REPORT OF PAEDIATRIC INTENSIVE CARE FELLOWSHIP EXAMINATION

August/October 2007

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 perform at a satisfactory level in the written before being eligible to sit the oral part of the exam. The oral exam comprised six interactive vivas, ten OSCE stations (with four interactive stations, including two cold cases) and two separate hot cases .

Overall statistics

Table 1-Overall performance

a)	**Total number of candidates presenting for the Examination (b+c+d)**	**7**
b)	Total number of candidates appearing for the written exam	6
c)	Number of candidates carrying the written mark from a previous attempt	0
d)	Number of OTS candidates – eligible to appear for the vivas directly	1
	Breakdown of written exam performance	
e)	Number of candidates scoring > 50%	2
f)	Number of candidates scoring 45-50%	3
g)	**Total number invited to the vivas based on written marks (e+f)**	**5**
h)	**Total number invited to the vivas (c+d+e+f)**	**6**
i)	**Total number approved**	**5**
j)	**Pass rate** (as a percentage of those presenting for the written + eligible from previous exam **– (i/a*100)**	**71%**
k)	**Pass rate** (as a percentage of those presenting to the vivas	**83%**

	(**i/h*100**)	
l)	**Pass rate** amongst those who scored >50% in the written paper (2/2)	**100%**
m)	**Pass rate** amongst those who scored 45-50% in the written paper (2/3)	**67%**

Table 2: Analysis of performance in individual sections

a)	**Pass rate** in the written paper (2/6)	**33%**
b)	**Pass rate** in the OSCE section (5/6)	**83%**
c)	**Pass rate** in the vivas (6/6)	**100%**
d)	**Pass rate** in the clinical section (5/6)	**83%**
	Pass rate in the Hot Case Section (5/6)	**83%**
	Pass rate in the Cold Case Section (3/6)	**50%**

Detailed statistics for the written paper

1) Highest aggregate mark in the written paper – 62%
2) 100% of candidates achieved a pass or higher in Questions 3,6,16,25 and 27.
3) In 20 of the 30 questions, the pass rate was < 50%.

Detailed statistics for the clinical / oral component

Station	Pass rate	Highest individual mark for the station
OSCES		
1. CXR	83%	75%
2. Monitoring	100%	90%
3. CXR	33%	65%
4. Equipment	100%	80%
5 CT Scans	83%	100%
6. Electrolytes	83%	90%
7. Communication	67%	80%
8. Procedure	67%	90%
CROSS TABLE VIVAS		
Viva 1- Trauma/Retrieval	83%	90 %
Viva 2 – Asthma	100%	100%
Viva 3 – Near Drowning	67%	80%
Viva 4 – Seizures	100%	80%
Viva 5- Collapsed neonate	100%	84%
Viva 6- Post Cardiac Surg	100%	80%
CLINICALS		
Hot Case 1	50%	77%

Hot Case 2	67%	92%
Cold Case 1	0%	40%
Cold Case 2	50%	85%

The courts of examiners made the following observations with regards to the performance of the candidates and suggest that candidates appearing for the exams in the future take note of these recommendations.

Written section

The pass rate in the written paper was poor compared to previous examinations. Candidates appeared to score well in questions related to clinical management, but scored poorly on other questions particularly in areas which are currently topical but are not discrete chapters or section in textbooks – for eg genetic susceptibility to disease in critical illness, dealing with a high SMR, etc. It is recommended that candidates prepare for this exam with a broad approach and use not only just a text book as the source, but review articles, and editorials etc from appropriate journals.

Candidates are reminded that as of 2008, the minimum mark required in the written section to secure an invitation to the oral section is 50%, not 45%. Please also refer to notes in the OSCE section.

Clinical Section

2) The performance in the clinical section continues to raise concerns. The pass rate averages between 50-70% in the hot cases and around 50% in the cold cases. Many candidates had failed to adequately prepare for the clinical examination. Under the pressure of the exam, the deficient clinical skills of poorly prepared candidates' become obvious to the examiners. Candidates should take care to listen to the examiners' instruction and focus their examination, at least initially, towards the questions asked. The best candidates were very specific in what they examined and their discussion presentation revolved around the question asked. Some of the reasons for failure in the clinical included
a) missing clinical signs
b) inability to present in a cogent manner
c) Lack of ability to put the fundamental aspects of the case together
d) Inability to put forward a big picture scenario
e) Many candidates repeated non-essential findings in their discussion, and their examination and presentation were often not targeted to the question.
f) Whilst it is important to start with a general observation of the patient, pumps , etc, candidates often took too long to get to the patient.

Future candidates need to focus on practising their clinical approach until it becomes efficient and effective and their clinical examination technique is so well entrenched that it can survive the stress of the Fellowship exam!

Trainees are reminded that from Apr 2008, the clinical section in the exam carries a higher mark (30%) as compared to 26% at the present time and the threshold mark for a severe fail in the clinical section has increased from 30% to 40%. Besides it relative weight in the examination marking scheme, hot cases are integral to our practice and regular practice (at least practising presentation under exam conditions at least once a week and more frequently as the exam approaches) is recommended. Candidates are also reminded of the need to have completed a supervised assessment on 4 hot cases and have it documented prior to application for each examination.

OSCE section

a) Overall, candidates performed well in the OSCE section of the examination.
b) Communication**:** Candidates are encouraged to spend more time rehearsing for this component. A station such as this is core ICU business. All candidates should aim to pass this station.

An analysis of the performance in the above stations led to the following conclusions:
- Lack of preparedness for these stations
- Ineffective time management
- Failure to address the question specifically put to them.

Whilst the OSCE will not be a separate section in the examination from 2008, candidates are reminded that from next year, the sections originally examined in the OSCEs will now be assessed in the other parts of the exam such as the written and the vivas and therefore adequate preparation is essential.

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4) Vivas: Viva stations traditionally are high scoring sections. Although all candidates passed this section overall, some candidates performed poorly in some vivas.
Reasons for failure in the vivas include
Knowledge deficit
Failure to recognise clinically significant issues

Trainees are reminded that as of 2008, vivas will consist of 8 stations, not 6, and carry 40% of the mark. The procedure and communication stations normally assessed during the OSCEs will now be examined as part of the vivas. Vivas will incorporate a radiology component.

WRITTEN SECTIONS

This 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 would have been more likely to pass if they:
- answered the question asked
- demonstrated their priorities
- organised their answer in a way that demonstrated a broader knowledge
- included additional relevant detail

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.

Five of the six candidates who were required to sit the written examination received sufficient marks in the written to be invited to the oral section.

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).

SHORT ANSWER PAPER

1. A 2 year old boy presents with toxic shock syndrome as a complication of a staphylococcal infection of a recent burn injury. List key features in pathogenesis, clinical presentation, and management of staphylococcal toxic shock syndrome.

Pathogenesis
- Due to toxin (TSST-1, 2 or 3) released by Staph and enteroxin
- TSST acts as a superantigen activating T-cells directly with massive elevation of cytokines
- Originally associated with tampon use but also seen with surgical procedures and wound infection, cellulitis, sinusitis, HIV.
- Very similar presentation and course seen with other bacteria (toxic shock like syndrome) such as Streptococci

Presentation
- Initially myalgia, fever
- Vasodilated shock and multiple organ dysfunction
- Marked erythema with desquamation 7-14 days later
- Oedema due to capillary leak syndrome
- Blood cultures usually negative

Management
- Resuscitation and support including adequate fluids, inotropes/organ support…
- Search for source which may be covert – drain abscess……
- There may be a role for IVIg to bind toxin
- Antibiotics may not alter course but infection should be treated
- Lincomycin/Clindamycin may have a particular role as it inhibits synthesis of bacterial toxins

Pass Rate: 33%

2. You have been asked to review a six week old infant in the emergency department with a presumptive diagnosis of bronchiolitis. Outline your approach to the assessment and management of this baby.

Important points include:

a) Past medical history. Premature delivery, neonatal ventilation, any respiratory disease, congenital heart disease or other syndromes (eg Trisomy 21). All worsen prognosis, and increase the likelihood of need for respiratory support.
b) Diagnosis: must exclude undiagnosed congenital cardiac condition;
is this RSV bronchiolitis? Naso-pharyngal aspirate is the usual way of making this diagnosis. Other differentials include pertussis and influenza, both of which have the potential for poorer outcome.
c) Length of history of this illness. In the normal child, RSV bronchiolitis runs a course of 7 – 10 days. So a severe presentation in the first 3 days is more serious than the fifth or sixth day.
d) Current clinical status. Pulse and respiratory rate, severity of respiratory distress, and history of significant apnoeas requiring resuscitation.

If the child has very significant respiratory distress, has had more than one significant apnoea, has very high pulse or respiratory rate, is desaturating despite significant oxygen therapy (such as >60% FiO2), or presence of exhaustion – then ICU/HDU admission is indicated.

Initial management includes oxygen therapy, IV fluids and fasting, CPAP via N/P tube/ bubble CPAP/high flow nasal prong oxygen or face mask BIPAP. Antibiotics are indicated if there are grounds for suspecting bacterial infection. Aminophylline or Caffeine may be useful in reducing the number of apnoeas if the child has been premature. A few children, usually in the high risk groups above, will require intubation and mechanical ventilation.

Could also mention other advocated therapies
Eg nebulized adrenaline/salbutamol/heliox /Ribavarin– and have an opinion re efficacy.

Pass Rate: 50%

3. A 10 year old girl with a severe head injury is ventilated in the Paediatric Intensive Care Unit. Her intracranial pressure has been >30mmHg for periods of longer than 20 minutes at times. On Day 3, her urine output is greater than 5mls/kg/hour for at least the last two hours. Investigations are summarised below.

Sodium	147	mmol/L	(135 -145)
Potassium	3.2	mmol/L	(3.2 - 4.5)
Chloride	110	mmol/L	(100 -110)
Urea	3.0	mmol/L	(3.0 - 8.0)
Creatinine	65	mmol/L	(50- 100)
Glucose	4.0	mmol/L	(3.0 – 6.0)

a) List the possible causes for the increased urine output and differentiating features of each cause.

Diabetes Insipidus (DI) – high Urine output/low urine SG/urine osmo, ½ serum osmolality/responds to DDAVP/rising serum sodium level
Mannitol therapy – history plus osmolar gap (difference between measured and calculated serum osmolality)
Cerebral Salt Wasting Syndrome - high urine sodium/higher urine osmolality

b) What further investigations should be considered

Serum and urine osmolality and electrolytes.
Serum Brain Natiuretic Peptide level

c) Outline your management of the polyuria.

Treat the cause as above. Cease Mannitol. Treat DI with vasopressin and very careful fluid management. Consider the use of a mineralocorticoid if BNP is very high.

Pass Rate: 100%

4. A 12 year old boy presents with purpura fulminans.

(a) Describe the role of corticosteroids in this condition.

Use of steroids in this condition is controversial. Originally recommended for associated adrenal haemorrhage (Waterhouse Friedrichsen syndrome), subsequent trials have shown no benefit. Steroids do have a role in the minimization of neurologic complications in meningitis, which may or may not be present associated with purpura fulminans.

(b) **How would you assess the indication for corticosteroids in this patient?**

Steroids should be given if meningitis is present, otherwise evidence of adrenal secretory failure (Synacthen test) is one option for deciding whether or not to use steroids. Even this approach has its detractors, and more evidence is needed.

Pass Rate: 17%

5. Outline the essential requirements for Cardiac Protection in a Paediatric Intensive Care Unit bed space.

Cardiac protection is a level of electrical safety sufficient to reduce the risk of direct microshock to the heart. Essential requirements include:

a) Equipotential earth points (no more than 100 micro volts between any two).
b) Either isolation transformers with associated line isolation monitor, or
c) earth current leakage detectors on each power point. (these detect earth leakage and turn off the power).
d) All electrical equipment directly connected to the patient must have current isolation on the patient interface.
e) All electrical equipment should be regularly checked and certified by a biomedical engineer.
f) No non certified mains equipment should be allowed near the patient (eg television).

Pass Rate: 0%

6. A 2 year old child with Trisomy 21 presents in respiratory failure due to viral pneumonitis. His condition has deteriorated to the point where despite high frequency oscillation with 100% oxygen and mean airway pressures of 32 cm H2O, he is hypoxaemic (arterial oxygen saturation < 80%) and has evidence of a worsening lactic acidaemia.
Outline the indications for and risks of extracorporeal membrane oxygenation ECMO in this situation.

Indications

Comment [m1]: 50%

1. Severe acute respiratory failure, unresponsive to conventional treatment
   Assumptions:
   - Secure diagnosis of viral pneumonitis
2. Single organ failure
   Assumptions:
   - Hypoxia not secondary to intracardiac shunting (increased incidence of septal defects and propensity to early development of secondary pulmonary hypertension in trisomy 21). Veno-arterial ECMO may be necessary under these circumstances.
   - Hyperlactaemia not secondary to gut ischaemia
3. Reversible organ failure
   Assumptions:
   - Patient is not likely to have developed fibrosis due to prolonged high pressure ventilation. ECMO should be considered early in disease (maximum 10-14 days of mechanical ventilation).

4. Important points
   - Trisomy 21 is not a contraindication to ECMO
   - A premorbid condition with poor expectation of survival would be a contraindication (eg poor prognosis leukemia, established pulmonary hypertension)

Complications

1. Veno-venous ECMO
   - Inadequate cardiac support if pulmonary hypertension, cardiac failure due to uncorrected defect or myocardial suppression due to sepsis.

- Bleeding due to anticoagulation.
- Thrombosis with potential for right sided embolisation (or systemic if R to L shunt exists)
- Sepsis (trisomy 21 have increased susceptibility to infection)
- Mechanical failure of circuit
- Cannula –related complications (dislodgement, kinking)

2. Veno-arterial ECMO
    - As above plus
    - Carotid occlusion (assuming neck cannulation)
    - Systemic embolisation of clot

Pass Rate: 100%

7. A 13 year old girl with acute severe asthma being managed with continuous inhaled therapy in your paediatric intensive care unit deteriorates suddenly. Describe and give your rationale for the management of this patient.

Initial assessment (ABC)
Does she need immediate intubation?
Yes – see below
No – Why has she deteriorated?
Inadequate treatment
Ensure 100% Oxygen driving nebuliseer
Continuous undiluted nebulised beta-agonist
Adequate intravenous corticosteroid
Nebulised atrovent
Sputum plug or worsening bronchoconstriction
Escalate treatment
Pneumothorax
Drain immediately if clinical signs of tension pneumothorax
Escalation of treatment:

1. Intravenous Magnesium Sulphate 50mg/Kg over 20 minutes

Rationale Cochrane Database of Systematic Reviews 2000 - "Intravenous magnesium sulfate appears to be safe and beneficial in patients who present with severe acute asthma".

2. Aminophylline 10mg/Kg over 1 hour

Rationale Cochrane Database of Systematic Reviews 2005 – "some improvement in lung function in children with severe acute asthma unresponsive to beta-agonists and steroids".

3. Intravenous salbutamol 5µg/kg/minute for 1 hour, then 1µg/kg/minute infusion

Rationale There is currently no good evidence demonstrating that intravenous beta2 agonists offer additional benefit to nebulised delivery of the same drug in severe acute asthma (Cochrane Database of Sytematic Reviews 2001). However, given that the delivery of drug by the inhaled route is dictated by tidal volume, there may be some rationale for doing so in severe cases.

4. There is no good evidence to support the use of noninvasive ventilation in acute severe asthma in children, however this is used in some units with reported success.
5. There is very limited evidence for benefit from Heliox in severe acute asthma (Cochrane Database of Systematic Reviews 2006).

Intubation and ventilation:
Clinical decision (real or imminent respiratory arrest, obtundation, fatigue) rather than being driven by results of blood gases.

- Setup (assistant, monitoring etc)
- Rapid Sequence Induction – assume gastric stasis
- Cuffed endotracheal tube – high pressures likely to be required
- Keep paralysed initially to allow controlled hypoventilation and adequate expiratory time. Ketamine infusion may provide additional bronchodilation
- If unable to ventilate consider: inhaled halothane or isoflourane, Heliox, ECMO

Pass Rate: 50%

8. A 7 year old boy presents with abdominal pain following a handle bar injury on his push bike. He has a markedly elevated lipase and is admitted to PICU because of haemodynamic instability. Outline your approach to the investigation and management of this boy with particular reference to meeting the nutritional needs of this patient.

ABC – stabilize and resuscitate
Ensure adequate intravenous access and continue volume resuscitation
Cross match urgently
Secondary survey – Abdominal bruising, distension, tenderness, guarding?
Do not perform diagnostic peritoneal lavage
Ensure adequate analgesia
Investigation
(Assuming FBC, clotting, U&E, LFT all done with previous bloodwork)
History implies risk of solid organ (especially pancreas) or intestinal injury

- Abdo CT scan with contrast - appropriate medical supervision and airway management
- Nasogastric tube to relieve gastric distension and minimize risk of aspiration
- Consult with trauma surgeons
- Other imaging depending on secondary survey
- Urinalysis

When haemodynamically stable, assuming isolated pancreatic injury

- Conservative management of pancreatic trauma (unless transection of pancreatic duct)
- Analgesia
- Watch for other signs of pancreatitis (hypocalcaemia, fever, tachycardia)

Nutrition – depends on severity of pancreatic injury and dysfunction

- Nasogastric decompression
- Initially intravenous fluid and nutrition while ileus persists.
- Assess nutritional needs in association with Clinical nutrition service. (Indirect calorimetry may be useful)
- Aim to meet nutritional needs with parenteral nutrition, including lipid emulsions.
- Provide usual amounts of glucose, but additional insulin may be necessary if there is damage to the endocrine function of the pancreas.
- Start enteral feeds early in consultation with trauma surgeon and nutritionist. Nasojejunal tube (blind or fluoroscopy) if not tolerating gastric feeding Usually carbohydrate feeds introduced first, with subsequent addition of low fat and protein feeds.
- Watch for increasing abdominal pain, vomiting
- A semi-elemental diet may be necessary in severe pancreatic damage.
- Watch for complications - pseudocyst, abscess.

Pass Rate: 50%

9. A 2 year old in complete heart block is paced post cardiac surgery in DDD mode. Explain what the DDD setting means and describe how you would confirm appropriate pacemaker settings.

Pacing code
1st D Paced chamber (A = atrium, V = ventricle, D = dual)
2nd D Sensed chamber (as above, D = dual)
3rd D Response to a sensed event (I = inhibit, T = triggered, D = dual [or Double]) ie: a sensed atrial event will trigger ventricular pacing and a sensed ventricular event will inhibit ventricular pacing

Appropriate settings

Rate: Set the rate to desired heart rate for size and physiology . Above this the pacemaker will track the atrial rate and pace the ventricles accordingly. The upper rate (maximal tracking rate) cannot usually be set by the operator

A-V delay: Effectively (but not exactly) the p-r interval. This should be set at 70 – 120 ms, depending on rate.

Sensitivity :

NB Sensitivity can only be checked when that chamber beats at its intrinsic rate

- Atrial
  - Set rate < intrinsic atrial rate
  - Gradually increase the sensitivity
  - Point at which atrial pacing starts is atrial sensitivity
- Ventricular
  - Do not test this unless there is an adequate intrinsic ventricular rate
  - Set rate < intrinsic ventricular rate
  - As above to determine ventricular sensitivity

Set sensitivity as low as possible without sensing non-cardiac activity

Output:

- Atrial capture threshold
  - Set rate > intrinsic atrial rate, and pace
  - Gradually reduce atrial output
  - Point at which no p wave is visible after pacing spike is atrial threshold (ventricle will continue to pace at set rate)
- Ventricular capture threshold
  - Set rate > intrinsic ventricular rate , and pace
  - Gradually decrease ventricular output
  - Point at which QRS is dropped (no QRS after ventricular spike) is ventricular threshold. Set outputs at >2 x threshold for each chamber

Pass Rate: 33%

10. In tabular form outline the differences between hypothyroidism and the "sick euthyroid state" in the critically ill paediatric patient.

	Hypothyroid	Sick Euthyroid
TSH (2 marks)	↑	N/↓
TSH response to TRH (2 marks)	↑	N/↓
T4 (1 mark)	↓	↓
T3 (1 mark)	↓	↓
rT3 (2 marks)	↑	↓
T3 uptake (FTI) (2 marks)	↓	↑

Pass Rate: 50%

11. Your unit is experiencing an increase in nosocomial infections. You are asked to put in place initiatives to improve hand hygiene in your unit. Briefly describe these initiatives.

- Plan a strategy with a steering group of representatives of medical, nursing and other clinical groups. There should be broad ownership of problem.
- There should be a clinician leader who drives strategy.

- There should be a communication strategy so that all staff realize the importance of hand washing and when and how hand washing should be performed. All methods of communication should be employed so that as many staff as possible get the message: emails, posters, communication books, hand overs, teaching sessions etc /
- The materials for hand washing need to be easily available: soap, alcohol bottles all around every bed side etc.
- There should be monitoring of hand washing practices and nosocomial infection rate and results should be prominently displayed.

Pass Rate: 83%

12. What are the requirements for a mechanical ventilator capable of supporting patients from the neonatal age group to adolescence?

- Pressure control and volume control modes of ventilation
- Ability to measure flow in the circuit accurately (usually requires flow sensor close to ETT rather than at ventilator end expiratory limb of circuit).
- Ability to flow trigger and rapid response time for faster respiratory rates.
- Ability to compensate for leak around ETT uncuffed tubes.
- Compatibility with low volume circuits, ability to cope with circuits with different volume/compliance.
- Ability to generate a wide range of tidal volumes (10mls to 1.5L).
- Ability to set age–compatible default settings and alarm limits.

Pass Rate: 17%

13. Compare the use, effectiveness and risks of Heat Moisture Exchangers and Water Bath Humidifiers in paediatric patients.

- HMEs: 50–80% efficient, simple ,cheap, disposable, probably reduced potential for infection, less disconnection potential, increased obstruction with thick copious secretions
- Water bath humidifiers: more efficient, storage requirements, servicing, circuit complexity, risk disconnection, infection hazard, potential for burns and drowning, altered circuit compliance.

Pass Rate: 50%

14: With respect to continuous renal replacement therapy (CRRT) in the PICU,

a) define the terms diffusion and convection and the role they play in solute transport during CRRT

Diffusion is the movement of solutes from one compartment to another along a concentration gradient. Diffusion is the principal mode of solute clearance during dialysis.
Convection is the movement of solute across a semipermeable membrane in conjunction with significant amounts of ultrafiltration of water (solvent drag). Convection is the principal mode of solute clearance during ultrafiltration.

b) define the terms filtration fraction and sieving coefficient and their significance

Filtration fraction is the fraction of plasma that is removed from blood during hemofiltration. The optimal filtration fraction at a hematocrit of 30% is of the order of 20-25%. A higher filtration fraction can lead to hemoconcentration in the filter increasing the risk of filter clotting.

The sieving coefficient is the ratio of the concentration of solutes in the ultrafiltrate to that of plasma. A high sieving coefficient is desirable for middle molecules but undesirable for albumin sized molecules.

Pass Rate: 33%

15. A newborn baby is transferred to the Paediatric Intensive Care Unit with a presumed diagnosis of cyanotic congenital cardiac disease. However on review, the baby is found to have persistent pulmonary hypertension of the newborn. Outline the circulatory and respiratory changes that normally occur after birth. List the possible reasons for this baby's presentation.

- Placental circulation removed, SVR increases, LV and LA pressures increase; increased LA from increased pulmonary blood flow leads to functional closure foramen
- Ventilation begins, oxygen tension increases in alveolus and arterial blood; pulmonary vasoconstriction relaxes and PVR less than SVR
- Ductus arteriosus constricts because of increased oxygenation
- Lung expansion straightens out compressed vessels
- Closure foetal conduits that carried blood by the lungs not into them.
- Balance vascular resistances shifts blood flow into low resistance pulmonary beds

Elevated PVR so that venous blood diverted through ductus arteriosus and foramen ovale into systemic circulation and bypassing lungs with resultant systemic arterial hypoxaemia. Causes:

- Associated with pulmonary parenchymal disease: HMD, meconium aspiration etc
- Normal lungs on CXR: persistent foetal circulation
- Lung hypoplasia: eg, diaphragmatic hernia

Pass Rate: 83%

16. One of your colleagues in the Paediatric Emergency Medicine Department asks for your advice regarding a potential snake bite victim. The patient is a 4 year old boy who was playing in the garden and claims to have been bitten by a snake. There are two distinct puncture marks on his left ankle. His mother brought him to the emergency department. No first aid or other treatment has been initiated. Briefly outline your recommended management for this patient. List the possible pitfalls in identifying the snake species.

Keep patient still – avoid unnecessary muscle movement to reduce venom movement in lymphatics
Swab puncture marks – for use with snake venom detection kit
Use of lymphatic bandage leg to thigh to reduce lymph flow at this stage is debatable – probably too late if not already in place.
It will need to be removed once initial assessment and IV access is obtained
O2 if required
ABC assessment
IV access
Investigations – coagulation profile, serum electrolytes, full blood count including platelet count
Continuous monitoring and look for signs of envenomation such as weakness, coagulopathy, haemolysis etc
Assess tetanus immunisation status and tetanus prophylaxis if required
Specific antivenom only if symptomatic – note need same dose as adult ie antivenom dose is titrated against dose of venom – snake does not calculate mg/kg!

Pitfalls: observer unreliability eg in terms of colour/pattern etc
snake specimens often mutilated beyond recognition
snake venom detection kit problems

- out of date kits
- read upside down
- misinterpretation of result
- false positives

Pass Rate: 100%

17. A three week old infant has been retrieved to the Paediatric Intensive Care unit with severe pertussis pneumonitis. List the possible complications of pertussis infections. Briefly outline your management options for this patient.

Complications:

- apnoea
- pneumonia – respiratory failure
- seizures
- leucocytosis (lymphocytosis)
- death
- public health risks

Management:

- Isolation
- Supportive
- Intravenous fluids
- Nutrition – may require enteral feeding
- Monitoring respiratory status
- Ventilation if required
- Exchange transfusion/leukophesis if WCC > 100,000
- Antibitiotics – if symptomatic
  - If asymptomatic but +ve PCR
- Reduce severity of symptoms
- Reduce transmission
- (Azithromycin 5 day course
- or Erythromycin 14 day course (risk of pyloric stenosis)
- Immunization at 2 months

Pass Rate: 33%

18. You have been asked to review a 5 year old boy in the emergency department one hour after a moderate head injury. Define the term "moderate head injury". Draw an algorithm to illustrate your management plan.

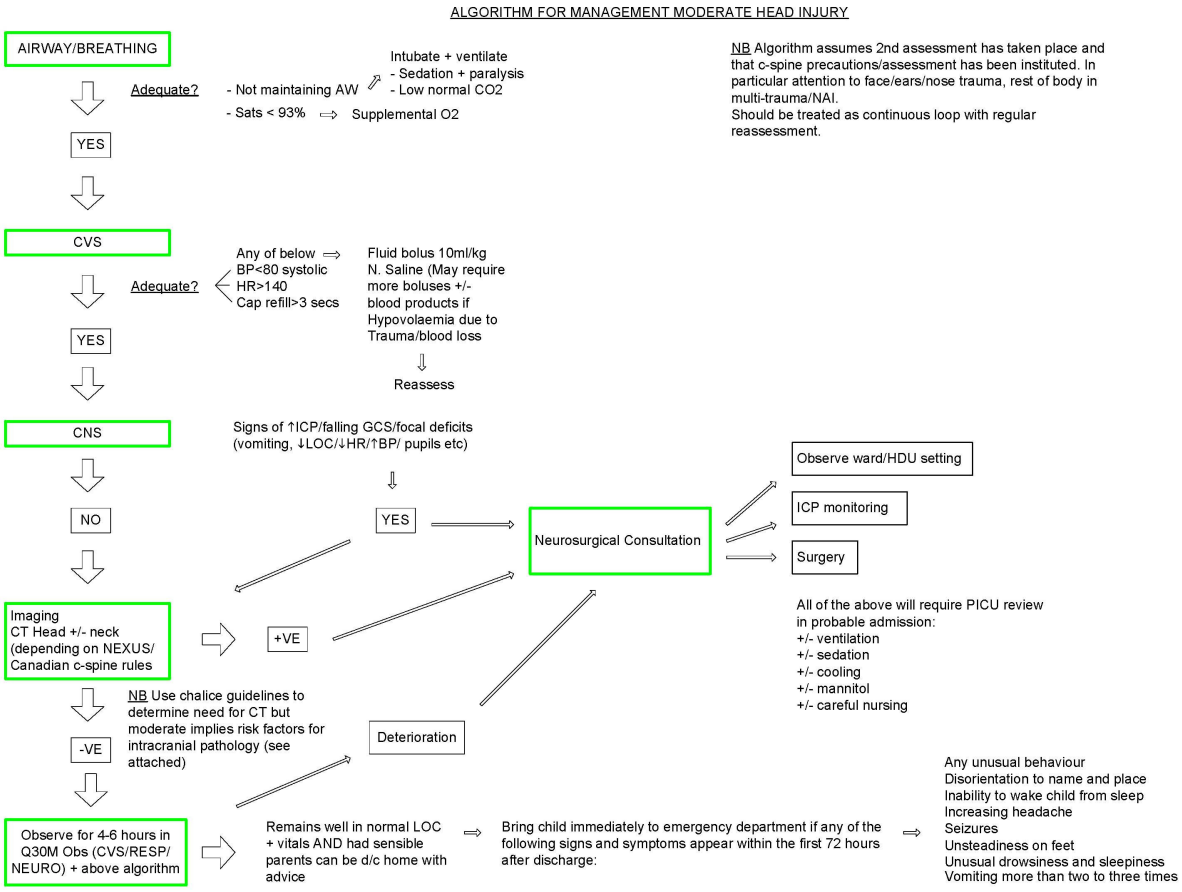
Moderate Head Injury (RCH Brisbane web site)

Brief loss of consciousness at time of injury
Currently alert or responds to voice – may be drowsy
Two or more episodes of vomiting
Persistent headache
Up to one single brief (< 2 min) seizure occurring immediately after impact
May have a large scalp bruise, haematoma or laceration
Normal examination otherwise

Moderate Head Injury (Canadian Pediatric Society)

Loss of consciousness for 5 minutes or more
Progressive lethargy, headache
Vomiting protracted (more than three times) or associated with other symptoms

Post-traumatic amnesia
Post-traumatic seizure
Multiple trauma
Serious facial injury
Signs of basal skull fracture
Possible penetrating injury or depressed skull fracture
Suspected child abuse
Glasgow Coma Scale score of 11 to 14.



Pass Rate: 50%

19. A six week old baby with respiratory failure is ventilated in the paediatric intensive care unit with a diagnosis of congenital chylothorax. List the potentially life threatening issues related to this diagnosis. Briefly outline the management options for this patient.

- ventilatory failure – lung collapse
- pressure effects – tensioning
- malnutrition – loss of protein/lipid rich chyle
- immunocompromise
  - lymphocyte depletion within chyle
  - Loss of immunoglobulins
- iatrogenic complications of ventilation/drainage

– usual ventilation complications
- empyema/sepsis 2^{o} to drainage

Management:
conservative

- drainage
- decrease lymph flow
    - salt restriction and diuresis
    - nutritional (high protein, high-carbohydrate, medium chain TG with reduced fat - initially enteral buy can use parenteral if continues to accumulate
- measure serum immunoglobulins, coagulation. Replace if necessary
- ?role of octreotide infusion

surgical

- ligation of thoracic duct : indications
    - chyle loss > 100 ml per day per year of life after 5 day trial of medical management
    - chyle flow not diminished with 2 weeks of medical treatemtn
    - severe nutritional complications.

Pass Rate: 83%

20. An 11 year old girl is admitted following biopsy of a mediastinal tumour and prior to commencing chemotherapy. Outline the principles for preventing and treating the tumour lysis syndrome.

Ensure adequate and secure airway given that mediastinal mass.
Prevention depends on understanding of disease

- Establish adequate venous access for sampling and fluid administration.
- Baseline bloods (urate, Na. K, Ca, PO4, urea, creatinine, WCC, pH, HCO3)
- Assess risk: higher if haematological malignancy, already elevated uric acid prior to therapy, raised WCC (>50), pre-existing renal failure)
- Commence preventative treatment 24-48hrs prior to and stop 72hrs after chemotherapy if possible. However TLS can occur without Chemo.
- "Hyper Hydration" therapy. IV fluids (0.9% saline) at 200% maintenance (based on weight). Aiming for urine output (catheterise) of 3ml/kg/hr without diuretics if possible (may increase urate precipitation). Aims to increase urine output, intravascular volume, renal blood flow and GFR, thereby promoting urate and phosphate clearance. Significant risk of electrolyte disturbance and fluid overload especially if associated cardiac problems, needs to be anticipated (12hrly electrolytes minimum and hourly fluid balance) and treated.
- Urine alkalinization. Controversial so discuss with oncology but if used aim to keep urine pH>6.5 with IV bicarbonate. Overzealous treatment may result in serum electrolyte disturbances, may actually worsen rather than prevent precipitation of crystals in urine. Acetazolamide may aid HCO3 excretion.
- Drug therapy to prevent hyperuricemia
    i. Allopurinol: traditional treatment, competitive xanthine oxidase inhibitor, prevents production of uric acid but dose not reduce if already raised, raises serum xanthine levels which may also precipitate in urine, would use if low risk of TLS.
    ii. Rasburicase: rapidly acting recombinant urate oxidase, promotes urate oxidation to allantoin (10x more soluble in urine), thereby reducing urate levels in blood. Would use if urate already high or high risk patient.
- Explain risks appropriately to child and family.
- Severity of disease based on:

    i. Severity of electrolyte disturbance (urate, K, PO4, Ca)
    ii. Renal dysfunction
    iii. Symptoms (seizures and arrhythmias)
- Hyperuricemia due to nucleic acid/cell breakdown. Treat as for prevention above.
- Hyperphosphatemia due to malignant cell breakdown. Results in calcium phosphate precipitation, in tissues and kidney and hypocalcaemia. Treat by reducing intake, promoting excretion (oral phosphate binders eg aluminium hydroxide, promoting urine output, possible RRT (HD>CVVH>PD). Avoid calcium administration unless essential.
- Hypocalcaemia due to hyperphosphatemia. Potential for serious muscular cardiac or neurological disturbances. Main treatment is to reduce phosphate, administer IV Ca Gluconate (0/5mg/kg via CVL) only if significant symptoms (eg arrhythmia or fit)
- Hyperkalemia due to release from cells and or renal failure. Main risk is arrhythmias (asystole classically) monitor ECG for peaked T waves and arrhythmia. Treatment as per usual (reduce intake, oral or rectal binders, inhaled or IV salbutamol, IV glucose with or without insulin, IV bicarbonate via CVL, frusemide, RRT) however caution with IV Calcium.
- Renal dysfunction. Careful fluid balance (may need to reduce input once established), optimise intravascular volume, treat hyperuricemia and hyperphosphatemia, consider frusemide and or mannitol, consider RRT (HD if stable and available, if not CVVH or PD), and adjust nephrotoxic drugs.
- Treat fluid overload, reduce input if possible, promote diuresis, manage effects (eg CPAP/ventilation but caution as mediastinal mass and may be difficult to ventilate if paralysed).
- Specific Treatment for complications eg seizures, arrhythmias, nausea

Pass Rate: 67%

21. An 8 week old infant born at 29 weeks gestation is admitted to the Paediatric Intensive Care unit for monitoring following bilateral inguinal hernia repair under general anaesthetic. List the risk factors for post-operative apnoea in infants.

Prematurity plus history of:
- CNLD
- Pulmonary hypoplasia
- Anaemia
- Intraventricular haemorrhage
- Opioid analgesia
- General anaesthesia
- Hypothermia post operatively
- hypocalcaemia

Give a brief overview of the relationship between risk of apnoeas and age and the time since surgery.

- Risk of apnoea until > 52 weeks post conceptual age
- 30% risk of apnoea post GA
- most occur within 12 hours of General Anaesthetic

Several apnoeas requiring stimulation are observed four hours after surgery.
List the management options for post operative apnoeas in this baby.

- Monitoring during high risk period

- Discontinue opiates
- Prefer simple analgesics plus local anaesthesia
- Caffeine/theophylline
- NP tubes/CPAP/high flow nasal prong oxygen

Pass Rate: 83%

22. Your intensive care unit collects PIM2 and mortality data and derives the Standardized Mortality Ratio (SMR) annually as a quality control measure. The SMR for your unit normally ranges between 0.65-0.7. Last year, the SMR for your unit was noted to be 1.2. Briefly discuss the likely explanations for the change in the SMR?

SMR is the ratio of the observed deaths and the predicted deaths (predicted by PIM2).
A ratio of > 1 implies a higher than expected mortality.

Potential explanations:

1. Erroneous increase in SMR (likely given magnitude of increase).

This may be due to inaccurate data collection or inaccurate PIM2 scoring. Review data collection process and quality control measures. Review scoring procedure and entry.

2. Increase may reflect shortcomings of scoring system.

There may have been a change in casemix that is not detected by the scoring system. There may have been a change in referral patterns from external sources introducing the possibility of lead time bias.

3. There may be a real increase in the SMR (unlikely given magnitude)

Examine potential causes for higher than usual mortality rate:
changes in personnel, staffing ratios, rostering practices
changes in practice/treatment /guidelines
operations, procedures, treatments that are new to unit
increased/resistant nosocomial infections

Pass Rate: 33%

23. "The genetic make up of the patient influences severity of illness and recovery in a variety of disease states" – Outline a few examples in support of this statement in paediatric critical illness.

1) Sepsis – It is now believed that genetic predisposition influences the risk of serious infection and outcome from severe injury. These genetic variations are thought to be the result of single nucleotide polymorphisms (SNP). These are thought to influence the severity of injury by controlling the induction of TNF, NF kappa B and toll receptors.

2) Acute lung injury The genetic susceptibility to the development of and variable outcomes in acute lung injury/acute respiratory distress syndrome (ALI/ARDS) has become a topic of great interest in the pulmonary and critical care community. Published studies of variable genetic susceptibility to ALI/ARDS already have identified some important candidate genes and potential gene-environment interactions.

3) Head injury – There is now data to suggest that the presence of certain Apo Lipoprotein genes may have an adverse outcome in head injury.

4) Pharmacogenomics: Response to and adverse effects of a drug are thought to have a genetic basis

Pass Rate: 17%

24. Two days following a severe head injury, a 13 year old male remains intubated and ventilated in the Paediatric Intensive Care Unit. A hard cervical collar remains in situ. A lateral cervical spine radiograph is normal. Describe your cervical spine management plan for this patient for the next 24 hours. List the required steps to "clear" his cervical spine in order to safely discontinue cervical spine immobilisation.

- Ideally issue would have been assessed on admission.
- 13yr old is less likely than adult to have spinal cord injury without radiological abnormality (SCIWORA) so may be able to be cleared radiologically.
- Assess available information.
    - Mechanism of injury (higher risk if high velocity, fatality in same incident, ejected, fall >3m)
    - Initial assessment: if conscious and no distracting injuries spine may already have been cleared clinically or focal tenderness or neurological weakness may have been ascertained.
    - Known injuries: to rest of spine, head etc
    - Reason for ventilation: if severe TBI unlikely to be clinically clearable in near future, however if not for good reason wake and assess clinically ASAP.
    - Reassess lateral C spine view for adequacy (down to C7/T1 space) and normality, and ensure no other imaging already performed.
    - Haemodynamic stability (? Evidence of spinal cord injury)
    - Neurological exam (GCS, rectal tone if not already asessed)
    - Log roll patient, remove collar and examine for neck for deformity, bruising and tenderness if possible)
    - Type of hard collar and fitting : stiffneck collar is not appropriate change immediately to Philadelphia or similar.
    - Complications: pressure sores over occiput or mandible, neurosurgical anxiety level over collar effecting ICP.
    - Consult with orthopaedic and neurosurgical teams but make up own mind.
- Clear neck clinically or "radiologically "now if humanly possible (see b.)
- If unable to clear options are:
    - Continue with Philadelphia collar until cleared if likely to be soon. Institute 2 hourly pressure area cares.
    - Replace collar with sandbags and tape, particularly if patient immobile and likely to remain so. Keep collar on bed and replace immediately if patient starts to move about (and remove tapes).

- Steps to clear spine:
    - If able to be fully conscious (including adequate sedation and analgesia removal) and no distracting injuries with normal lateral X-ray: examine neurology (conscious level, motor or sensory abnormalities) then with 4 assistants fully examine neck including a log roll for tenderness, bruising, step, active movement. If normal remove collar and document neck clinically cleared in notes.
    - If unlikely to clear neck clinically in near future options are to rely on assessment performed in part a plus radiological clearance. This is controversial; preferred investigations are listed in order of preference;
        - Cervical MRI. Will detect soft tissue injury well but may over diagnose potential instability. Will accurately diagnose spinal cord injury. May be less useful in detecting bony injury. Patient must be adequately ferrous metal free and stable enough to perform.

    - Cervical multi-slice CT (24 or more) is potentially more useful at detecting bony instability and is now the standard in some adult centres (Alfred in Melbourne who used to use MRI)
    - Passive flexion extension views have been described under controlled conditions without adverse consequence;
    - Multi view plain films (Lateral, AP, Peg, Obliquex2) not useful.
- In conclusion this is a controversial subject; almost all the literature is from adults where SCIWORA is less common.

Pass Rate: 50%

25. Tabulate the differences between acute tubular necrosis and pre-renal failure with respect to the following parameters:

	ATN	**Pre-renal**
BUN/plasma creatinine ratio	Normal in ATN	May be greater
Urinalysis	Urinalysis in ATN reveals muddy brown granular and epithelial cell casts and free epithelial cells. However, the absence of these urinary findings does not exclude ATN.	Normal or near normal in prerenal disease; hyaline casts may be seen but these are not an abnormal finding.
Urine sodium concentration	High in ATN (>40 meq/L) due in part to the tubular injury.	Low in prerenal disease (<20 meq/L) in an appropriate attempt to conserve sodium
Urine osmolality	Low, because of loss of concentrating ability. Below 450 mosmol/kg in almost all cases and usually being below 350 mosmol/kg	High because of preserved concentrating ability. Osmolality above 500 mosmol/kg is highly suggestive of prerenal disease,

a) **Urea/creatinine ratio**
b) **Urine sediment**
c) **Urine osmolality**
d) **Urine sodium concentration**

Pass Rate: 83%

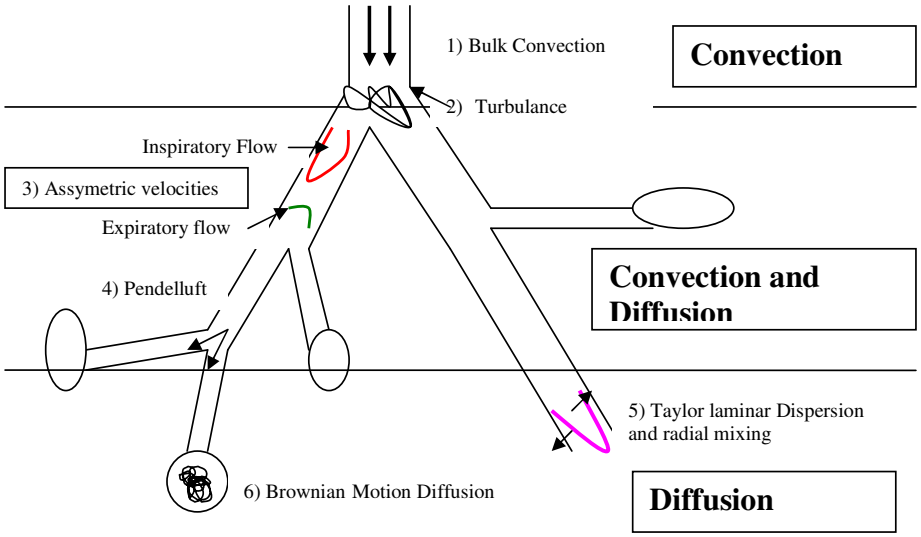
26. Using words and/or diagrams, describe the physical principles of gas exchange involved in high frequency oscillatory ventilation.

High Frequency Oscillatory Ventilation (HFOV) is driven by a continuous bias flow with the pressure waveform being derived from a piston that moves above and below a zero point.
A number of novel gas flow mechanisms have been identified to occur with HFOV, which make variable contributions to gas exchange in the lung. The majority of gas exchange occurs by either convection or diffusion or a combination of the two.

1) Bulk Convection is the mass movement of gas associated with the piston movement and bias flow. Whilst this is thought to be the predominant mechanism of gas exchange in conventional positive pressure ventilation, the contribution in HFOV is thought to be less

and restricted to the proximal alveoli. The volumes of gas moved with HFOV are usually less than the anatomical dead space of the patient.

2) Turbulence generated in the large airways contributes to the mixing of gases and may also play a role in the efficiency of CO2 clearance in HFOV.
3) Asymmetric velocity profiles during inspiration and expiration leads to net convective gas transport. Inspiratory gas flow is asymmetric and parabolic whilst expiratory gas flow tends to be flatter and more symmetric. This is more prominent at airway bifurcations. This leads to net convective gas flow.
4) The regional variability in compliance and resistance of gas exchange units and therefore their time constants leads to out of phase gas exchange between regional units, this is called pendulluft.
5) Taylor dispersion is related to the longitudinal dispersion of molecules in laminar flow augmented by radial dispersion of gases which increases gas mixing. This is further enhanced by turbulent flow at junctions.
6) Molecular gas diffusion or Brownian motion leads to significant mixing and gas exchange at the alveolar level where gas velocities approach zero.
7) Cardiogenic mixing is related to the rhythmic contraction of the heart contributing to peripheral gas mixing.



Pass Rate: 50%

27. Two hours after admission to the Paediatric Intensive Care Unit post cardiac surgery, a 15 month old infant becomes poorly perfused and tachycardic. Junctional Ectopic Tachycardia is suspected as the cause. Describe how you would confirm this diagnosis. Detail your management.

a) Junctional Ectopic Tachycardia (JET) is due to increased automaticity of the Bundle of His. It is typically self limiting and resolves in a few days, but can lead to severe haemodynamic compromise that is potentially life threatening. It is a not infrequent post operative arrhythmia when there has been significant ventricular resection, prolonged bypass, young patient, use of catecholamines and/or electrolyte disturbances particularly potassium, calcium and magnesium.
It is diagnosed by a 12 lead surface ECG or atrial lead ECG that demonstrates

-A tachycardia that has increased over time rather than having a sudden onset this is the so called warm up phenomenon.
-JET rates are commonly greater than 170 beats per minute.
-Narrow QRS Complex that has normal or near normal morphology.
-There is atrioventricular dissociation

-The ventricular rate is typically faster than the atrial rate, but there may be retrograde conduction of a P wave following each QRS complex.
Adenosine in this situation will not revert the tachycardia as the automatic rhythm is initiated below the atrio-ventricular (AV) node and does not depend on AV node conductance for its continuation. However, adenosine will block retrograde P wave conduction, which may be helpful in diagnosis.

The management of the patient with JET includes the following approaches often in unison

- Use of adequate analgesia and sedation to ablate inherent catecholamine responses. There has been a tendency to utilise Fentanyl for this purpose as it is thought to reduce sympathetic tone and have minimal cardiovascular compromise, but there is little data to justify this particular approach.
- Minimising catecholamine use particularly dopamine but also dobutamine, adrenaline, noradrenaline and milrinone.
- Cooling of the patient to normothermia or just below recognising an increased risk of ventricular arrhythmias with temperatures below 34 degrees.
- Monitoring and correcting of electrolyte disturbances with particular reference to Potassium, Ionised Calcium and Magnesium. The use of Magnesium to levels at the upper limit of normal and even above has been shown to have some benefit.
- Use of anti arrhythmic agents to reduce the automaticity. Typically in Australia this is with amiodarone as a bolus and then an infusion. Other agents have included Propafenone, Procainamide and Flecainide.
- Atrial override pacing is of benefit once other therapies have stopped the incessant increase in the heart rate or even reduced the heart rate. Atrial pacing is essential when using anti-arrhythmic agents such as amiodarone as bradycardia is a significant adverse event.

On rare occasions there have been reports of the use of Extra Corporeal Life Support (ECLS) for the acute management of this condition and even articles describing the use of radiofrequency ablation in the post operative period. However with the above mentioned approach there should be little need to resort to these extremes.

Pass Rate: 100%

28. With regards to nutrition in the critically ill paediatric patient.
List the methods available to estimate energy requirements.
List the metabolic and clinical problems caused by overfeeding.
List the clinical and biochemical features of the refeeding syndrome ?

Methods:

(i) Various predictive calculations such as Schofields equation use body weight, age and surface area to estimate energy requirements with adjustments for factors such as sepsis, trauma, ventilation.

(ii) Indirect Calorimetry can be used to calculate the energy expenditure based on the carbon dioxide release. The equipment for this is expensive and has limitations including that there is no endotracheal tube leak in a ventilated patient and less than 60% Oxygen concentration is required to oxygenate the patient

Problems:

1. hyperglycaemia
2. hyperlipidaemia
3. hyperosmolarity and hypertonic dehydration (in patients fed excess nitrogen who have impaired urine concentrating ability
4. increasing hypermetabolic demands - azotaemia
5. Increasing respiratory requirements due to increased CO2 production.
6. Increased hepatic workload (hepatic steatosis)
7. Associated difficulties with fluid balance depending on approach to nutritional support used.
8. Associated difficulties with bowel management depending on the type of enteral feed utilised ie diarrhoea with high osmotic loads

Refeeding syndrome is the combination of electrolyte and fluid shifts that occurs with the reintroduction of nutrition be it oral, enteral or parenteral to a nutritionally compromised patient. In starvation the secretion of insulin is decreased and fat and protein stores are catabolised to produce energy. This results in an intracellular loss of electrolytes, in particular phosphate (also Mg, K). Thiamine deficiency can be unmasked. With the reintroduction of feeding a sudden shift from fat stores to carbohydrate metabolism occurs and secretion of insulin increases. This stimulates cellular uptake of phosphate, which can lead to profound hypophosphataemia. This syndrome can be manifested clinically by weakness, rhabdomyolysis, leucocyte dysfunction, respiratory failure, arrythymias, cardiac failure, hypotension, arrhythmias, seizures, coma, and sudden death. In the paediatric population it is most likely to occur at the first presentation of insulin dependant diabetic ketoacidosis, in anorexia nervosa or in malnourishment associated with child abuse.

Pass Rate: 67%

29. Evaluate the role of crystalloids and colloids as volume replacement fluids in the critically ill child.

In deciding between crystalloids and colloids in the critically ill child it is important to note that only a few crystalloid solutions are of value as volume replacement. Free water solutions such as 5% and 10% dextrose and other variants 4% Dextrose and 0.18% NaCl have no role in the critically ill child as volume replacement solutions. Use of these fluids is associated with marked shifts in serum sodium and contribute to increased morbidity and mortality in the critically ill. 0.9% Sodium chloride and Hartmann's Solution do not behave as free water in the intravascular space and can be used as volume replacement solutions.
The safety and availability of colloids is also noteworthy with Dextran solutions being of little value in resuscitation due to their effect on platelet function and cross matching. Hetastarch solutions such as haemaccel have at times been troubled by anaphylactoid reactions but are easy to store at room temperature and have a long shelf life. Albumin as a blood component is at times restricted in its availability and has distinct storage requirements.
In deciding between crystalloid and colloid it is also important to appreciate the patient's underlying pathophysiology. In some settings such as diabetic ketoacidosis where the fluid lost is essentially water the use of crystalloids is an obvious choice. In the setting of significant blood loss then blood replacement is appropriate. However in the majority of other settings there has been significant debate as to the safety and efficacy of crystalloids and colloids in the critically ill. After an adverse meta analysis the safety of colloids in volume replacement was re-established by the SAFE study conducted by the ANZICS CTG. This study in 70 000 adult patients demonstrated that the use of albumin was as safe as the use of 0.9% Saline as volume replacement in critically ill adult patients. In the Ad Hoc analysis of this study there was some suggestion that there was a tendency to improved outcome in trauma patients managed with 0.9% saline and the septic patients treated with 4% Albumin. Neither of these findings reached clinical significance as the study was not powered to answer these questions.
Therefore there is little paediatric data to support the exclusive use of either crystalloids or colloids as volume replacement solutions. However factors such as patient pathophysiology and product features such as safety and storage requirements will guide practice and decision making in any given institution and setting.

Pass Rate: 50%

30. What is a meta-analysis? What is the role of meta-analysis in evidence based medicine?

A form of systematic review that uses statistical methods to combine the results from different studies

1. ↑ statistical power by ↑ sample size

2. Resolve uncertainty when studies disagree
3. Improve estimates of effect size
4. Establish questions for future PRCTs

What are the features you look for in a meta-analysis to determine if it has been well conducted?

1. Are the research questions defined clearly?
2. Are the search strategy and inclusion criteria described?
3. How did they assess the quality of studies?
4. Have they plotted the results?
5. Have they inspected the data for heterogeneity?
6. How have they calculated a pooled estimate?
7. Have they looked for publication bias?

Pass Rate: 17%

OSCE Section

A systematic approach to the types of investigations examined was more likely to maximise the candidate's score. Candidates should ensure that they take note of the carefully chosen clinical information provided when considering their answer. It is imperative that candidates answer the specific question asked (eg. differential diagnosis, "the most likely" means give one, or "list five" means list up to five but not more).

1.Chest X Rays:
The films included:
1) Cystadenomatoid malformation
2) Dextrocardia
3) Lung collapse in a child with muscular dystrophy

2.Monitoring:
Date provided for interpreting included:
1) EEG with burst suppression
2) ECG – SVT
3) ECG – Atrial fibrillation with rapid ventricular response
4) Arterial waveforms showing damping and hyper-resonance.

3. Chest X Rays:
The films included:
1) Post diaphragmatic hernia repair with malpositioned devices
2) Staphylococcal pneumonia

4. Equipment OSCE:
The equipment included:
Oesophageal pacing wire
Transvenous pacing wire
Temporary pacing wire/skin wire
Remote defibrillator pads

5. CT Scans
The films included:
CT head with subarachnoid bleeding and cerebral oedema
CT chest with haemothorax and lumbar spine fracture

6. Serum and Urine Electrolytes:
Inappropriate antidiuretic hormone secretion
Diabetes insipidus
Cerebral Salt Wasting Syndrome

7.Communication OSCE:

The following scenario was given to the candidate:

On returning from leave, you take over the management of Simon, a twelve year old boy, with severe muscular dystrophy who has been on ventilatory support in your PICU for 5 weeks. He has been ventilated on five previous occasions. On this occasion, multiple unsuccessful attempts have been made to wean him from mechanical ventilation. His dystrophy was early onset. His heart has been failing over the last 18 months also, and he is currently inotrope dependent, with an ejection fraction estimated at 22%. His parents are separated. His father has remarried, but his mother is completely dedicated to looking after Simon. His mother is waiting to discuss with you the options for further treatment. The medical consensus is that he should be extubated and not be offered reintubation. You must discuss this with the mother.

The actress was given the following instructions:
You are playing the role of Simon's mother. He is the complete focus of your life. You want to explore the options of stem cell transplants and taking him to America. You cannot accept that he is going to die. You express a range of emotions from shock, sadness, anger in response to what the candidate tells you. At the end of this 10 minute conversation – you will not have had a significant change of opinion but you will be prepared to have more discussions about Simon's future.

The candidate was expected to:

- Introduce himself/herself to mother and clarify doctors position and role
- Offer support for relative "any one you wish to be present" other relatives or social worker/patient advocate. Ask whether father or anyone else should be involved in this discussion
- Ask about recent discussions.
- Explain purpose of this meeting
- Review medical facts and options for treatment
- Determine mothers understanding of Simon's condition and find out something about who Simon is as a person and what he means to the mother
- Discuss Simon's perspective on death and dying
- Allow the mother time to express her feelings and talk about Simon
- Allow mother time to ask questions and responds to questions
- Demonstrate appropriate communication style: general positioning, body language, tone of voice, eye contact, empathy and pace of discussion
- Summary of conference
- Give mother control over timing of "extubation"
- Reassure mother that Simon will be made comfortable
- Plan for further discussions
- Provide contact information
- Acknowledge or show appreciation for the value of the conference and care that Simon has received from the mother
- Discuss what may happen after the conference

8. Procedure OSCE:
The procedure being tested was Basic and Advanced Life Support on a child.
The candidate was required to recognize and treat asystole.
The candidate was required to demonstrate the correct insertion technique for an intraosseous needle. The candidate was required to recognize and treat pulseless electrical activity.

Cross Table Viva Section

There were 6 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 provide a systematic approach for assessment and management of commonly encountered clinical scenarios. 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 problems encountered included ones related to knowledge deficits (and awareness of these deficits), questionable judgement, and poor exam technique. The topics covered in the Viva stations, including introductory scenario and the initial question were:

Viva 1:
An 8 month old child is involved in a motor vehicle accident, having been thrown from the vehicle. He is now in the Emergency Department of a country town hospital, and the General Practitioner is asking for advice and retrieval. The vital signs are: GCS 12, pupils equal and reacting, PR 180/min, BP 65/30 mmHg, RR 15/min. He has a large scalp laceration and a fractured left femur.
What questions will you ask the GP?

Viva 2:
You are called to see a 4year old boy who has been admitted with asthma. He developed shortness of breath at home unresponsive to his inhaler and was given IM adrenaline by the Ambulance crew. He is sitting up markedly short of breath, unable to talk with a heart rate of 180/min, respiratory rate 34/min and SpO_2 of 85% in 10 L/min face mask oxygen. Outline your initial management.

Viva 3:
You attend the Emergency Department (ED) to review a 3 year old boy who was immersed in a dam near a country caravan site. When his de-facto father found him he was not breathing and appeared pulseless. When paramedics arrived, a nurse from the campsite was administering effective basic life support. He received adrenalin x 2 via intra osseous needle prior to arrival at the ED. He is now (1 hour post immersion) extending to pain, and breathing spontaneously.
HR 148 bpm
BP 65/40 mmHg
RR 28 bpm
What are the immediate priorities of management?

Viva 4:
A 5 year old previously well girl, Susan, is admitted to the PICU from the Emergency Department with status epilepticus, fever and rash. She has been intubated and ventilated in the Emergency Department and still has intermittent generalized twitching. Discuss your initial management.

Viva 5:
As the Intensive Care specialist you are called to the Emergency Department to assist in the management of a 3 week old infant. The baby looks pale, feels cold and has a weak pulse. There is no rash and the baby is unresponsive to pain. The family has all been unwell with URTI symptoms for several days and the baby has not been interested in feeding for the last 8 hours.
The following vital signs have been recorded
T 35 ^{o} C

HR 189
RR 68
Describe your assessment and management of this child?

Viva 6:
A 7 year old girl with tricuspid atresia has just been admitted to the PICU following an uneventful fenestrated Fontan procedure. She is fully ventilated and on 5mcg/kg/min Dobutamine.
HR 100 bpm,
BP 91/50 (62) mmHg,
Atrial Pressure 5 cms H_2O,
SVC Pressure 12 cms H_2O,
SpO_2 91% in 50% Oxygen
Describe your approach to this patient and management plan for the first post-operative night

The Clinical Section: Clinical ICU cases

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

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 related 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 as hot cases included patients with:

(1) 8 year old quadriplegic ventilator dependent boy post transverse myelitis.

Discussion - Management of complications/discharge planning

(2) 15 year old girl post bone marrow transplant for ALL with sepsis, renal failure, mucositis and veno-occlusive disease.

Discussion – Underlying pathology post BMT
Approach to meeting nutritional requirements

(3) 1 year old boy post Tetralogy of Fallot repair – peritoneal dialysis

Discussion – management of post operative low cardiac output states.

(4) 3 year old girl ventilated for RSV/Staphylococcal pneumonia

Discussion – assessment for extubation.

Cold cases

There were two cold case stations. The following cases were used.

1. 4 year old boy with dextrocardia, situs inversus.

2. 9 year old girl with posterior fossa astrocytoma – ventilator dependent with critical illness polyneuropathy

Dr Bruce Lister
Chairman, Paediatric Examination Committee,

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