PAEDIATRIC FELLOWSHIP EXAMINATION
AUGUST/OCTOBER 2009

REPORT

October 2009

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

The Paediatric Intensive Care Fellowship written examination consists of two 2.5 hour written papers (30 short answer questions in total). Candidates are required to score at least 50% in the written examination to be eligible to present for the oral component of the Paediatric Intensive Care Fellowship examination. The oral examination consists of eight structured vivas, and two separate clinical PICU cases.

Candidates must have successfully completed four observed clinical examinations of intensive care patients prior to presentation for the Final Fellowship Examination
Data interpretation and radiology may be assessed in the written component of the examination and will also be assessed in the structured viva section of the exam.
Simulated Procedure and Communication stations have been incorporated into the structured viva section of the examination.

Five candidates presented for the Written Examination. Four candidates passed and presented for the Oral Examination. All candidates who presented for the oral examination were successful.
There was one Overseas Trained Specialist who presented for assessment. This candidate was also successful.

The court of examiners made the following observations with regards to the performance of the candidates and suggest that future candidates take note of these recommendations.

The overall impression of the examiners was that candidates were reasonably well prepared for the written section of the examination. Candidates should ensure they have an excellent understanding of basic concepts used in day to day critical care practice. Candidates should be able to support their approach to clinical problems with a sound knowledge of current and relevant literature.

The guide below is meant to be an information resource. It is not written under exam conditions and does not reproduce an ideal answer, but it does include the type of material that should be included in a good answer.

Feedback from examiners indicated that candidates are more likely to pass if they:
answer the question asked, organize the answer in a way that demonstrates a broad knowledge and the ability to prioritize.

Writing should be legible to allow candidates to gain optimal marks.

A number of the questions had been asked in previous exams, some in a modified format.

The following “Glossary of terms” was provided for the candidates

Critically evaluate:	Evaluate the evidence available to support the hypothesis.
Outline:	Provide a summary of the important points.
List:	Provide a list.

Compare and contrast: Provide a description of similarities and differences (eg. table form).

2009 Short Answer Questions

Question 1

Critically evaluate the role of exogenous surfactant in the management of acute hypoxaemic respiratory failure in children.

Evidence for use in acute hypoxaemic respiratory failure

Animal studies – show improved lung mechanics, oxygenation and outcomes

Infant studies in neonatal RDS – improved outcomes only in RDS with multiple administrations (Cochrane) – no benefit in MAS or CDH.

Adult studies – Very limited use due to cost

Paediatric studies (Wilson et al JAMA) showed limited improvement in mortality, several smaller studies showing improved oxygenation

Issues -Advantage of natural vs synthetic due to surfactant proteins
Administration systems

Disadvantages – Cost very expensive for larger children
Limited studies showing improved mortality
Transient desaturation common during administration
Nil suctioning post administration for certain time

Current Use – Limited use as due to cost .Only used for severe respiratory failure after other strategies unsuccessful. Current trial in progress in adults and children.

Question 2

An eight (8) month old child is admitted to the Paediatric Intensive Care Unit with a purpuric rash, a heart rate of 180 beats per minute, a respiratory rate of 55 breaths per minute, a capillary refill of five (5) seconds and an altered mental state.

a. Briefly outline your initial management.

Simultaneous investigations, monitoring, and treatment comprising

1 Control of airway and ventilation – sedation/Muscle relaxation/Intubation and Ventilation – beware hypotension at induction

2 Circulatory Support - fluid resuscitation which will require adequate vascular access, inotrope, consider ECLS. Goal Directed Therapy

3 Appropriate broadspectrum antibiotic cover – should include either Benzylpenicillin or 3rd generation cephalosporin.

4 Organ Support
- Coagulation factors
- Glycemic control debatable – recent NEJM article shows higher mortality in group with tight glycaemic control in children.
- Renal CVVH as required
- Immune modulation/factor removal – Steroids, IVIG, plasmafiltration

5 Patient Examination looking for site of sepsis – may include USS

6 Investigations
- FBC,UE, Coag, LFT, ABG
- CRP, Lactate
- Central venous saturation
- Cultures blood, urine, fluid collections
- CXR
- ECG to exclude arrhythmia
- Cardiac echo
- CSF but not acutely (patient too unwell)

7 Monitoring
- CVL
- Arterial line – serial ABGs and lactates
- Urinary catheter
- PICCO
- Central venous saturations
- Cardiac Echo

NIRS
8 Appropriate involvement of other specialties eg orthopedics, general surgeons, plastic surgeons, ID consultants
2b. List the direct and indirect means of assessing cardiac output in this patient.
Direct
ECHO for cardiac output – intermittent or continuous
PiCCO – pulse contour analysis
NICO, pulmonary artery catheter haemodilution, ultrasonic, impedence method
Indirect
Measures of adequacy of perfusion/oxygen delivery
peripheral perfusion
HR, cap refill, urinary output, lactate, central venous saturation, pH,
Cardiac echo to assess end diastolic volume.

Question 3
A one (1) week old infant presents with hypotension, cyanosis and poor peripheral perfusion. The serum lactate is 4.5mmol/L (normal range 0.2 – 2.0). Echocardiograph demonstrates a Type 1 Truncus Arteriosus which was not detected on antenatal scans.
3a. Briefly outline your initial approach to stabilizing this patient.
Recognise the patient is critically ill
Needs resuscitation – ABC. Will need intubation and ventilation – need to balance PVR and SVR to maintain pulmonary and systemic blood flows (avoid high FiO_2, adjust ventilator settings to optimise lung volumes and keep CO_2 normal, minimise SVR)
Induce with fentanyl or ketamine
Circulation – volume bolus (10ml/kg) +/-inotrope
Check function on ECHO
Monitor –SpO_2, ECG, CVL, arterial line, urinary catheter,serial lactate, Sv O_2
3b. Following initial stabilization, the baby has a further deterioration and becomes poorly perfused and hypotensive. The lactate is now 8.0 mmol/L with oxygen saturations fluctuating between 85% and 95%. Briefly describe how you might improve the circulatory status of this baby.
This suggests excess pulmonary blood flow and inadequate systemic blood flow. To rebalance circulation:
Increase PVR – Limit FiO_2,Increase $PaCO_2$, Increase intrathoracic pressure, Increase Hct, Lower pH
Decrease SVR – Vasodilator (will also drop PVR) Milrinone could be useful.
Increase cardiac output – Inotrope, fluid loading,calcium
3c. When would be the optimal time to operate on this baby? Justify your answer.
Most of these babies are operated on at the end of the first week of life as beyond this they develop increasing CHF and don't usually feed or grow well. PVR too high at birth.
Optimal timing would be later (4-6 months) when baby bigger but very unlikely to get to this stage due to low PVR and increasing CHF

Question 4
You are transporting a neonate intubated because of meconium aspiration in a non-pressurized aircraft at 5000 feet. Oxygen saturation falls to 80%.
4a. List four (4) possible causes of the desaturation resulting from the altitude and give an explanation for each.
Pneumothorax: gas expands with increasing altitude.
Hypoxia: partial pressure of oxygen falls with increasing altitude although this would not be a problem because fixed concentration being delivered via ETT.
Increased shunting from pulmonary hypertension
Endotracheal tube blockage: humidity and temperature fall. Water content at max saturation will fall with decreasing pressure. Increased risk if unhumidified gas or HME not used in circuit.
Gastric distension with air expansion.
4b. Briefly outline the steps you would take to manage each of the causes you have listed.
Drain free air/ chest tubes for pneumothorax preferably pre flight
Request flight at lower altitude
Pressurize to sea level if possible
Increase FiO2
Bicarbonate to alkalinize for pulmonary hypertension
Nitric oxide

Humidification/HME and frequent suction with installation of saline
Reintubate if tube blocks
Gastric tube on free drainage

Question 5

You are asked to assess a 14 year old child with Duchenne Muscular Dystrophy (DMD) who is wheelchair bound and requesting a high risk scoliosis repair.

5a. What are the important factors in the preoperative assessment of this patient?

Assess respiratory function to predict need for postoperative ventilatory support
Previous respiratory support required eg BPAP
Recent respiratory illnesses or deterioration
Assess cardiac function to exclude cardiomyopathy because of implications for anaesthesia and post operative care

5b. List and give a brief definition of four (4) basic principles of medical ethics.

Autonomy – respect for ability to make own decisions .. ? at any age
Beneficence – provide benefit
Non-maleficence – avoiding harm
Justice – fair and equal distribution of risks and benefits for all

5c. Briefly discuss the application of the listed principles to this particular request for surgery in this patient.

Autonomy: This boy has the right to make decisions about his own life if he understands and accepts the risks. Parents have legal decision making due to his age, but should be given right to express views and be listened to. Issues about his ability to comprehend implications outlined, and could need assessment of mental capacity to determine this.
Beneficence: Should be evidence that surgery will help boy such as alleviating pain or preventing further deterioration in respiratory function. This may be hard to assess.
Non-maleficence: Significant risk of harm and death for this boy in this situation.
Justice: Huge resource implications relating to intensive care and hospital stay - may result in other patients not being able to be admitted.

Question 6

A five (5) year old sustains major chest trauma in a road traffic crash. There is no loss of consciousness, but on arrival in the Emergency Department he is in significant respiratory distress with a GCS of 14. During the resuscitation, bilateral chest drains are placed using a seldinger wire technique. There is no drainage from the left side, but a gush of air and 100mls of blood rapidly drains from the right sided drain. He is taken to radiology for an urgent CT of the chest and abdomen.
His chest drains were clamped during the transfer from the stretcher to the CT gantry. Following the CT, he is transferred to PICU. Soon after admission to the PICU, the child becomes hypotensive, unresponsive to a fluid bolus, and ultimately progresses to pulseless electrical cardiac arrest. Chest compressions are commenced, at which time someone notices that the chest drains were still clamped. The chest drain clamps are removed releasing fluid and air. There is a return of a spontaneous rhythm with pulses but unfortunately, the child has fixed and dilated pupils bilaterally. You are about to talk to his parents.
Briefly outline the key elements of disclosing medical errors to families.

Always take a second person with you for this conversation.
Sit down, introduce yourself and your colleague and explain your role
Ask if parents would like to have a support person present
Expression sympathy and regret for the harm that has occurred
Disclose facts known at the time; acknowledge that an error has occurred
Listen to parents' understanding of what has happened and address questions or concerns and indicate that their views and concerns are being taken seriously
Explain what will happen next in terms of treatment, investigations etc
Information on likely effects
Explain that there will be an investigation into why the adverse event has occurred and explain how feedback will be provided on the findings
Offer support to parents
Information on how to take matter further including complaint processes
Don't rush.

Question 7

A newborn baby is intubated and transferred to PICU shortly after birth with a diagnosis of congenital diaphragmatic hernia (CDH).
7a. Outline your ventilation strategy for this baby.
Aim for preductal oxygen saturation >85%
Accept moderate hypercarbia 6 – 7.3kPa
Avoid high airway pressures: keep PIP < 25 cms water
If unable to oxygenate with conventional ventilation, consider HFOV
Avoid recruitment manoeuvres.
Consider nitric oxide.
7b. What are the indications that this strategy is not successful?
pre-postductal difference > 10 %,
increased hypercarbia, despite maximum conventional ventilation, or HFOV,
hypoxia
worsening oxygenation index
7c. In note form, outline the non-ventilatory aspects of your management plan.
Paralyse initially then only as required
Central venous access with right preductal intra arterial line
Cardiac echo to exclude cardiac abnormality, measure RV/PA pressure and assess shunt
Consider iNO and assess effect of this with echo
Consider PG1 infusion to maintain ductal patency and avoid RV failure
Consider bicarbonate infusion to reduce PVR if acidaemic
Volume loading and inotropes in RV failure
Gut decompression with NG tube
TPN
Prone positioning
7d. Briefly describe optimal timing for surgery and prognostic indicators for babies with congenital diaphragmatic hernia.
Surgery should be delayed until
low ventilator settings required
PVR reduced
PIP < 25 cms water on conventional ventilation

Question 8.1
An 18 month old child with biliary atresia returns to the Paediatric Intensive Care Unit following a cut-down cadaveric liver transplant.
8.1a. List the important considerations in the management of the recipient of a cadaveric liver transplant on the first post-operative day.
Optimize graft perfusion
Optimise haemodynamic status
Replace wound losses
Reduce risk of hepatic artery occlusion
Accept low haematocrit 25-30
Accept mod abnormal coagulation profile
Monitor vessel patency with ultrasound
Appropriate analgesia and sedation
aim for early extubation if abdomen closed
Anti-rejection management plan
typically methylprednisone in OT
tacrolimus and azathioprine in PICU – assuming adequate urine output and WCC/platelets.
Other options are basiliximab.

The following haematology results are from a specimen collected on return to the PICU from the operating room:

		Unit	Normal Range
Haemoglobin *	63	g/L	105 - 135
White cell count	13	x 10^9/L	6.0 – 17.5
Platelets *	40	x 10^9/L	150 - 400
Haematocrit*	0.20		0.33 – 0.4
Prothrombin Time*	38.8	seconds	11 -15
INR*	3.7		1 – 1.2
Activated partial thromboplastin time*	50.1	seconds	23 - 34
Fibrinogen*	1.0	g/L)	1.5 - 6

8.1b. Briefly discuss the benefits and risks of administering blood products in this situation
PRBC – improves Hb, CaO2 hence organ oxygen delivery, but risks: increased risk of thrombosis in graft vessels, infection, GVHD, citrate load
FFP – substitution of clotting factors, improves INR, PT, aPTT, but risks: infection, ALI, citrate load
Platelets – improves platelet count, but infection, ALI
Cryo – substitute Fibrinogen, but risks: infection
Prothrombinex (II, VII, IX, X) – ideal, minimal volume load, confounds INR as a marker of function
summary: top up with PRBC aiming for Hb 60 - 80 g/l, no specific need for clotting production substitution, unless bleeding complications, guided by TEG
8.2a. Below is the chest x-ray on day three (3) postoperatively. The child is ventilated with a PEEP of 8 cm water. Peak Airway Pressure is 26 cm water. List the abnormal findings.
moderate sized right pleural effusion
left sided pulmonary venous congestion
cardiomegaly
8.2b. Briefly outline your management of these findings.
exclude pericardial effusion
intravenous diuretics
consider antibiotics

Question 9
In 2005-6 the ILCOR recommendations for paediatric resuscitation were updated and published.
9a. List the important changes to paediatric resuscitation as a result of the 2005 ILCOR recommendations.
Cardiac compression:ventilation ratio change to 30:2 for single rescuer/lay person
15:2 for trained rescuer
either 1 or 2 hand compression technique acceptable for children
single initial chock for shockable rhythms – followed by immediate CPR – replaces stacked shocks for VF/VT
consider hypothermia post cardiac arrest (patients in coma)
cuffed or uncuffed endotracheal tubes acceptable in infants
high dose adrenaline (100mcg/kg) not recommended
exhaled CO2 to check ETT position
emphasis on IV/IO route rather than tracheal route for drug delivery
biphasic attenuated shocks with an AED for those >1 yr of age
9.b Briefly outline the difference between monophasic and biphasic defibrillation.
Monophasic – current delivered in only one direction
(older machines)
Biphasic – current delivered in two directions. Biphasic defibrillators have improved efficacy of shock delivery, less myocardial damage and are the defibrillator of choice.
9c. Summarise the evidence for the current recommended energy dose for Ventricular Fibrillation / pulseless Ventricular Tachycardia.
Initial shock 2J/kg – subsequent shocks 4J/kg
Evidence poor – based on 27 children (Gutgesell, 1976) in OR post cardiac surgery, defibtillated within seconds of VF. Some supportive animal data.
Tibbals found most children reverted with only 1J/kg
European Resuscitation Council recommends initial shock 4J/kg based on limited human and animal work.
9d. List the indications for and complications of adenosine.
Revert SVT
Diagnosis of tachyarrhythmias
Protracted AV block with asystole

Risk of bronchospasm especially in patients with history of asthma

Question 10

A two (2) year old child presented to the Emergency Department with respiratory failure and shock. He is now intubated and ventilated. PCR is positive for H1N1. Briefly describe the infection control measures you would implement

Isolate in single room
Only educated staff should be allowed to enter the room
Personal protective equipment (PPE: hand hygiene, P2 mask, protective eyewear, gloves, gown, closed suction system.
Do not touch eyes, nose ,mouth; avoid touching contaminated environmental surfaces;
Dispose PPE as general waste in patient's room or anteroom
Anti-influenza treatment
Room must be disinfected after patient discharge
No visitors who are pregnant, immunocompromised or vulnerable group
Possible staff prophylaxis

Question 11

A three (3) year old female presented to a regional hospital with gastroenteritis and dehydration. She was rehydrated appropriately but has been anuric for 24 hours. She has been retrieved to your Paediatric Intensive Care Unit. She is alert and cooperative when she arrives in PICU with no respiratory distress or circulatory impairment, but has generalised oedema with a documented weight gain of 3.4kg in the last three days. Her most recent biochemistry and full blood count reveals:

Na^+	126	mmol/L	135 - 145
K^+	6.7	mmol/L	3.2 – 4.5
Urea	38	mmol/L	1.0 - 6.0
Creatinine	460	mmol/L	15 - 50
Hb	58	g/L	105 - 135
Platelet count	73	x 10^9/L	150 - 400

11a. List two (2) likely causes of this clinical picture.

Haemolytic uraemic syndrome
Thrombotic Thrombocytopenic Purpura
(Sepsis)
(rarely glomerulonephritis)

11b. Briefly describe how you would manage this child.

Obtain venous access, give a 20ml/kg Saline fluid bolus followed by intravenous Calcium Chloride, Sodium Bicarbonate and a 1mg/kg Frusemide bolus. If potassium remains high commence a glucose insulin infusion and if child remains anuric commence CRRT – either CVVHDF or Peritoneal Dialysis.

11c. Briefly outline the relative risks and purported benefits of each therapy mentioned in your answer to 11b.

Therapy	Advantage	Disadvantage
Venous access	Acid-Base status, HCO3 level	Time
Fluid Bolus	Dilution of K+ Level by increase in intravascular volume	Fluid Overload, cardiac decompensation
CaCl2	Lowers K+ immediately	Painfull injection Increase in BP Flush syndrome
NaHCO3	Lowers K+ immediately Na substitution	Increase in CO2 Worsening of intracellular acidosis
Frusemide	Lowers K+ more Diuresis to regulate volume status	Might be ineffective because of ARF Takes time
Insulin + Dextrose	Lowers K+ effectively	Rebound effect after ceasing infusion

		Time to prepare infusion Risk of hypoglycaemia
Haemodiafiltration	Corrects acid / base status Corrects electrolytes Radical catcher for septic toxins Regulates fluid status	Time until vascular access is established Time until dialysis machine is setup Risk for infection Patient need sedation for line insertion Need for anticoagulation
Peritoneal Dialysis		
Plasmapheresis	Removal of the antibodies in TTP	Volume load Risk of infection

Question 12

You are about to intubate an 18 month old child with presumed meningococcal sepsis. You are concerned about the possibility of the child developing ARDS and requiring high pressures to maintain adequate oxygenation and ventilation. Critically evaluate the use of cuffed endotracheal tubes in children < 8 years of age in paediatric intensive care.

Issue:

Historically, uncuffed endotracheal tubes (ETT) were recommended for children under the age of 8 years (Motoyama, Fisher).

Recent ILCOR guidelines allow for their use in certain situations.

Why is it an issue:

Small diameter airway – greater impact of endotracheal tube induced oedema – need for reintubation

Conical shape of child's airway – cricoid narrowest level and complete cartilage ring

Pros:

- Allow volume control ventilation
- Improve accuracy of TeCO2 monitoring
- Reduce need for changing tube because if excessive leak
- Allow scavenging of NO
- Facilitate use of metabolic cart
- Smaller diameter at vocal cord level – lower incidence of cord trauma
- Prevent macro-aspiration

Cons:

- Subglottic oedema – post extubation stridor
- Failed extubation
- subglottic stenosis
- doesn't prevent micro-aspiration
- cuff displacement causing vocal cord trauma

Evidence Against

Impaired tracheal mucosal blood flow especially when tube too big or cuff overinflated - higher incidence of post-extubation laryngeal oedema and tracheal stenosis (adult and animal studies).

These were high-pressure, low-volume cuffed ETTs.

Causal relation between duration of intubation and occurrence of laryngeal mucosal inflammation for cuffed and uncuffed ETTs.

Evidence For:

3 studies – (Khine, Deakers, Newth) no increase in the incidence of post-extubation stridor in children <8 years.

(Khine) decreased number of laryngoscopies

(Fine) reduced risk of aspiration, and improve end-tidal CO2 monitoring.

No studies to compare incidence of subglottic stenosis between cuffed and uncuffed tubes in children Case series of five children with subglottic stenosis - only one had immediate post-extubation stridor, 4 developed dyspnoea 4–13 days after extubation.

Absence of immediate post-extubation stridor does not mean that subglottic stenosis will not develop.)

Conclusion

Use of low-pressure, high-volume cuffed endotracheal tubes is not associated with increased incidence of post-extubation stridor in children (Grade C)

No studies which adequately assess potential long term consequences eg subglottic stenosis. (Grade D)
Statement of How this will affect my practice:
In selected cases in whom high airway pressures are anticipated during their intensive care stay, cuffed endotracheal tubes can be used to avoid the need for reintubation because of air leak around the ETT. (Grade C)
Future studies should be designed with subglottic stenosis as an endpoint before routine use of cuffed endotracheal tubes can be recommended

Question 13
An audit of central venous lines in your intensive care unit reveals that the catheter related sepsis rate has doubled since last year. Outline your approach to this problem.

Implement training program for medical/nursing staff re insertion and management of central lines.
Guidelines (bundle) should address the following:
Assess risk of line insertion versus the risk of infection for each case.
Choose insertion site carefully. Femoral lines may have slightly higher risk of infection.
An ultrasound guided approach should be used. All materials for insertion should be set out on a sterile drape. Any additional equipment should be given to the physician in a sterile technique.
The physician should follow strict hospital guidelines in regards to handwashing / surgical gown / face mask and sterile gloves.
Surgical scrub type skin preparation with chlorhexidine solution. If a physician is not successful on second attempt he should refer the procedure to another person or to another insertion side (studies shown that the infection rate directly correlates with the attempts of vessel puncture). Sterile transparent surgical dressing should be applied before removing the drape.
Restrict sampling from central lines. Any injection/manipulation (eg adding or changing lines) to central line should always be done in aseptic fashion and lumen should be wiped with alcohol swap before and after usage. Always apply fresh sterile top cocks after usage. The insertion side should be inspected regularly for signs of infection. Leave dressings undisturbed for 48 hours and then clean with chlorhexidine and apply fresh transparent dressing.
Remove lines early. Avoid routine changes or rewiring of catheters unless signs of infection.
Heparin coated catheters may reduce infection risk.
Remove catheter if evidence of line related sepsis or line infection.

Question 14
You are managing a one (1) year old child post-Tetralogy of Fallot repair. The child had a previous Blalock-Tausig Shunt at three (3) weeks of age for severe hypoxia but has again become hypoxic over the last few weeks.
List the most important issues in the first 24 hours of the post-operative management of this child and briefly outline your approach to each issue.

Right Ventricular Failure	Assessment of RV function – clinical assessment, echocardiography, assessment of overall cardiac function Optimize fluid status, may need higher filling pressures due to RVH/diastolic dysfunction Inotropes – Dopamine, Dobutamine, Milrinone, Levosimendan ECLS
Pulmonary hypertension	Secondary to RVF or primary Optimize PVR with ventilation, Milrinone, NO
Low cardiac output state	optimize fluid status, CaO2, inotropic support, optimize sedation, consider paralysis, consider cooling, temporary ECLS support
Bleeding – common problem due to length of bypass, and Right Ventricular myotomy	Correct coagulopathy Optimise serum ionised calcium, Normothermic Correct acid base abnormalities Call surgeon if bleeding > 5mls/kg/hr Replace drain loss with blood/platelets/FFP/cryoprecipitate Protamine if ACT> 180 dDAVP Factor 7

Arrythmias – Junctional Ectopic Tachcardia most common	Use Atrial Lead ECG to diagnose JET Optimise sedation Correct acid base and electrolyte abnormalities Particularly sodium, magnesium, potassium Decrease positive chronotropic inotropes if possible Cool to 35oC Amiodarone if haemodynamic compromise Overdrive pacing to re-establish AV concordance Cardioversion if severe haemodynamic compromise
Pleural Effusions – common due to high venous pressures	Drain if indicated Assess for pericardial fluid

Question 15

Your PICU is considering introducing Dexmedetomidine. Briefly discuss the role of dexmedetomidine in the PICU.

Mechanism of Action

Alpha 2 agonist with 8 times alpha 1: alpha 2 selectivity of clonidine

Anxioloytic, sympatholytic and analgesic effects

Pharmacokinetics

Elimination T ½ = 2.7 hours

Adverse Effects

Bradycardia

Hypo/hypertension, respiratory depression

Dystonic movements, atelectasis, nausea and vomiting, hypoxia, dry mouth, tachycardia, atrial fibrillation, haemorrhage, acidosis, confusion, agitation, anaemia, and rigors

Evidence for use in children

Several case series supporting the use of dexmedetomidine for procedural sedation and sedation post=operatively and post-trauma.

Role in PICU

Approved for use in adults for up to 24 hours.

Long-term sedation role in longer term (>24 hours) is less certain with only limited evidence.

Increasing reported use in children

For sedation/analgesia particularly for those patients requiring large doses of standard analgesics/sedatives

Although studies show, Dexmedetomidine can be safely used in children post cardiac surgery, need to be aware of potential decrease in cardiac output occurring because of bradycardia and hypotension.

Question 16

A two (2) year old boy is suspected of ingesting iron tablets.

16a. List three (3) clinical signs of iron poisoning.

Clinical sign	Cause
nausea / vomiting/ haematemesis	acute gastritis, ischaemia
diarrhoea	
abdominal pain	
melaena	
tachypnoea	metabolic acidosis
Coma/ seizures	
shock/ hypotension	myocardial depression
oliguria	capillary leak
jaundice / coagulopathy	hepatic necrosis

16b. List two (2) investigations which would support the diagnosis of iron poisoning.

Iron Level > 300 microgm/dL, or 63 micromol/L	
Abdominal XR:	shows iron tablets
Blood gas	metabolic acidosis
Hyperglycaemia	
Coagulopathy	Interference with coagulation cascade/ hepatic failure

Deranged liver enzymes	From hepatic necrosis
Raised white cell count	

16c. Which of the following blood gas results would be most consistent with iron poisoning?

	Result A	Result B	Result C
pH	7.1	7.55	7.45
pCO2	4.5 kPa	4.5 kPa	4.5 kPa
pO2	10 kPa	12 kPa	9.3 kPa
BE	-18 mmol/L	+4 mmol/L	-0.1 mmol/L

A. Metabolic acidosis due to uncoupling of oxidative phosphorylation.

16d. List three (3) treatments specific for iron poisoning.

Desferrioxamine
(binds intravenous iron to form water soluble ferrioxamine that is renally excreted)
Whole bowel irrigation
(polyethylene glycol: works with minimal complications, aim for clear rectal effluent and absence of tablets on AXR)
Exchange transfusion with plasmapheresis.
Surgical/ endoscopic removal of tablets (if seen on AXR).
e. List one (1) serious long term complication of iron poisoning.
Gut obstruction (especially gastric outlet)
Gastrointestinal strictures

Question 17
A three (3) year old boy requires Extracorporeal Life Support (ECLS) following cardiopulmonary arrest during resuscitation for presumed Staphylococcal Toxic Shock Syndrome. Heparin requirements to maintain target Activated Clotting Time (ACT) between 200 – 220 seconds have increased during the preceding 24 hours. Heparin is now being infused into the ECLS circuit at 48 Units/kg/hour. The following coagulation profile is obtained:

			Normal Range
APPT	56.9	Seconds	23 – 38
PT	16.9	Seconds	11 – 16
Fibrinogen	3.7	g/L	1.5 – 4.0
ACT	160	seconds	

17a. List three (3) possible causes for this coagulation picture.
Antithrombin III deficiency
Sepsis +/- Thrombocytosis
Circuit thrombosis or clot formation
17b. Briefly outline your management of each possible cause.
A heparin level and TEG may provide further information and guide therapy. Also review previous heparin administration rates in this patient. In the meantime increase heparin infusion to 55u/k/h.
Replace factor with FFP or recombinant AT3, subsequently reduce heparin.
Culture, Antibiotics, source removal, subsequently reduce heparin as per appt/act,
Review circuit – especially oxygenator for clots, consider planning to change or remove circuit which will require higher levels of heparin, Change to a heparin bonded circuit.

Question 18
Define cerebral perfusion pressure (CPP).
CPP = MAP - ICP
List the advantages and limitations of using CPP as a therapeutic target in the management of traumatic brain injury.
Advantages

Easily monitored
Can be monitored continuously
Can see immediate effect of positioning and procedures and manipulation of ABP with fluids and inotropes

Limitations
Used as a surrogate for CBF
CVR is variable and therefore changes in CBF not detected by CPP
Does not allow for differential autoregulation in the normal and injured brain.
Therapy to maintain CPP can result in lung injury
No Class I data to support use
Poor correlation between CPP and indices of brain oxygenation

Question 19

A seven (7) year old boy develops severe ARDS after an accidental strangling incident. Critically evaluate the use of a low tidal volume ventilation strategy in this patient.

Low tidal volume ventilation strategy forms an arm of a protective ventilation strategy which also encompasses permissive hypercapnia (CO2 tolerated up to 80-100mmHg, with pH > 7.25 and sats > 85%) and high PEEP (10-15cmH2O).

Low tidal volumes are 5-9ml/kg breaths, whilst high are 10-15ml/kg. Paediatric practice in terms of adoption of the low tidal volume strategies are derived largely from extrapolation of adult data – ARDSnet and Amato that suggested benefits in mortality and morbidity – but with questions remaining over their control group mortality. Erickson et al in 2007 found in 120 cases of paediatric ALI that higher tidal volumes were associated with better outcomes and improved mortality in this patient cohort suggesting further study was required in paediatrics. Whilst low tidal volumes form part of my approach to protective ventilation strategies it is part of a bundle of care, they are not an absolute goal, oxygenation (OI) incorporating mean airway pressure is more fundamental in terms of guiding conventional, HFOV or ECMO consideration for respiratory support.

Question 20

A child with hypoplastic left heart is admitted to the PICU following a bidirectional Glenn procedure. Oxygen saturations are 65%.

20a. List four possible causes of the low oxygen saturation and briefly outline the appropriate management for each cause.

Sats target is ~ 85%

Increase FiO2 and minimise PVR whilst excluding:

1.Haemothorax – manipulate or insert ICC

2.Atelectasis – physio', NIV or low level peep 5-7 with increased FiO2 +/- NO

3. Excessive intrathoracic pressure with high mean airway pressure – examine and CXR, wean Vent pressures, increase fiO2 temporarily, reduce sedation and aim for spontaneous ventilation – consider neg press vent.

4. Myocardial dysfunction with high pulmonary venous pressures – improve myocardial contractility with inodilators and optimise PVR via ventilation strategies, (also ensure sinus rhythm).

b. List four (4) anatomical prerequisites for a Fontan procedure.

1. intact AV valve – mild regurg at most
2. unrestrictive atrial septum
3. No PAPVR
4. Well grown branch PA's (PVR<2WU on ccath

Question 21

A six (6) month old baby with Trisomy 21 and a 4 mm Ventricular Septal Defect (VSD) was a recent ward inpatient for six (6) days with an exacerbation of cardiac failure. One day prior to planned discharge she develops signs of a viral upper respiratory tract infection and subsequent features of bronchiolitis. Her condition deteriorates and she requires ventilatory support in your Paediatric Intensive Care Unit PICU).

21a. Briefly outline the infection control principles for preventing health care acquired infection.

The likely agent is RSV but the principle of infection control is similar for all respiratory droplet spread pathogens. Isolation in a single room with single room nursing cohorting is the first step. Hand hygiene is particularly important as RSV in particular can remain on surfaces for long periods. Hand washing with chlorhexidine and alcohol rub should be used on entering and leaving room. All visitors as well as staff need to follow the same principles. Those potentially exposed to respiratory secretions (eg, suctioning) should wear gown, gloves and face shield. All equipment should be disinfected by wiping with

hypochlorite or alcohol. Patient should be considered infective until PNA is negative or 21 days after symptoms have resolved.

21b. On day five (5) of this babies PICU admission she deteriorates with fever widespread alveolar opacity and an elevated white cell count. A broncho-alveolar lavage (BAL) specimen is collected. You have been asked to consult regarding ongoing management.
Provide your recommendations in tabular form.

Further management would depend on the results of BAL and antibiotic therapy should be tailored to pathogen isolated. Recommend posterior nasal aspirate to look for viral pathogens.

Question 22

A ten (10) year old boy presented to a Rural Emergency Department with acute severe asthma and was treated with oxygen, inhaled ipatropium, continuous inhaled salbutamol, intravenous Hydrocortizone (1mg/kg) and maintenance intravenous fluids. The Paediatrician has called you to ask for advice and possible transfer of this patient to your centre. He reports that the salbutamol is now being delivered intravenously at 5 micrograms/kg/min and that boy is more tachypnoeic than on presentation. An arterial blood specimen has been analysed.

		Units	Range
pH	7.26		
pCO2	35	mmHg	
PO2	50	mmHg	
BE	-10.5	mmHg	
HCO3	16.3	mmHg	
Na	136	mmol/l	
K	2.8	mmol/l	
Cl	103	mmol/l	
Ca	1.18	mmol/l	
Hct	38	%	
Glu	20.4	mmol/l	
Lactate	8.1	mmol/l	

22a. What advice would you give the Paediatrician regarding on going management of this boy?

1. Would assess current status-concious state, haemodynamics, air entry, CXR?
2. Reassure doctor that his management has been appropriate
3. Discuss implications of blood gas. No type II respiratory failure but hypoxia and a lactic acidosis
4. Suggest additional medications-aminophylline loading 10 mg/kg over 1 hour, magnesium sulphate
5. Fluid bolus 10 mls/kg saline as may be relatively hypovolaemic
6. Potassium replacement
7. Try to reduce ventolin dose-may be toxic
8. Needs Chest X-ray to exclude pneumothorax
9. Consider additional Atrovent

22b. List the most likely causes for his failure to respond to therapy.

1. Most likey cause is acute asphyxial asthma with failure to respond to therapy
2. Other possibilities would include failure of drug delivery, pneumothorax/severe atelectasis

22c. Briefly outline your evacuation plan for this patient.

1. Decision has to made as to whether he needs intubation and ventilation for transfer
2. Assessing the anaesthetic skills available
3. Options are to wait for some improvement and then transfer breathing spontaneously or if no improvement with additional management and time, intubate and transfer.

Antimicrobial	Reason for choice	Duration of Therapy
Timentin and Vancomycin	Broad spectrum cover of likely pathogens + staphylococcus cover	7-10 days
Aminoglycoside	Gram negative cover plus synergy for Gram positives	7-10 days

4. Need to advise about the process of endotracheal intubation
   -best available assistance

-rapid sequence induction
-risk of aspiration
-drugs-ketamine, fentanyl, suxamethonium
-may need volume
-avoid hyperinflation
-beware pneumothorax
- post extubation chest radiograph

Question 23

Describe the current role of palivizumab in patients at risk of RSV infection.

Mechanism of Action/Definition

Palivizumab is a humanized monoclonal IgGI antibody specifically direct to the RSV fusion protein and is 50-100 times more potent in vitro than RSV-IGIV . Palivizumab (15 mg/kg intramuscularly) has been shown to be safe, well-tolerated and efficacious in preventing serious RSV disease in high risk paediatric patients. It is active against both A and B subtypes of RSV.

Evidence for Use

Feltes et al, J Pediatr 2003: large randomised trial in patients with congenital heart disease at risk of severe RSV infection Palivizumab was shown to reduce hospital admission and be cost-effective.

Frogel et al, Journal of Perinatology 2008: Palivizumab outcomes registry suggests a significant reduction in hospitalisation in patients given Palivizumab. This study included patients with chronic respiratory disease and congenital heart disease.

Cost is significant – approx $1500 per vial. (up to $10,000 for a 6 month course)

Recommendations for Use

Patients at risk of severe RSV

1. Congenital heart disease with significant left-right shunts, cyanotic congenital heart disease, pulmonary hypertension.
2. significant respiratory disease, Chronic neonatal lung disease requiring home oxygen, airway abnormalities
3. immunosuppressed patients

Question 24

What is a receiver operating characteristic plot (ROC curve as applied to a diagnostic test?

An ROC plot is a graphical representation of sensitivity vs 1-specificity for all the observed data values for a given diagnostic test How may it be used?

Can give a visual assessment of test accuracy.

Allows comparison of accuracy between several tests.

May be used to generate decision thresholds or "cut off" values.

Can be used to generate confidence intervals for sensitivity and specificity and likelihood ratios.

What are its advantages?

Simple and graphical

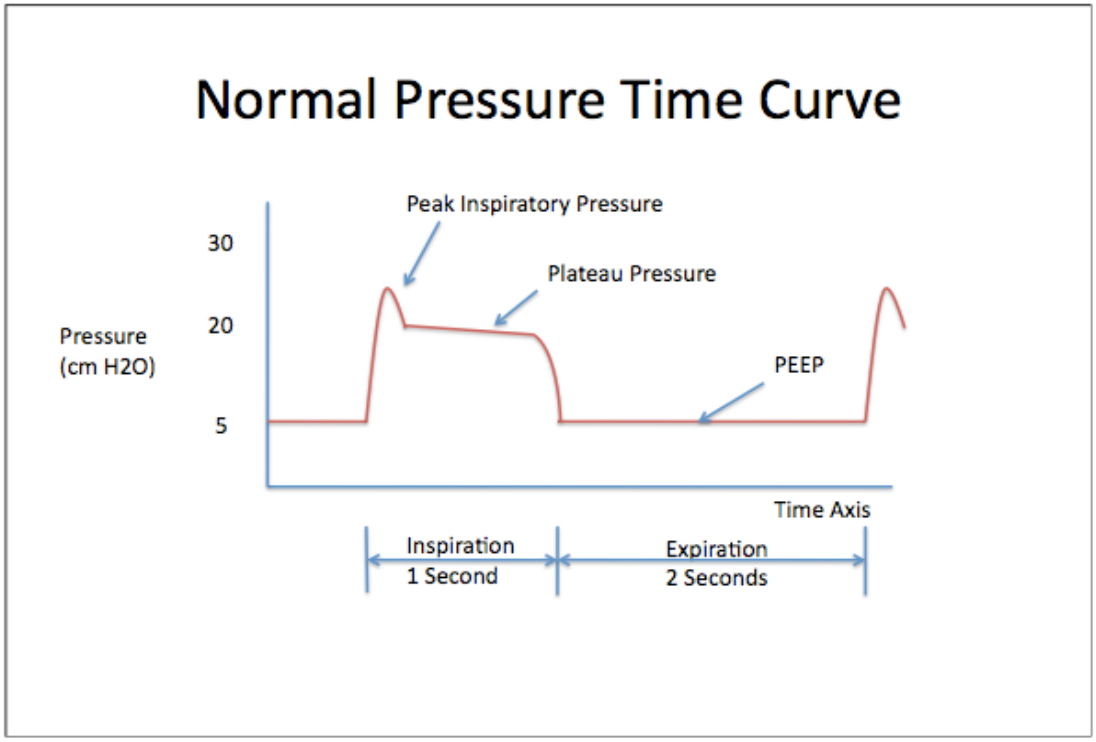
Represents accuracy over the entire range of the test.

It is independent of prevalence.

Tests may be compared on the same scale.

Question 25.1

Draw and label the airway pressure - time curve for a 14 year old boy with normal lungs being ventilated with constant flow volume controlled ventilation with a respiratory rate of 20 breaths per minute and an inspiratory to expiratory ratio of 1:2.

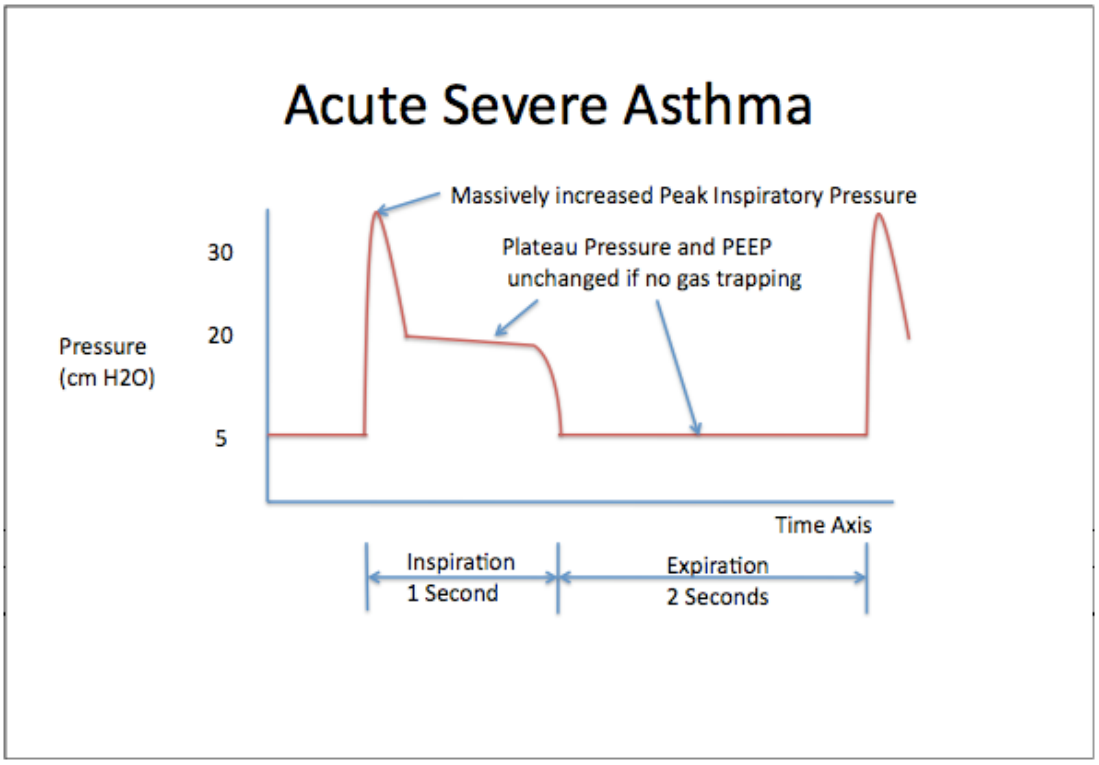


Normal Pressure Time Curve should include the following
Baseline pressure above zero equals PEEP
Peak Inspiratory pressure (PIP)
Plateau pressure should be included with the long inspiratory time (1second) from rate 20 and I:E 1:2 described in the question
Return of pressure to baseline PEEP
Time axis should have seconds, 1 second in inspiration, 2 in expiration

Plateau Pressure of 15-20 cm H2O and PIP less than 30 cm H20 as patient described as having normal lungs.

Question 25.2

Using the same scale, and assuming the same ventilator settings, draw a representative airway pressure - time curve for a same patient with acute severe asthma.
Give a brief explanation for any changes from the previous curve that you have represented.



Changes: Raised PIP with unchanged Plateau pressure, but accepting that PEEP and plateau pressure may be increased with successive breaths if illustrated (due to gas trapping / auto peep)

Basis: increase in inspiratory airflow resistance but not lung or chest wall compliance, unless significant gas trapping with ensuing AutoPEEP

Question 26

A previously well 18 month old male presents to the emergency Department with acute pleural effusion. The following radiograph was taken after the insertion of a chest drain.

26a. List the possible causes of acute pleural effusion.

Infection (Strep / Staph, atypical, TB)
Trauma / recent surgery / CVL insertion
Sympathetic – abdominal pathology
Fluid overload – cardiac or renal failure
Malignant
Immunological eg SLE

26b. Give an explanation of the appearance of the chest radiograph.

Pleural fluid not draining possibly because of loculations or other aetiology of effusion.

26c. Briefly outline your approach to the investigation and ongoing management of this situation.

obtain further detailed history (incl. recent travel and contacts) and exclude trauma
Ultrasound chest looking for fibrin/loculations
If pleural fluid suggestive of infective aetiology
Commence empiric antibiotics for potential Staphyloccus/Pneumococcus – Cefotaxime plus Vancomycin if community acquire MRSA or Cephalosporin resistant Pneumococcus possible
Commence intrapleural fibrinolytics (eg TPA or Urokinase) or consider VATS.
CT chest prior to VATS.
If pleural fluid not suggestive of infective aetiology – further investigations required
Eg cardiac and abdominal ultrasound.

Question 27

You have been asked to review a 26 day old 3.4 kg infant born at 36 weeks gestation who presented to the Emergency Department with a 24 hour history of poor feeding and irregular breathing. His two (2) year old sister has a documented Respiratory Syncytial Virus infection. When you examine the infant, you note that he is initially vigorous and pink in room air with mild tachypnoea and subcostal recession. His peripheral pulses are present and feel normal. However during the examination he is noted to have a 25 second central apnoea resulting in oxygen desaturation to 76% and his heart rate decreases from 145 to 90 beats per minute. He requires assisted ventilation with a bag and mask for one minute.

27a. List the possible causes for this clinical scenario.

Central apnoea in term infant with RSV contact
viral URTI/bronchiolitis. Likely RSV
Cardiac Failure (cardiomyopathy/myocarditis or increasing flow through L-R shunt lesion
sepsis

27b. List the options for management of apnoea in this infant.

1. Observe. Stimulate if apnoeic.
2. respiratory stimulant –caffeine or aminophylline
3. high-flow nasal oxygen or nasopharyngeal CPAP
4. Intubate and ventilate

27c. Briefly outline the rationale for and potential complications of each option.

Option	Rationale	complications
1	Maybe it won't happen again. Do no harm.	probably will happen again. You may have to intubate urgently
2	Central respiratory stimulant effective in apnoea of prematurity	Aminophylline toxicity (tachycardia, dyrhythmia, vomiting, seizures. Need to monitor levels
3	Decreases airway resistance Decreases work of breathing Improves apnoea of prematurity Generally stimulates infant	Uncomfortable Can block Requires connection to ventilator/driver
4	Most secure way of ensuring regular ventilation	risk of intubation Need for sedation Potential for complications of intubation – blocked tube, air leak, VAP etc

Question 28

Outline the role of vasopressin and its analogues in the critically ill patient.

Only drugs in use in Aus/NZ are vasopressin (Pitressin/AVP) and desmopressin (DDAVP/Minirin). Both are synthetic.
Vasopressin – 9 amino acids
T1/2 9-10 minutes. Pressor and antidiuretic effects
IV/SC/IM
Desmopressin (1-desamino 8 D-arginine vasopressin)
T1/2 2-3 hours (resistant to breakdown). Antidiuretic effects only
IV/SC/IM/IN/oral
Vasopressin uses

1. Central diabetes insipidus – infusion alone titrated to urine output or as part of urine replacement fluid. Includes use in brain death
2. Pressor – infusion to increase blood pressure in catecholamine-resistant shock
3. During cardiac arrest – no good evidence of benefit over adrenaline

Desmopressin uses

1. Central diabetes insipidus – intermittent doses (IV/SC/IM). Includes use in brain death.
2. Bleeding diatheses. Used in VWD and mild-mod Haemophilia A.
3. Bleeding due to platelet dysfunction
4. Bleeding oesophageal varices

Question 29

A four (4) year child presents after a near drowning incident. Five days following admission, the child remains unconscious. There is no response to central painful stimulation, no gag reflex, no cough, and no spontaneous breathing. However, the left pupil responds sluggishly to light. The parents understand the

grim prognosis and wish to discontinue life support. However, they are determined to donate their child's organs. Briefly outline the pertinent issues relevant to withdrawal of life support and donation after cardiac death.

Broad areas that are important:

1. DCD has been established in that institution and all involved parties have been trained properly.
2. Ongoing care for the dying child
3. Discussions about withdrawal separate to discussion about donation.
4. Discussions with family (who, where, when)
5. Content of discussions
6. Potential problems with donation (takes time to organise, time taken to die greater than agreed limit, medically unsuitable, progression to brain death)
7. Location of withdrawal (practicalities)
8. Ante mortem interventions? Legality, utility
9. Warm ischaemic time
10. Concept of diagnosis of death – period of pulselessness and apnoea
11. Potential 'stand-down' time
12. Role of ICU staff in caring for child throughout
13. Exclusion of transplant team from end-of-life care
14. Role of Designated (delegated) officer

Organ retrieval needs to begin very soon after death in order to minimise the effect of warm ischaemia. This allows family members very little time with their loved one after death has been declared . Predicting the time from treatment withdrawal to death is difficult. If this interval is greater than the maximum that allows organ retrieval for transplantation, organ donation will not be
possible. Tissue donation may still occur if suitable and the family consents. If organ donation is not possible, care for the patient will be continued in the ICU or another suitable location. Consenting to donation will usually result in a significant delay in the time that treatment may be withdrawn due to the complex logistics associated with arranging donation and transplantation. The family must be prepared for and consent to this. Blood is taken for serology and tissue typing before treatment is withdrawn. Family's permission will be sought for the administration of drugs (e.g. IV heparin) and procedures (e.g. bronchoscopy) to facilitate organ donation . Pre-operative assessment or organ removal surgery may reveal medical reasons why donation may not proceed. Circumstances of the death may need to be reported to the coroner and a coronial post-mortem examination may occur. This is independent of the donation process. Anxiolytics and analgesics will be given, as necessary, until the moment of death. Next of kin may withdraw consent at any time.

Question 30

You have been asked to review a three (3) year old child who was trapped in a house fire and is now in the Paediatric Emergency Department. There is no history available from the child's carer and you observe that the child is drowsy and confused and has a persistent cough. His heart rate is 140 beats per minute, blood pressure 70/40 mmHg. Respiratory rate is 54 breaths per minute and oxygen saturations are 94 % on high flow oxygen via a non re-breather mask.

30a. Briefly outline the initial priorities in management.

1. Resuscitation including primary and secondary survey
2. Assessment and management of potential airway burn injury – mention consideration of early intubation,
3. Obtain large bore iv access and administration of fluid bolus (20mls/kg) for probable hypovolaemic shock- mention that groins are usually spared in burns and are a good site for clean skin vas cath access.
4. Look for signs of traumatic injury and assess extent of body surface area and depth of burn
5. Awareness of risk of hypothermia
6. Seek collateral history for past medical history and medication history and history of acute events

30b. List the features from the history and your examination of this child which would suggest a significant airway injury.

1. Burns occurring in a closed space
2. Cough, stridor, hoarseness of voice
3. Burns to face, lips, mouth, pharynx or nasal mucosa
4. Soot in sputum, nose or mouth
5. Hypoxaemia or

6. Dyspnoea
7. Carboxyhaemoglobin levels > 2%
8. Acute confusional state or depressed level of consciousness

30c. List four (4) likely causes for his altered conscious state.

1. Traumatic brain injury
2. Carbon monoxide / CN – poisoning
3. Hypoxic insult
4. Other pathology precipitating loss of consciousness eg seizure-related, hypoglycaemia, drug ingestion.

ORAL SECTION

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. Feedback from examiners suggested that common deficiencies encountered included ones related to knowledge deficits (and awareness of these deficits), questionable judgment, and poor exam technique. The range of material covered in the viva section can be deduced from the following illustrative examples of introductory cases with sample questions. Suggested responses are given for the communication and procedure station only.

Viva 1 Communication Station

Peter is an intubated and ventilated 6 month old boy in the PICU. On admission he was noted to have generalized weakness and after one week a diagnosis of Spinal Muscular Atrophy Type 1 has been confirmed. His mother has been warned about the possibility of a serious underlying condition. You are now going to tell his mother the diagnosis and its implications.

Good candidates demonstrated the following:
Introduce yourself, sit down and make eye contact.
Ask if the mother would like a support person.
Ask mother what she understands (mother will say that she is very worried)
Validate mother's anxiety and fear
Explain diagnosis in simple terms, that there is no treatment and that it will progress
Pause and ask for any questions at different stages throughout the interview
Emphasize that we are still caring for Peter and want him to be comfortable
Address cause and genetics, attempt to decrease guilt
Outline possible approaches: withdrawal of ventilation; nocturnal mask ventilation; tracheostomy and ventilation
Explain that this is the first discussion, and that there will be many further discussions and opportunities for mother to ask questions.
Ask for any questions, offer other sources of information.

Viva 2

A 4 year old boy with a past history of severe obstructive sleep apnoea and developmental delay remains intubated with an uncuffed 5.0 mm oral RAE because of concerns about his airway after a difficult intubation for adenotonsillectomy the previous day. How will you assess his readiness for extubation?
How will you assess his readiness for extubation?
Describe the process of extubation.
Discuss your management if the child then develops inspiratory stridor.
Discuss the indication for and method of reintubation if required.

Viva 3

You receive a call from a small suburban private hospital Emergency Department (ED) which is approximately 45 minutes away by road. An adult emergency physician with limited paediatric experience wishes to discuss management and potential transfer of a previously well 2 year old girl following a possible seizure at home (2 hours ago). In the ambulance and emergency department she has had 3 generalised tonic-clonic seizures of up to 5 minutes duration. She received 2 doses of midazolam (0.5mg) and is currently being loaded with 20mg/kg phenytoin over one hour. Her last seizure was 20 minutes ago. She is described as sleepy but rousable to painful stimuli. There are no paediatric services on-site and the emergency physician is requesting advice and transfer to your hospital. Your transport team is out on another trip and will not return for 1 hour.
What further information do you require from the referring doctor?
What advice would you give?
The referring physician calls to report 'ectopic beats' on cardiac monitoring. What are you going to advise?
What are the differential diagnoses for this child's presentation?
Grandmother reveals that she has imipramine in the house and that child may have taken some of these. It is now four hours since presentation.
How would this change your management?

Viva 4

An 11 month old girl day required ECMO following cardiac surgery. Four days post decannulation, she presents with poor perfusion and diminished pulses in the lower limbs. The abdomen is distended.
What are the possible diagnoses?
What investigations would you perform to elucidate the cause?
Define intra-abdominal compartment syndrome and describe how you would diagnose it?
The intra-abdominal pressure is 21mmHg. Describe your initial management.
What are ongoing management options?

Viva 5 Procedure Station

You have been called to a code in the Recovery Room. At the end of surgery for talipes in an 8 month (10kg) previously healthy boy, the anaesthetist placed a caudal catheter. The anaesthetist loaded the catheter with 10 mls of 0.25% Bupivacaine. A subsequent bolus was given in recovery after which the child stopped breathing and the anaesthetist has commenced bag mask ventilation. A nurse is reapplying the ECG leads as you arrive.
Candidate required to initiate cardiopulmonary resuscitation and demonstrate use of appropriate arrhythmia algorithm and consider therapy for Bupivacaine toxicity.

Viva 6 Neurology

A previously well 3 year old girl presents with fever and a generalized seizure. She is given midazolam in the Emergency Department and intubated. On admission to the PICU you notice that the child is still seizing. Outline the essentials of initial assessment and management.
What are the contraindications to lumbar puncture?
Is there a role for ICP monitoring?
Is there a role for decompressive craniectomy?

Viva 7 Radiology

A 5 yr old restrained back seat passenger in high speed head-on motor vehicle accident is intubated at scene with GCS 3 and transported to ED where you are called to assess. You note abrasions to forehead, HR 100, BP 75/40 (50), equal air entry, distended silent abdomen, equal and reactive pupils.
Discuss your approach to initial radiological investigation.
Candidate required to identify abnormal findings in a series of plain films, CT scans and MRI images.

Viva 8

A 16 month old girl presents to the emergency department after being unwell for 4 days. She has had a fever for 4 days and has been vomiting with diarrhoea for 24 hours. She has also been feeding poorly with decreased urine output. She is fully immunized, milestones are normal and has not had any previous illnesses. On examination she is very ill looking, pale and lethargic. She has grunting respirations with moderate intercostal recession. Her respiratory rate is 70/minute but chest is clear on auscultation. O2 Sats 99% in 6 L/minute of O2 via Hudson mask. HR 190, BP 50/30, Temp 36^{o}C, Heart sounds normal, weak pulses and cold extremities. GCS 13/15, fontanelle feels normal, pupils equal and react to light. Liver edge 7 cm below costal margin, otherwise normal abdominal examination.
8.1 Describe your initial management.
8.2 Describe the abnormality on this blood gas result.3

Test	Result	Normal range
pH	7.06	7.35-7.45
paCO2	36	35-45 mmHg
paO2	55	85-110 mmHg
HCO3	10	20-30 mmol/L
BE	-19	-4-2
Lactate	9.3	0.4-1.3 mmol/L

You decide to intubate. How would you do this?
Review the post intubation chest x ray and ECG.
Review the cardiac ultrasound.

The Clinical Section

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

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. Patients were 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, and respecting the dignity of the patient. Candidates must show appropriate courtesy and respect to patients.

Cases encountered in the clinical component of the examination included:

An 8 year old boy 2 months post liver transplant presenting acutely with respiratory failure. The candidate was requested to assess for causes of respiratory failure.

A two month old infant 24 hours post complete AVSD repair. The candidate was required to assess progress and develop a management plan for the next 24 hours.

Dr Bruce Lister
Past Chairman, Paediatric Examination Committee

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