider insulin infusion if protracted, use conservative BSL goal
SIADH	Counter-regulatory stress hormone response – ADH	Strict fluid balance Limit free water administration Monitor serum Na frequently Use strong NaCl to maintain safe / desired serum Na
Central Diabetes Insipidus	Direct injury or Brain death	Strict fluid balance Monitor serum Na frequently Test urinary electrolytes Consider urine chase Titrate vasopressin infusion
Cerebral salt wasting	Disregulation natriuretic protein release	Strict fluid balance Monitor serum Na frequently Test urinary electrolytes Supplement salt Consider fludrocortisone

Question 18

A two month old infant is critically ill when admitted with a diagnosis of septic shock.

Tabulate ten (10) relevant management principles from the “Surviving Sepsis Campaign 2008” guidelines which are priorities for the next six hours and beside each principle list key treatment points.

Relevant Management	Key treatment points
1. Initial resuscitation ABC	<ul style="list-style-type: none"> • Intubate ventilate; Appropriate agents given shock (eg ketamine, fentanyl, rocuronium) • Adequate iv access, give fluid bolus
2. Diagnosis, Source identification and control, Antibiotic therapy	<ul style="list-style-type: none"> • Blood cultures, CXR, urine cultures • PCR for specific organisms • Defer LP, consider CT head, consider US abdo • Broad spectrum Abs with examples • Consider cover for Str pyogenes, Staph incl MRSA
3. Therapeutic end points	<ul style="list-style-type: none"> • Goal-directed resuscitation • Cap refill, HR trend, mBP, Urine output, mental state, CVP, venous sat, lactate • Echo (contractility, filling) • ? other available bedside monitoring PICCO, Venous sat catheter, USCOM
4. Fluid therapy	<ul style="list-style-type: none"> • Insert CVL (platelet count, coagulation profile) • fluid challenge (crystalloid vs colloid), dose
5. Vasopressors, Inotropes	<ul style="list-style-type: none"> • Pressors: specify 1st/2nd line choices • Inotropes: specify 1st/2nd line choices • Insert IAL
6. Mechanical ventilation	<ul style="list-style-type: none"> • Protective strategy for sepsis induced ALI / ARDS • Effect of PEEP on circulation
7. Sedation and Analgesia	<ul style="list-style-type: none"> • Sedation protocol, beware haemodynamic effects • Avoid relaxants if possible
8. Steroids	<ul style="list-style-type: none"> • ? iv hydrocortisone – when? dose?
9. Renal Replacement	<ul style="list-style-type: none"> • CVVH: oliguric renal failure vs removal of sepsis mediators
10. Immunoglobulin	<ul style="list-style-type: none"> • Adjuvant role
11. Blood products	<ul style="list-style-type: none"> • General parameters for use of RCC, Plts, Cryo, FFPT Transfuse RC if Hb <70

Reference

Crit Care Med 2008;36(1):296-327

Question 19

A 14 year old girl is transferred to your PICU from a private hospital because of persistent bleeding from the surgical wound following an elective spinal instrumentation for idiopathic scoliosis (completed 6 hours previously). The girl and her family are Jehovah's Witnesses and have negotiated with the private orthopaedic surgeon and anaesthetist to have the procedure performed without blood products.

The procedural consent form specifies that there is not consent for blood transfusion. She is assessed after admission to PICU. She is awake and breathing unassisted apart from nasal prong oxygen. Her breathing and circulation are optimised. The bleeding has been controlled and her haemoglobin is 32 g/L (ref range 120 -160 g/L).

- a) Explain the relevance of Gillick Competence in this situation.
- Gillick Competence: (UK 1985): authority of parents to make decisions for their minor children not absolute but diminishes with the child's evolving maturity
 - Normal 14 year old girl is sufficiently mature to make many decisions about her care.
 - Risk of permanent morbidity or death due to anaemia. Level of maturity likely insufficient to fully assess these consequences or to understand that she can make free choices which may be different from her family's choices.
- b) List four (4) basic ethical principles which are relevant to the decision to transfuse and apply them to this situation.
- *Autonomy* –child's right to make decisions, but parental autonomy, Gillick competence, legal minority, and ? impaired cognitive functioning (general anaesthetic 6 hours ago and profound anaemia) are all confounders
 - *Beneficence* – blood transfusion will improve oxygen delivery and perhaps save life and limit hypoxic brain injury. Hb of 32 is life threatening.
 - *Non-maleficence* – blood transfusion has potential physical adverse effects (list of many) and also possible psychological harm to child and family
 - *Justice* – resource implications – there is no reason to withhold transfusion in this situation. No locally available practical alternative.
- c) What is required legally for you as the treating doctor to prescribe a blood transfusion against the child's and family's wishes? (Your answer should reflect the legal requirement in your current hospital).
- Details different in each jurisdiction but key points: suitably qualified doctor, 2nd suitably qualified doctor, appropriate documentation in patient notes (and the medical superintendent in some jurisdictions).
- d) Which persons should be included in a family meeting to discuss blood transfusion?
- Patient, parents, child-nominated support (pastoral, family member), social worker, yourself, colleague to provide second opinion, +/- medical superintendent of hospital.

Question 20

An eight year old child returns to the PICU following insertion of rods for severe scoliosis. The procedure was prolonged, and he received two units of packed red blood cells intra-operatively, together with approximately 30 ml/kg crystalloid (0.9% saline). On return to the PICU he is self-ventilating in 4 litres/min Hudson mask and has the following laboratory results:

Parameter	Value	Normal Range
pH	7.31*	7.34 – 7.43
pCO ₂	32 mmHg	32 – 45
pO ₂	145* mmHg	80 – 100
Bicarbonate	16* mmol/L	18 – 25
Base excess	-8* mmol/L	-4 to +3
Glucose	5 mmol/L	3.3 – 5.8
Lactate	1.9 mmol/L	0.5 – 2.25
Na ⁺	142 mmol/L	135 – 148
K ⁺	4.5 mmol/L	3.5 – 5.0
Cl ⁻	119* mmol/L	99 – 110
Mg ⁺⁺	0.8 mmol/L	0.7 – 1.15
Ca ⁺⁺	1.1 mmol/L	1.1 – 1.4
Hb	85* g/L	160 – 200

- a) What is the anion gap?
- $(\text{Na} + \text{K}) - (\text{Cl} + \text{HCO}_3) = 11.5$ (mmol/L)
- b) Is it increased, decreased or normal?
- Normal (usual normal range is 8 - 16)
- c) What is the (apparent) strong ion difference (SID)?
- $(\text{Na} + \text{K} + \text{Mg} + \text{Ca}) - \text{Cl} = 29.4$ (mmol/L)
- d) Is it increased, decreased or normal?
- Decreased (Normal ~ 38 mmol/L)
- e) You wish to give a bolus of fluid for intravascular depletion. List the effects, and the reasons for the effects, of the flowing fluids on the patient's metabolic state:
1. 0.9% NaCl (normal saline)
 - Zero SID fluid ($[\text{Na}] = [\text{Cl}]$). Giving NS will further decrease the SID principally by elevating $[\text{Cl}]$, increasing the metabolic acidosis. The anion gap will also decrease
 2. Hartmann's solution
 - "Balanced crystalloid" (SID almost identical to serum). Hartmann's will tend to restore the SID towards normal, reducing the metabolic acidosis. $[\text{HCO}_3]$ will increase, $[\text{Cl}]$ will fall. Anion gap will be relatively unaffected
 3. 4% Albumin
 - SID of 4% albumin is much lower than serum but higher than zero (~ 12 mmol/L), so albumin will decrease the SID (and anion gap), increasing the metabolic acidosis.

References

Critical Care 2005; 9: 204-11

Question 21

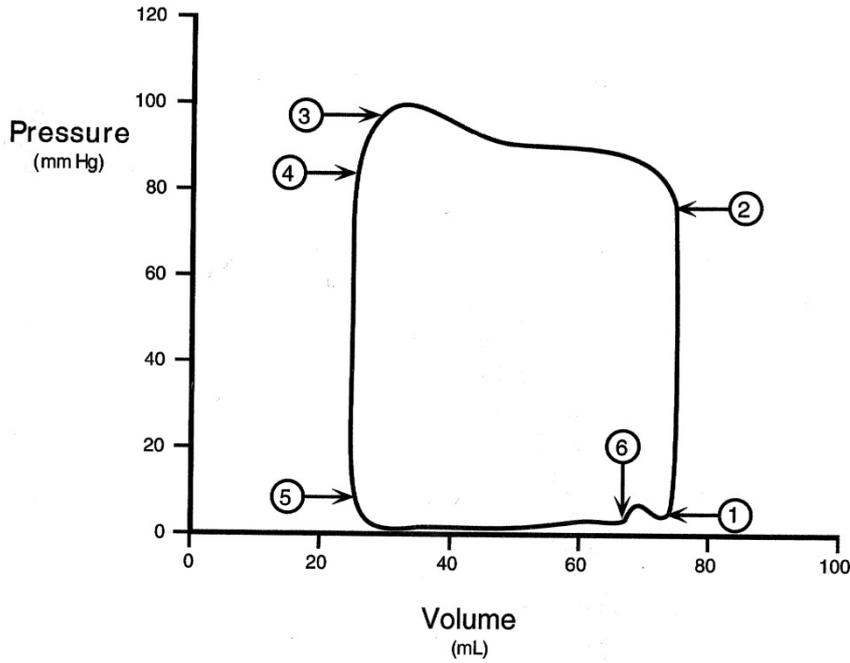
- a) Briefly outline the mechanism of action and pharmacology of intravenous Amiodarone.
- Class 3 anti-arrhythmic (K channel blocker) with Class 1,2 & 4 properties
 - Lengthens Action Potential Duration and prolongs refractory period in all cardiac tissue
 - Metabolised by Cytochrome p450 in liver, excreted in bile. Virtually no urinary excretion
 - Highly protein bound
 - Complex (and variable) pharmacokinetics:
 - Rapid distribution into tissues during intravenous loading and infusion – highly lipophilic
 - Long whole body elimination half-life (40-60 days)
- b) List four (4) effects of Amiodarone on the surface ECG.
- Sinus bradycardia
 - Slowing of AV node conduction
 - Widening of QRS
 - Prolongation of QT
- c) What are the current indications for and dose of Amiodarone in paediatric cardiopulmonary resuscitation?
- Pulseless shockable VF or VT after 3rd shock
 - 5mg/kg IV/IO
 - (Wide QRS tachycardia with output only after expert consultation)

References

Pediatric Emergency Care 2010;26:382-393
Australian Resuscitation Guidelines 2010

Question 22

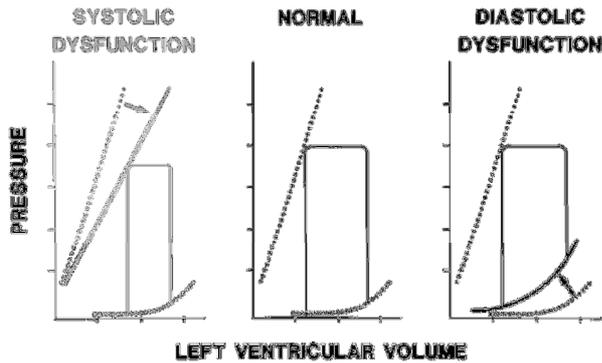
Below is an idealised pressure-volume loop for a left ventricle in a child.



a) Identify the points numbered 1 to 6.

1. Ventricular contraction (end-diastole/start-systole)
2. Aortic Valve opening
3. End-systole
4. Aortic Valve closure
5. Mitral valve opening
6. Atrial contraction

b) Draw a simplified version of the ventricular pressure-volume loop in pure diastolic dysfunction, showing how it differs from normal.



Question 23

A newborn baby is admitted from a neonatal PICU for investigation of suspected congenital heart disease. The admission Chest and Abdominal X-Ray is shown below.

a) Identify Catheter A and Catheter B.

- A. Umbilical venous catheter
- B. Umbilical arterial catheter

b) Comment on the position of these catheters.

- UVC too low (ends well below diaphragm). Pointing towards liver (may be in portal vein).
- UAC in acceptable low position - ends in descending aorta at L3. Some evidence that high position is associated with fewer complications.

c) Describe the intravascular course and direction taken by an ideally placed umbilical venous catheter.

- Umbilical vein to left portal vein to ductus venosus to IVC.
- Catheter passes cephalad within the anterior part of the abdomen before coursing posteriorly and cephalad into IVC.

References

American Journal of Radiology 2003;180:1147-1153

Cochrane Database of Systematic Reviews 1999, Issue 1. Art No.: CD000505

Question 24

Outline the barriers to effective enteral nutrition in the PICU.

Candidates likely to approach this in different ways. Marks awarded for a well-structured approach and answer.

- Unable/Unwilling to feed
 - Primary GI disease (GI surgery/NEC/GI sepsis/typhlitis/mucositis)
 - Ileus (critical illness/surgery/drugs/immobility)
 - High-risk (hypotension/high-dose vasoconstrictors/active cooling/compromised systemic circulation [coarctation etc]/large run-off from systemic circulation [big PDA or shunt])
- Inappropriate estimate of requirements
 - Caloric requirements not usually measured. Need to allow for losses (Drains/chylothoraces/diarrhoea)
- Inability to supply requirements
 - Fluid restriction
- Procedure-related feed interruptions
 - Prolonged fasting for ?intubation/?extubation/surgical procedures
- Technical problems with feeding tubes
 - Placement/displacement of NGT
 - Difficulties placing/confirming NJT
 - Blockage of NJT
- 'Feed intolerance'
 - Interruption because of gastric aspirates/abdominal distension/vomiting. Frequent reason for interruption with variation in practice.
 - Need protocolised management to minimise interruptions

References

JPEN 2010;34:38-45

Question 25

a) Outline pathophysiology, clinical features and radiological findings in Typhlitis.

- Pathophysiology
 - Necrotising colitis affecting caecum and ascending colon (can also affect transverse colon).
 - Bowel wall oedema, mucosal ulceration, minimal inflammation.
 - May be due to mucosal damage by cytotoxic drugs, bacterial invasion and endotoxin production.
- Clinical features
 - Fever
 - Abdominal pain, often generalised
 - Neutropaenia
 - Abdominal distension, tenderness
 - Peritonitis
 - Diarrhoea
 - PR bleeding

- Radiological Findings
 - Plain abdominal X-ray – Paucity of gas
 - May show pneumatosis intestinalis if perforation
 - US - bowel wall thickening and free fluid
 - CT - bowel wall thickening and free fluid

b) List four (4) differential diagnoses.

- (Any cause of abdo pain and fever in neutropaenic child)
 - Appendicitis
 - Pseudomembranous colitis
 - GVHD
 - VOD
 - Infectious colitis

References

Journal of Pediatric Surgery 2009;44:381-385

Roger's textbook Ch 90

Question 26

Outline the mechanism of action, use and complications of Citrate anticoagulation in continuous renal replacement therapy.

Mechanism

Citrate chelates Calcium. Low ionised Calcium prevents activation of coagulation cascades and platelets

Use

Citrate is infused pre-filter at a rate dependant on blood flow

(1.5 – 2 ml/min for every 1ml/hour blood flow)

Titrate to maintain prefilter iCa 0.3-0.4

Post-filter Calcium infusion is necessary to maintain patient serum iCa 1.0-1.3

Some Citrate-Ca complexes are filtered. Those that do enter the body are metabolised by the liver to Bicarbonate

- Complications
 - Hypocalcaemia May be due to inadequate Ca supplementation or to citrate accumulation. Ratio of ionised:total Ca falls with citrate accumulation
 - Alkalosis due to bicarbonate produced by citrate accumulation
 - Metabolic acidosis – Citrate is acidic. In cases of severe hepatic dysfunction Citrate accumulates causing acidosis.
 - Hypomagnesaemia – Mg also binds to Citrate
 - Hypernatraemia – high Na content of Citrate solution

References

Nephrology Dialysis Transplantation plus 2009;2:439-447

Pediatr Nephrol 2004;19:208-212

Nephrol Dial transplant 2005;20:1416-1421

Question 27

Define the following common terms used to describe data.

Give formulae where appropriate.

- a) Mean
- b) Median
- c) Mode
- d) Geometric mean
- e) Inter-quartile range
- f) Standard Deviation
- g) Standard Error of the Mean

Mean (X bar)	Sum of values divided by number of values ($\Sigma x/n$)
Median	Value that is half-way when values ranked in order
Mode	Most commonly occurring value
Geometric mean	Antilog of the mean of the logged values
Standard Deviation (σ)	$\sqrt{[\Sigma(Xbar-x)^2/n-1]}$, (square root of variance)
Interquartile range	Numerical difference between 25 th and 75 th centile
Standard Error of the mean	Standard deviation of many sample means from that population: σ/\sqrt{n}

References

Practical Statistics for Medical Research. Chapman & Hall 1991. Altman. Ch 3&4
Critical Care 2002;6:66-71
Critical Care 2002;6:143-149

Question 28

A 14 month old male was found floating in a swimming pool in winter after being missing for nine minutes. He was apnoeic and pulseless and cardiopulmonary resuscitation was commenced by a neighbour. He was intubated by the intensive care paramedic at the scene and given three 10 microgram / kg doses of adrenaline through an intraosseous needle resulting in return of circulation after approximately 20 minutes. His temperature is 34°C on arrival in the Emergency Department.

- a) Briefly discuss the current level of evidence for therapeutic hypothermia in hypoxic brain injury.
 - Neonate: Level 1 evidence for use in asphyxiated neonates
 - Adults: Level 1 evidence for use in post VF arrest
 - Paediatrics: Case series evidence for use in post cardiac arrest
 - No randomised controlled trials have been undertaken to establish usefulness in post cardiac arrest
- b) List the potential complications of induced hypothermia.
 - Suppressed immunity
 - Infection
 - Pressure area
 - Pancreatitis
 - Ileus and feed intolerance
 - Poor temperature control
 - Non convulsive status epilepticus if paralyzed

Question 29

A previously well four year old female presents with a three day history of respiratory distress, fever, joint pain and lethargy. She is admitted to the local hospital and treated with antibiotics and supplemental oxygen but becomes more breathless. A systolic murmur is noted. She is transferred to your hospital and admitted to the PICU on 6 cm H₂O mask Continuous Positive Airway Pressure and on 40% O₂.

Chest X-ray demonstrates borderline cardiomegaly and pulmonary oedema. An echocardiogram reveals severe mitral regurgitation together with mild aortic regurgitation. She continues to deteriorate, becoming oliguric with poor perfusion and has a heart rate of 130 beats per minute and a blood pressure of 65/28 mmHg. A diagnosis of rheumatic fever is suggested.

a) How would you confirm the diagnosis?

- Need 2 major OR 1 major + 2 minor + evidence of a group A beta haemolytic streptococcal infection

Major:

- Migrating polyarthrititis
- Carditis
- Chorea
- Erythema marginatum
- Subcutaneous nodules

- Minor:

- Fever
- Arthralgia
- Positive acute phase reactants
- Prolonged PR
- Previous rheumatic fever

b) Outline your acute management.

- Volume challenge 10-20 ml/kg for shock
- Intubation – need to be cautious with induction agents e.g. NOT propofol/thio – acceptable answers include ketamine, fentanyl, morphine, low dose of benzo
- Place central line, art line
- Inotropes. Role of afterload reduction if tolerated.
- Recognise too much vasopressor will be bad with mitral and aortic regurg.
- Antibiotics for Strept
- Salicylates (aspirin 100 mg/kg/day)
- Steroids (prednisolone 2 mg/kg/day)

Reference

Eur Rev Med Pharmacol Sci 2006; 10: 107-10

Question 30

A six week old previously well term infant is transferred on Continuous Positive Airway Pressure from a peripheral hospital with a diagnosis of bronchiolitis, following a two day history of increasing respiratory distress. On arrival, SpO₂ is 92% on nasal prong CPAP of 6 cmH₂O in F_IO₂ 0.6. He has increased inspiratory and expiratory work of breathing, with sternal and intercostal retraction, and a respiratory rate of 40 breaths per minute.

He has inspiratory stridor but the lung fields are clear, and his Chest X-ray reveals normal cardiac silhouette and lung fields. He has not fed for six hours and has a single peripheral intravenous cannula that appears to be working well. Over the next few hours his apparent airway obstruction becomes worse. Minimal improvement is noted with nebulised adrenaline and he obviously requires intubation.

Outline your approach to intubation.

- Identify this is most likely UPPER airway obstruction rather than a viral LRTI
- Note that because of his age there is a high likelihood of structural / anatomical problems
- Check access - ? place second IV
- Have resuscitation drugs drawn up
- Prepare a range of ETT tubes down to 2.5, with introducers
- Alert ENT / anaesthesia and/or have bronchoscope available
- Gaseous induction is preferred – sevoflurane or similar – noting that low minute ventilation secondary to UAO will mean induction is relatively slow.

ORAL SECTION

THE CLINICAL SECTION

The Clinical Section (2 clinical cases – 20 minutes per case) was conducted in the Paediatric Intensive Care Unit at The Mater Children's Hospital, Brisbane.

Candidates who approach the clinical examination of the patient and presentation of findings in an organized manner will impress the examiners. Candidates should approach the case discussion in a consultant-like manner. 30% of the overall marks are allocated to the two clinical cases. Candidates should bear this in mind when preparing for the examination.

Candidates should listen carefully to the introduction given by the examiners and direct their examination accordingly. Cases are usually presented as problem solving exercises. For maximal marks, candidates should demonstrate a systematic approach to examination, clinical signs should be demonstrated, and a reasonable discussion regarding their findings should follow. The twenty minutes available for each case provides ample opportunity to discuss investigations and plans of management. Some candidates waste valuable time at the start of the case by spending more than a couple of minutes around the bedside before they actually commence examining the patient. Exposing the patients should be limited to those areas that are necessary for that component of the examination. Candidates must show appropriate courtesy and respect to patients and their families if present during the examination.

Cases encountered in the clinical component of the examination included:

A one month old child with a complicated course following repair of obstructed total anomalous pulmonary venous drainage. The candidate was asked to examine the patient and assess the reasons for inability to separate from mechanical ventilation.

A 12 year old boy with severe cerebral palsy who had undergone extensive posterior spinal surgery the previous day. The candidate was asked to examine the patient and formulate a management plan for the next 24 hours.

A 21 month old child 48 hours after urgent abdominal surgery. The candidate was asked to examine the patient and assess readiness for extubation.

STRUCTURED VIVA SECTION

There were 8 stations of ten minutes each for structured vivas. There were two minutes provided to read an introductory scenario (which included the initial question) outside each viva room. This same information was also provided inside the viva room.

Candidates should be able to demonstrate a systematic approach to the assessment and management of commonly encountered clinical problems. Candidates should also be prepared to provide a reasonable strategy for management of conditions that they may not be familiar with.

The examiners commented that the general viva questions revealed significant knowledge gaps in several candidates. Performance in the communication station was generally poor and candidates are reminded that this viva is one that requires practice and a structured approach.

The following are the introductory scenarios and questions provided to the candidates:

Viva 1

A 12 year old girl (50kg) with history of anxiety and chest pain is being transferred to your hospital by helicopter. The retrieval team request your involvement because of relative bradycardia. (A 12-lead electrocardiogram was provided to the candidate).

What rhythm does the ECG show?

Viva 2

A 2 year old boy has been admitted to the ICU after a 1 week hospital admission with newly-diagnosed Acute Myeloid Leukemia. He has developed an increasing oxygen requirement after an anaesthetic for his lumbar puncture and bone marrow aspirate. He has been on 150% hyperhydration for 2 days during his induction with Etoposide, Daunorubicin, Ara-C.

Post anaesthetic his heart rate is 155 beats per minute, with a respiratory rate of 50 and increased work of breathing.

His laboratory results before treatment were as follows:

	Normal Range
WCC 201.0 x10 ⁹ /L (12% blasts)	6.0 – 17.5
Hb 61 g/L	105 – 135
Plat 29 x10 ⁹ /L	150 – 400

	Normal Range
Sodium 136 mmol/L	135 – 145
Potassium 4.2 mmol/L	3.2 – 4.5
Chloride 106 mmol/L	100 – 110
Bicarbonate 15 mmol/L	19 – 32
Calcium 2.41 mmol/L	2.15 – 2.70
Urea 10.8 mmol/L	1.0 – 6.0
Uric Acid 0.61 mmol/L	0.06 – 0.30
Creat 165 umol/L	15 – 50
Albumin 38 g/L	33 – 47

Describe your initial approach to assessment and management of this boy.

Viva 3

A 3 month old infant has been admitted to ICU with pneumonia and respiratory failure. Following intubation he becomes profoundly desaturated with poor tidal volumes despite 100% oxygen and high ventilator pressures.

(A chest X-ray was provided to the candidate).

What does this chest X-ray show?

Viva 4

5 year old boy is admitted from ED with acute liver failure. He is jaundiced and drowsy but responds to commands. Full serology and metabolic workup have been initiated by the gastroenterologists.

(The following initial investigations were provided to the candidate).

AST	3600	15 – 60 IU/l
ALT	4000	0 – 35 IU/l
Alb	19	35 – 45 g/l
SBR	80	<10 micromol/l
NH ₃	200	<50 micromol/l

Hb	90	120 – 140 g/l
White Cell Count	4.0	5 – 15 x 10 ⁹ /l
Platelets	60	150 – 350 x 10 ⁹ /l

INR	6.1	0.9 – 1.2
APTT	49	25 – 45 secs
Fibrinogen	1.0	1.5 – 3.5 g/l

Na+	150	135-145 mmol/l
K+	2.8	3.5-4.5 mmol/l
Cl-	101	98-102 mmol/l
Glucose	3.0	4.0-6.0 mmol/l
Urea	1.0	1.2-3.4 mmol/l
Creatinine	0.08	60-90 µmol/l

He is intubated and ventilated. Arterial line, femoral central venous line and indwelling urinary catheter are sited. An arterial blood gas with FiO₂ 0.4 demonstrates:

pH	7.25	(7.34 – 7.43)
CO ₂	29 mmHg	(32 – 45)
O ₂	90 mmHg	(80 – 100)
HCO ₃	17 mmol/l	(18 – 25)

Following intubation his blood pressure is 88/60 mmHg, CVP 8 mmHg.

Over the next few hours he becomes oliguric and is noted to have frank blood aspirated from his nasogastric tube.

What is your immediate management plan?

Viva 5

You are called to the surgical ward as an emergency to see an 8 year old boy who underwent an uncomplicated appendicectomy 2 days ago. He has had increasing abdominal pain, fever and tachycardia for 6 hours and has received 20 ml/kg normal saline fluid bolus during that time.

A full blood count performed 1 hour ago:

Hb	110
Plts	104
WCC	2.2 (33% neutrophils, 35% bands)

On examination he is difficult to rouse, flushed and has a temperature of 39°C.

Heart rate 186 beats per minute
Blood pressure 68/29
Respiratory rate 30 breaths per minute
Abdo distended with no bowel sounds
Extremely tender around wound

Briefly describe your initial approach and treatment.

Viva 6

A 22 month old girl presents with 4 weeks of cervical lymphadenopathy and intermittent fevers treated with 2 courses of antibiotics from her GP. At presentation to the children's hospital tonight, the ED consultant has found a palpable mass in the left upper abdominal quadrant and is concerned about soft positional stridor, only noticeable when she lies on her left side. She is otherwise comfortable, eating and drinking and has normal vital signs.

(An AP and Left lateral chest X-ray was provided to the candidate)

Please describe the important features on these X-rays. What are your differential diagnoses?

Viva 7 – Communication Station

You have admitted a three month old baby with subdural haematomas and a severe head injury to your unit. The child's prognosis is very poor. You suspect non accidental injury. The parent has been verbally abusive to the bedside nurses, including showing their gang tattoos. You are now meeting with the parent for the first time to address these issues.

Viva 8 – Procedure Station

Andrew is a 12 month old boy (10kg) in cardiac HDU 4 days post cardiac surgery for VSD repair. He is pacemaker dependent (VVI as no atrial wires) postoperatively with complete heart block and slow ventricular response. During routine removal of a mediastinal drain his ventricular pacing wires have accidentally been pulled out and he becomes bradycardic (40 bpm), pale and sweaty.

You will be expected to manage this scenario in a simulated environment. There are two PICU nurses in the room who can assist you.